Universidade do Minho
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IT Governance Mechanisms Baseline for Universities: A Multi-Country Study

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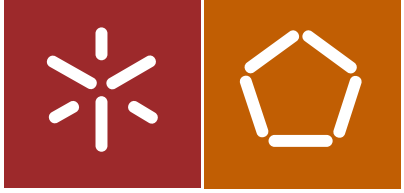

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IT Governance Mechanisms Baseline for Universities: A Multi-Country Study

Tese de Doutoramento
Tecnologias e Sistemas de Informação

Trabalho efetuado sob a orientação do
Professor Doutor Rui Manuel Dinis Sousa

maio de 2018

STATEMENT OF INTEGRITY

I hereby declare having conducted my thesis with integrity. I confirm that I have not used plagiarism or any form of falsification of results in the process of the thesis elaboration. I further declare that I have fully acknowledged the Code of Ethical Conduct of the University of Minho.

University of Minho, 24 of May 2018.

Full name: Isaias Scalabrin Bianchi

Signature: 

DEDICATION

I dedicate this thesis to my lovely parents Álvaro and Célia

and to my brother Ismael.

To the Federal University of Santa Catarina (UFSC) the great place where I work.

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First of all, I would like to thank to God to provide me health and strengths until this hard journey during this PhD program.

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RESUMO

A Tecnologia da Informação tornou-se essencial no crescimento e sustentabilidade do negócio em qualquer tipo de organização. As universidades são uma daquelas organizações que dependem cada vez mais de TI, possuindo processos complexos e uma infraestrutura tecnológica composta por tecnologias heterogéneas que transformam a governação de TI num verdadeiro desafio, o qual não tem recebido a devida atenção. Os processos de ensino-aprendizagem e investigação, nucleares no sucesso das universidades, exigem uma eficaz e eficiente governação de TI. Tal governação exige a definição e implementação de mecanismos formais ao mais alto nível da organização, tendo em consideração estruturas, processos e mecanismos relacionais para a criação de valor no negócio a partir de investimentos em TI. No entanto, determinar os mecanismos adequados à governação de TI continua a ser um trabalho complexo. Estudos anteriores identificam mecanismos de governação de TI usados nos setores de saúde e financeiro. Mas face às características únicas das universidades, e nomeadamente, das universidades públicas, é improvável que as propostas de governação de TI para outros setores de atividade possam ser diretamente aplicadas às universidades. Esta investigação, que se enquadra em Design Science Research, desenvolve um modelo de base com mecanismos adequados para o setor das universidades. A análise de trinta e quatro estudos de caso, identificados na revisão de literatura, proporciona um primeiro conjunto de mecanismos como ponto de partida para o desenvolvimento da proposta do modelo de base através do estudo de casos múltiplos que envolveu entrevistas com diretores de TI, em dez universidades, em cinco países: Brasil, Portugal, Espanha, Israel e Holanda. Oito novos mecanismos emergem nesta investigação. A proposta foi avaliada por cinco especialistas em universidades de Portugal, Espanha, Brasil e Alemanha. O resultado é um modelo de base com mecanismos adequados para a governação de TI nas universidades bem como um conjunto de orientações para a sua implementação.

Palavras-Chave: Mecanismos de Governação de TI; Universidades, Design Science Research; Estudo de Casos Múltiplos; Modelo de Base.

ABSTRACT

Information Technology has become essential for business growth and sustainability in any type of organization. Universities are one of those organizations that are increasingly dependent on IT, with complex processes and a technology infrastructure made up of heterogeneous technologies that make IT governance a real challenge that has not been properly addressed yet. The teaching-learning and research processes, core to the success of universities, require effective and efficient IT governance. Such governance requires the definition and implementation of formal mechanisms at the highest level of the organization, taking into account structures, processes and relational mechanisms for business value creation from IT investments. However, determining the appropriate mechanisms for IT governance remains a complex task. Previous studies identify IT governance mechanisms used in the health and financial sectors. But given the unique characteristics of universities, and particularly of public universities, it is unlikely that IT governance proposals for other sectors of activity can be directly applied to universities. This research, which fits into Design Science Research, develops a baseline model with appropriate mechanisms for the university sector. The analysis of thirty-four case studies from the literature review provides a set of mechanisms as a starting point for the development of the baseline model proposal through multiple case studies involving interviews with IT directors, in ten universities in five countries: Brazil, Portugal, Spain, Israel and the Netherlands. Eight new mechanisms emerge in this investigation. The proposal was evaluated by five experts from universities in Portugal, Spain, Brazil and Germany. The result is a baseline model with adequate mechanisms for IT governance in universities as well as a set of guidelines for its implementation.

Keywords: IT Governance Mechanisms, Universities, Design Science Research, Multiple Case Study; Baseline Model.

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LIST OF ABBREVIATIONS AND ACRONYMS

BSC	Balanced Scorecard
CEO	Chief Executive Officer
CIO	Chief Information Officer
COBIT	Control Objectives for Information and related Technology
COO	Chief Operational Officer
CS	Case Study
DSR	Design Science Research
IS	Information System
ISACA	Information Systems Audit and Control Association
ISO	International Organisation for Standardization
IT	Information Technology
ITG	Information Technology Governance
ITIL	Information Technology Infrastructure Library
ITSM	Information Technology Service Management
PMBOK	Project Management Body of Knowledge

1. INTRODUCTION

1.1 Context and Motivation

First of all, before choosing an interesting topic as a PhD thesis comes a personal motivation. I am an IT civil servant in a large public university in the south of Brazil. I have been working with IT at universities for over seven years. Moreover, the topic of my master thesis was IT governance where I developed and implemented an IT system in a faculty with two ITIL processes. The findings of this project have directly impacted the quality of service in research and teaching activities. In addition, the fact of studying abroad made it possible to become aware of other realities in universities.

Hence, among these motivational factors, it is important to highlight the contribution of ITG in universities, especially in public universities, due to the importance they represent for the country's development. Due to the purpose and mission they have in society for transferring knowledge and technology and providing quality services, universities are strong influencers of world economic and scientific development.

During the last few years I have been fully involved in IT related activities at universities where I have visited and contacted IT managers at universities from several countries to better comprehend the relevance of IT in this context. Therefore, in this PhD thesis, the topic of IT governance for universities is motivated by observations in the field by the researcher where the perception identified was that studies in this type of industry are scarce. Additionally, there is a motivation and interest in understanding more about IT governance at universities to apply the knowledge acquired to my position. In the next paragraphs relevance of this thesis' topic is explained as well as the academic motivation and the context.

Information technology (IT) is used to acquire, process and disseminate information in support of human activities. As complex organisations of hardware, software, and data, IT systems are developed to support individual and group work within some organisational settings (March and Smith 1995). Therefore, IT has become essential in supporting the growth and sustainability of all types of organisations (De Haes et al. 2013; Williams and Karahanna 2013; Wu et al. 2015).

Thus, the organisation has been using IT to automise and perform the processes integrating business among customers, suppliers and distributors as well to their competitive advantage. Moreover, the pervasive use of technology has created critical dependency on IT with particular attention to IT Governance (ITG) (De Haes and Van Grembergen 2008a).

ITG includes processes, people, and structures to guide decision-making around technology issues, Grama (2015) that when implemented can impact the organisation positively enhancing business/IT alignment (Wu et al. 2015). Therefore, to manage this variety of technologies, ITG mechanisms are required to support IT-related decisions, actions and assets that are more tightly aligned with an organisation's strategic and tactical intentions (Pereira et al. 2014c).

A study, in 250 organisations from twenty-three countries carried out by Weill and Ross (2004b) show that organisations with effective ITG have 20% higher performance than other organisations with similar strategies. Several studies in Brazilian firms also reveal that organisations, that have adopted formal mechanisms of ITG, improved their organisational performance in terms of profitability, efficiency and cost savings (Lunardi et al. 2009; Lunardi et al. 2014b). Recently, a study by Chong and Duong (2017) in Asian companies also identified that ITG mechanisms have a positive impact on a firm's profitability. In other words, effective ITG mechanisms and frameworks maximise the creation of business value in organisations.

1.2 Problem Statement and Research Question

The literature shows a variety of models and frameworks to assist the organisations to implement ITG. However, these frameworks have been seen as complex and generic (Bin-Abbas and Bakry 2014; Pereira and Silva 2010; Pereira and Silva 2011).

A survey carried out by IDC of 225 organisations identified the following adopted frameworks: ITIL (27,1%); Six Sigma (23,6%); ISO 20000 (14,7%); COBIT (12,9%); CMM/CMMI (8%); other (2.2%), None of the above (16%); Don't know (7,1%) where the developing of own models and frameworks are a remarkable: 43,6% (Broussard and Tero 2007).

Another study by Lunardi et al. (2014b) in 101 Brazilian organisations identified the following used ITG mechanisms: COBIT (54%), ITIL (44%), SOX (36%), BS7799/ISO17799 (27%), PMI (23%), SLA/SLM

(18%), BSC / IT BSC (10%), with a high adoption of own models (32%) and other (27%). In addition, other models and tools also are cited such as the COSO (Committee of Sponsoring Organisations); the IT service catalogue; shared domain knowledge; Six Sigma; SOA (Service Oriented Architecture); the IT project-linked compensation practices; and ISO 9000 among others.

The study carried out by Chong and Duong (2017) in 70 public Asian Companies identified that IT governance structural mechanisms have a positive impact on a firm's profitability, in contrast with IT governance processes and relational mechanisms which have a negative association with firm performance.

The ITIL and COBIT frameworks are pointed out as the two main references used by an organisation to implement ITG. Ko and Fink (2010), Selig (2008) and Van Grembergen (2007) argue that ITIL is a framework with necessary resources to assist ITG implementation. According to Iden and Eikebrokk (2014), ITIL is a popular driver to implement ITG. On the other hand, De Haes et al.(2013) state that an organisation tends to adopt COBIT for ITG.

However, the difficulty of organisations in implementing IT governance frameworks such as ITIL or COBIT is clear since they have been viewed as complex (Bin-Abbas and Bakry 2014; Pereira and Silva 2010; Pereira and Silva 2011). For example, ITIL version 3 provides twenty-seven processes in five different books and, in the case of COBIT, there are too many control objects. Both seem confusing and present quite a challenge for the organisation on how to go about implementing them.

Organisations may prefer to develop their own frameworks to attend their particular needs for IT governance (Fernández and Llorens 2009). Different organisations may require different solutions for IT governance. Universities are categorized as a type of organisation which are rather complex, that may benefit substantially from high level IT governance mechanisms, as suggested by Weill and Ross (2004b) and Lunardi et al.(2014b), for teaching, research and management activities. There is a lack of studies on IT Governance for universities, in particular, for specific sectors, in general. The number of universities using frameworks for IT governance is limited (Jairak et al. 2015).

Organisations such as universities have quite different goals from industry, specially, the public ones, in their mission in society (Zhen and Xin-yu 2007). While universities create and disseminate knowledge in

society, the industry is more focused on generating profit for the shareholder, reducing costs and creating economic value.

Therefore, because there is considerable difficulty in implementing IT governance frameworks, different organisations may require different solutions for IT governance, universities are one particular kind of organisation and there is a lack of studies on IT governance for universities, thus the development of a model for IT governance in this context was proposed. Indeed, there is a lack of guidance in the literature on how to identify a model and which mechanisms constitute it. Previous findings from the surveys showed the organisations choose to develop their own models, taking into account suitable practices from different models. The identification of each ITG mechanism as well as the effectiveness led to some difficulty.

The process of identifying the right mechanisms for a specific context is a complex endeavour which may depend on size, country, industry, control (public or private), among others (Marrone et al. 2014; Pereira and Silva 2012a; Sambamurthy and Zmud 1999).

Universities are complex organisations that require adequate IT and information systems (IS) to fulfil their mission. Their IT consists of a variety of applications, different platforms, academic systems, cloud applications, i.e., a heterogeneous set of technologies (Svensson and Hvolby 2012; Wilmore 2014). Different systems, structures, processes and technologies can be found at universities leading to considerable complexity in managing IT. The speed of change at which new technologies are implemented in this environment such as mobile devices, wireless computing, portal software, or digital libraries, adds to the challenge of getting value from IT investment.

All is required to offer the right conditions for teaching, learning and research while supporting the management processes (Coen and Kelly 2007; Wilmore 2014). The effective and efficient use of IT at universities to support research, teaching and management requires appropriate ITG (Bajgoric 2014; Conger et al. 2008; Hicks et al. 2012; Jairak et al. 2015; Wu et al. 2015). Effective ITG in universities is strongly associated with the high level of maturity of IT governance mechanisms (Yanosky and Caruso 2008). Moreover, the adoption of formal practices at the highest level of the organisation for governing IT, as claimed in Weill and Ross (2004b) and Lunardi et al.(2014b), brings benefits and improves organisational performance.

Grama (2015) states that an effective ITG helps an institution in achieving its goals by applying IT resources in optimal ways. On the other hand, ineffective IT governance might affect the organisation performance, quality of services, management of operations and costs (Ali and Green 2012; Pang 2014). In universities, ineffective ITG might affect the quality of teaching, research and management of internal processes (e.g. access to online courses, software, academic databases among others). It is quite clear that organisations with complex IT, need to have formal ITG to see worthy organisational performance.

Therefore, different organisations need different solutions for ITG (Jairak et al. 2015). A mechanism that may be suitable for an organisation in the financial industry may not be suitable for an organisation in another industry (Brown and Grant 2005; De Haes and Van Grembergen 2008a; Van Grembergen et al. 2004).

Previous studies have identified a baseline of IT governance mechanisms for a particular industry, for example, the financial industry De Haes and Van Grembergen (2009), Pereira et al.(2014b) and Pereira et al. (2014c) the healthcare industry. The outcomes show that the baseline model and the sequence of practices are different according to the activity sector. The authors state that more research is needed to address the ITG mechanisms' implementation in different contexts encouraging further studies.

Following the recommendation and also as pointed to in top journals such as MISQ and JIT, the research on ITG mechanisms is still scarce but has gained greater attention recently (Schlosser et al. 2015; Wu et al. 2015). This study expects to contribute to improve the body of knowledge developing a baseline for effective IT governance mechanisms in the context of universities. This work will be furnished with an empirical study to provide insights and recommendations in which mechanisms consider taking into account the contingency factors of sectors and specifics of the organisation.

Therefore, more investigation into ITG in universities is needed in order to identify the best practices for this industry. A first challenge may be to understand how universities are implementing IT governance mechanisms to reach the IT's full potential to leverage research, teaching and knowledge transfer to society (Hicks et al. 2012). Since there is a considerable difficulty in choosing suitable mechanisms for each organisation and there is a lack of study on IT governance in universities (Bianchi and Sousa 2016; Jairak et al. 2015), identifying a baseline with the most appropriate ITG mechanisms for universities was proposed.

Given the relevance that ITG has gained in IS and based on future work proposed on ITG mechanisms by Ko and Fink (2010), Schlosser et al.(2015), Wu et al.(2015), and Pereira et al.(2014b), this study aims to increase the body of knowledge on ITG in universities.

A first challenge for a specific sector such as universities is to understand the real situation regarding IT governance so the right and effective ITG mechanisms to realise the IT's full potential to leverage research, teaching and knowledge transfer to society were defined. Since there is considerable difficulty in choosing suitable mechanisms for each organisation and there is a lack of study on IT governance in universities, developing a model with suitable mechanisms for IT governance in universities was proposed.

To understand the IT governance, mechanisms that universities have adopted with a positive impact has been examined in the literature. Mechanisms *"are entities and activities organized such that they are productive of regular changes from start or set-up to finish or termination conditions"* (Machamer et al. 2000, p. 3). The purpose is to identify IT governance mechanisms in a real situation as a starting point to create a baseline of mechanisms for IT governance in universities. Therefore, we will seek to answer the following research question:

What is the baseline of mechanisms to govern IT in universities?

1.3 Research Objectives

To answer the research question, the following specific objectives for the research have been developed:

1. **Identify** the IT governance mechanisms from a literature review;
2. **Analyse** the IT governance mechanisms that were implemented in different universities;
3. **Propose** an IT governance mechanisms baseline for universities;
4. **Evaluate** the proposed baseline.

1.4 Research Strategy

The aim of this research is to develop a baseline model of ITG mechanisms for universities. A suitable research methodology to create an artefact is Design Science Research – DSR. The artefacts are defined as constructs, models, methods, and instantiations (March and Smith 1995). As examples of IT artefacts, we can have together a software, a module of software, processes or an organisational methodology for information systems (Kuechler and Vaishnavi 2012).

The key elements of the DSR on investigations into information systems are the possibilities of new fields of research, conducting testing and the validation of theories, or building new theories. The purpose of this work is to develop a model and solve a specific problem, in this case, ITG in universities. Therefore, DSR can be a suitable approach for this study.

1.4.1 Design Science Research

Design Science Research (DSR) is a method that has been used in engineering, architecture, medicine, social science and computer science (Hevner et al. 2004). Recently, DSR has gained importance and popularity in information systems, mainly in doctoral studies (Gerber et al. 2015). Many researchers have used DSR aiming to develop an innovative artefact in order to solve a specific and relevant organisation problem domain (Hevner et al. 2004; Kuechler and Vaishnavi 2012).

However, few researchers attempt to perform empirical studies on ITG at universities identifying appropriate mechanisms. Therefore, an innovative artefact with the most appropriate mechanisms is being built in the context of higher education in particular for universities

In this thesis, DSR will be adopted for many reasons. Developing an artefact and solving an organisational problem with IT governance mechanisms baseline for universities is a focus. In addition, new mechanisms from practice to complement the ITG list from the literature review are being looked at. To identify these suitable mechanisms means making a design. In this thesis, designing a model with suitable mechanisms for this particular context is the objective.

Furthermore, DSR is a method that has been used in PhD studies with well-defined steps and can be combined with other methods such as case study, action research, survey, and interview among others

(Gerber et al. 2015). The literature shows a range of ITG mechanisms; however, the challenge is choosing the appropriate ones for a particular context. Previous studies have already presented ITG mechanisms for a particular industry but higher education has not been considered yet for new mechanisms. Therefore, it is the intention to solve this problem facing this challenge in the context of universities.

For the development of the model, DSR will be followed extensively used in information systems research to solve complex problems (Hevner and March 2003; Kuechler and Vaishnavi 2008; March and Smith 1995; March and Storey 2008). DSR is not only appropriate to solve organisational problems in specific domains but also adequate to produce artefacts as it is in the case of this model (Hevner et al. 2004; Kuechler and Vaishnavi 2012).

The appropriate structures, processes and relational mechanisms will be looked at to design a model of IT governance for universities. In order to support the rigor to develop the artefact, several DSR processes have been proposed, Table 1 shows the different steps of the Design Science Research.

Table 1. Research process on Design Science Research

March and Smith (1995)	Hevner et al. (2004)	Peffers et al.(2007)	Kuechler and Vaishnavi (2008)	Gregor and Hevner (2013)
Build	Design as an Artefact	Problem identification and motivation	Awareness of Problem	Introduction
Evaluate	Problem Relevance	Definition of Objectives of a solution	Suggestion	Literature Review
Theorise	Design Evaluation	Design and development	Development	Method
Justify	Research Contributions	Evaluation	Evaluation	Artefact Description
	Research Rigor	Communication	Conclusion	Evaluation
	Design as a Search Process			Discussion
	Communication of Research			Conclusions

In this thesis, a combination of these steps was adopted, adapting the model proposed by Peffers et al. (2007). Models are used to represent the real world synthesising the knowledge about the reality (Dewalt 1999; March and Smith 1995). In this case, this model will address the reality of IT governance for universities in five different countries.

According to Gerber et al. (2015) the DSR process has three common points: 1) Identifying the problem; 2) Designing/building a solution for the problem; 3) Evaluating the artefact. DSR is like a "Swiss Knife" and can be used for several activities in scientific research, not only to "design something new and innovative." From this point of view, DSR is a method with well-defined phases that can be used in any situation to propose something useful. In this thesis, the following steps of the DSR process were adopted to propose a baseline model for universities which is presented in Table 2.

Table 2. DSR steps adopted in this thesis

Step	Description
1 Problem identification and motivation	Maturity of IT governance in universities is considered low; few studies exist on how IT governance for universities may be suitably implemented. Literature review on database: ISI, Scopus, AISel Library Key Words: IT governance; IT governance mechanisms; IT Framework; IT framework for universities; IT governance for universities;
2 Definition of objectives of a solution	Proposal of a baseline model of IT governance mechanisms for universities including its adoption in terms of structures, processes and relational mechanisms.
3 Design and development	List of Mechanisms from Literature Review Interviews (Semi-Structured with open-ended questions) to the Chief Information Officer of the universities to complement the list of mechanisms from the literature review. Interviews for the identification of suitable mechanisms of ITG. Level of adoption of IT governance practices, reasons for their adoption involving the Chief Information Officer on what they perceive as effective and an ease to implement. Design of a model with suitable and recommended mechanisms.
4 Evaluation	Evaluation of the model (baseline of IT governance mechanisms) through interviews with experts from universities (Chief Information Officer, IT director, IT manager).
5 Communication	Communication and dissemination of the model to IT practitioners and managers as well as the directors of universities. Publication of findings in journals and conferences.

According to Carvalho (2012, p. 4), the outcomes of Design Research can be validated using the four following criteria.

- **Successful Artefact -** The success of the artefact can be determined in terms of usefulness, efficacy and efficiency**;**
- **Generality** - The artefact is applicable to any situation;
- **Novelty** - The research outcomes are new knowledge;
- **Explanation Capability -** Justification on why the artefact is useful, and its efficiency rather than the alternatives;

Thus, after validating the artefact according to the above mentioned criteria, in accordance with the Carvalho (2012, p. 4) criteria, a discussion and conclusion follow leading to the dissemination of the model for IT practitioners and managers as well as directors of universities. A publication of findings in journals and conferences, magazines, blogs and forums will also be considered for dissemination. The next section describes the strategy and process for the literature review to develop the artefact.

1.4.2 Strategy for the Literature Review

The literature review is essential for all types of academic work (Webster and Watson 2002). Moreover, it is with the literature review process that the knowledge base of theories and concepts about research in any area is developed. In this thesis, to develop this artefact, extensive state of the art ITG in universities was performed. The aim is proofing that this model is better than the actual solutions or brings a new contribution.

The process of literature following the recommendations by Webster and Watson (2002), Kitchenham (2004), Kitchenham et al. (2009), Okoli and Schabram (2010) will now be presented. According to Vom Brocke et al.(2009) at the beginning of a literature review it is recommended to start with a conception of the topic and a definition of key terms in order to derive meaningful search terms. Table 3 summarises the process of the literature review in accordance with the Creswell (2013) criteria.

Table 3. Literature Review Strategy

Research Strategy Literature Review
Definition of Key Terms combined by Topic and Title "IT governance" and "Universities" "IT governance" and "Higher Education;" "IT governance" and "Mechanisms." "IT governance mechanisms" and "University"
Selection of Database and Data ISI Web of knowledge, SCOPUS and AISnet library.
Criteria for Inclusion and Exclusion Data from 2000 to November of 2017; Publication written in English and available in full text; Publication with a peer - reviewed process in Journal and Conferences proceedings.
Preliminary Articles ISI Web of knowledge: 11; SCOPUS:63; AISnet library; 4
Removing Duplication. Evaluation based on reading the Title, Abstract and Methodology
Final Pool of Articles: 26

Besides the most important academic database, the professional reference portal was used regarding IT governance in universities as two associations of information systems for universities EDUCASE[1] and UCISA[2]. The most relevant conferences and journals in information systems were selected. The software Perish was used to verify the number of citations in the articles as a criterion for the quality of the articles. It has also been opted to verify the quartile of the journal in the SCimago choosing quartile one as well as the impact of the journal in Thomson Reuters. However, the articles with quartile two, three and four were also selected. The number of citations in Google scholar was also utilised as quality criteria.

The abstract of the articles and only selected articles were read with a purpose and objective clearly connected with ITG. The articles about governance and corporative governance were discarded as well as the ones reporting mechanisms of ITG that did not fit into structures, processes or relational mechanisms. The process of the literature review illustrated that the topic of this research is relevant to this study and to science. It is a quite clear that the topic is relevant. Few studies on IT governance in universities show that it is necessary to research more about the topic. Therefore, in this thesis, an ITG baseline model mechanisms for universities was proposed.

1.4.3 Case Study

Understanding phenomena in organisational settings is at the core of the information systems discipline (Myers 1997, p. 7). Case study research is the most common qualitative method used in information systems (Myers 1997) and refers to strategic research that seeks to examine a contemporary phenomenon within the context valuing experiences (Yin 2013).

Myers (1997) argues that case study research is designed to help research understand the people in the social and cultural context. The case study is being used to understand the phenomena of IT governance in universities that has been explored very little yet. Moreover, the case research strategy is well-suited

[1] "EDUCAUSE is a non-profit association whose mission is to advance higher education by promoting the intelligent use of information technology. EDUCAUSE helps those who lead, manage and use information resources to shape strategic decisions at every level" (www.educause.edu).

[2] "UCISA represents almost all the major UK universities and higher education colleges and has a growing membership among further education colleges, other educational institutions and commercial organisations interested in information systems and technology in British education, providing a network of contacts and a powerful lobbying voice". UCISA exists to promote excellence in the application of information systems and services in support of teaching, learning, research and administration in higher and further education". (https://www.ucisa.ac.uk/en.aspx)

for capturing the knowledge of practitioners and developing theories (Benbasat et al. 1987). Therefore, the case study is a suitable method to comprehend ITG in the context of higher education institutions. Benbasat et al.(1987) state there are three reasons why case study research is a feasible information system research strategy. In this thesis, the case study method was chosen for these three reasons. First, it is possible to generate theories from practice. It was intended to generate theories for ITG in the context of higher education institutions. Secondly, a case study is one of the most popular methods when the aim is to investigate a phenomenon in context. The method allows the researcher to answer "how" and "why" questions. These questions help to understand the nature and complexity of processes. It is intended to answer how ITG is implemented in the higher education identifying the suitable mechanisms. Thirdly, the case is a useful approach in the emerging field of information systems where research on ITG is still scarce. Indeed, it is evident in previous studies that research on ITG is scarce, where many authors encourage researchers to investigate this topic further. Therefore, from this point of view, the case study can be an enabler to study the real situation of ITG in the context of higher education institutions.

A case study examines a natural phenomenon employing multiple methods to collect data from people, groups or organisations (Benbasat et al. 1987). The organisation of higher education for the people who are responsible for IT is being looked at. According to the philosophical perspectives, a case study case can be positivist, interpretive, or critical (Eisenhardt 1989; Myers 1997). The qualitative interpretivist approach is being used in this work specifically.

In this thesis, the mechanisms of ITG among the universities will be analysed and compared. Therefore, a case study is a suitable method for each university. Multiple case studies have the advantage of avoiding the vulnerability of a single case study. Moreover, the evidence of multiple case studies can be more easily generalised to draw conclusions and build theory (Yin 2013).

The proposal of this thesis is to develop a baseline of ITG mechanisms in the context of universities. Thus, this thesis is based on the fact that no other authors had proposed a model with mechanisms baseline, specifically in the context of universities.

1.4.4 Interviews

Interviews are the most well-known method to collect data in qualitative research and can be used in all kinds of philosophy paradigm whether positivist, interpretive or critical (Myers and Newman 2007). The qualitative interview is an excellent way of gathering data (Myers and Newman 2007). According to Myers (2013) the interview allows gathering valuable data from people in different roles and situations. Thus, interviews can be an appropriate method to develop and evaluate an artefact. The interviews are categorised in three basic types; unstructured, semi-structured and structured (Myers 2013). Table 4 shows this type of interview with a description.

Table 4. Types of Interview

Type of Interview	Description
Structured	In a structured interview there is a complete script and involves pre-formulated questions, it is necessary to plan a script of the interview to ensure the rigor (Myers 2013). The major advantage is the consistency. However, the disadvantages are that it is not possible to improvise. These type of interviews are usually used in the survey where the researcher does not need to be involved in the processes (Myers and Newman 2007, p. 4).
Unstructured	Unstructured interviews often involve no planning or pre-defined questions. This interview is like an informal talk where the questions are improvised. The interviewee can talk freely (Myers 2013). Due to the fact that there is no guide, it is difficult to maintain the consistency.
Semi-structured	Semi-structured interviews involve the use of pre-formulated questions. However, it is possible to improve the interview with new questions and discussions (Myers 2013). This type of interview has consistency due to a previous defined guide in place and it is considered the best of both approaches.

Semi-structured interviews are among the best techniques to collect data from different points of view in organisations (Myers 2013). Moreover, the unstructured or semi-structured interview, is the most typically used in qualitative research in information systems (Myers and Newman 2007, p. 4). The study led by Gerber et al. (2015) identified that interviews are the main method in DSR used in doctoral studies to develop and evaluate an artefact.

Therefore, in this thesis, using semi-structured interviews to collect data will be used. Collecting data from the Chief Information Officer in higher education institutions are being looked at to identify appropriate mechanisms. Therefore, to comprehend the effectiveness and ease of implementation of ITG mechanisms, semi-structured interviews are being used. CIO or someone in a similar position in IT in universities were selected to interview. According to the Educause survey, a large majority of respondents (81%) said that the CIO has been perceived as responsible for ITG at its institution (Yanosky and Caruso 2008). Therefore, for this reason the CIO is a suitable person to be interviewed.

Figure 1 presents the description of the research strategy using a Design Science Research process with in-depth interviews. Moreover, interviews can be used to demonstrate the applicability and validity of an artefact in practice (Peffers et al. 2007).

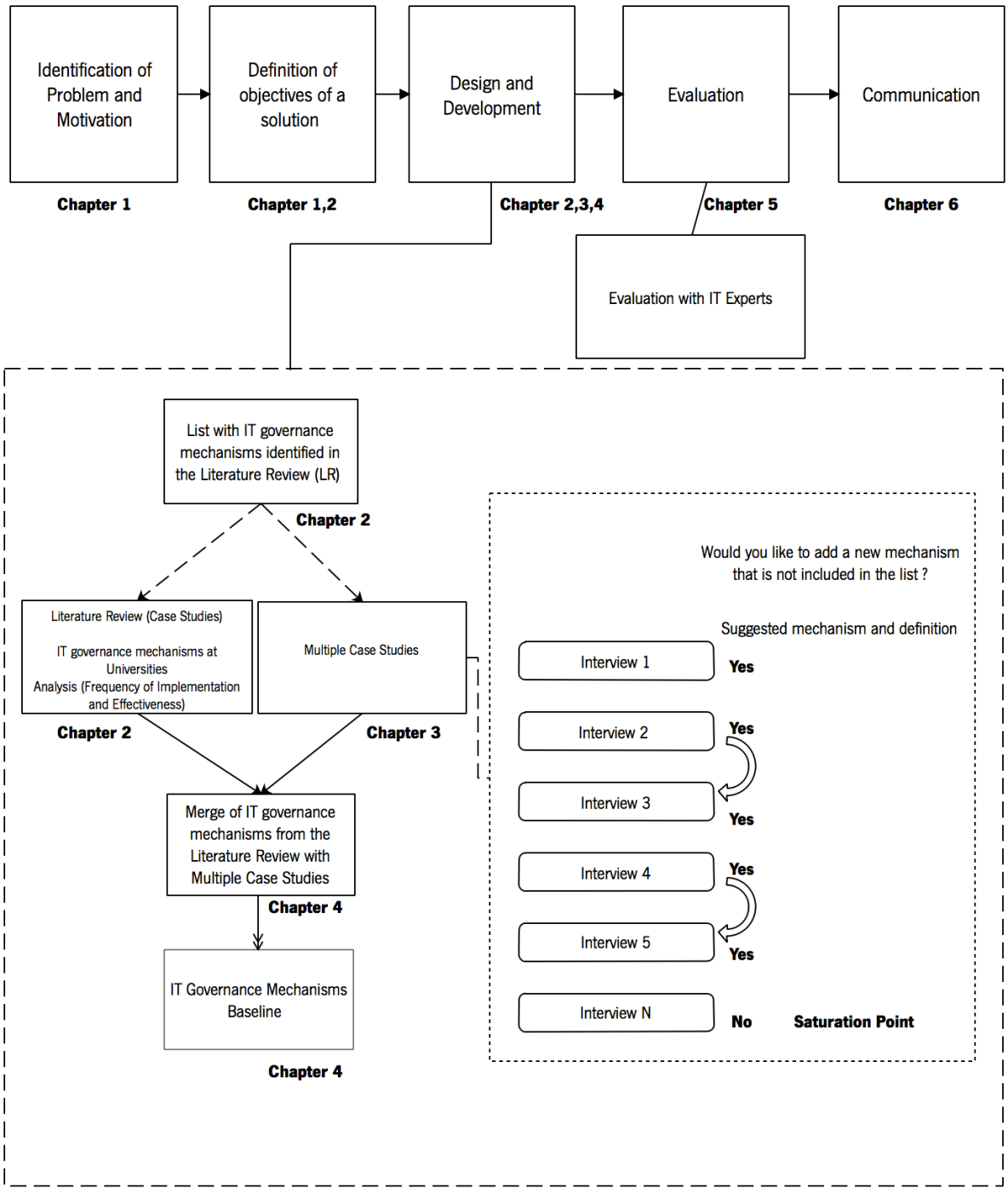

Figure 1. DSR - Design and Development

Regarding the numbers of interviews necessary in qualitative research, Myers (2013) argues that it is not a specific number. It depends on the research question and the answers being looking for. When there are no new insights into the answers that are being looking for from the interviews, a saturation point is reached.

1.5 Outline of Thesis

This thesis is structured according to a Design Science Research (DSR) process and comprises of the following chapters:

Chapter 1: Introduction – presents the research motivation, research question as well as the research objectives. It introduces an overview of the research method that has been utilised for this research and strategy of literature review adopted.

Chapter 2: Literature Review - describes "the state of art" (SOTA). It begins with an IT governance definition, then a summary of the studies on ITG mechanisms are presented in all types of industries. Thereafter, a list of ITG mechanisms generic for all types of organisation is presented, consequently, only the studies on ITG in universities as well as a summary. Last but not least, an analysis into ITG mechanisms in particular in universities is shown.

Chapter 3: Design and Development: Case Study – presents the method adopted inside step three of DSR. The case study method that has been used by this research and the process of data collection will be examined. It also provides all the information about the interviews as well the data analysis and findings in the multiple case studies.

Chapter 4: Design and Development: Proposal of a Baseline presents information for all the mechanisms in the baseline.

Chapter 5: Evaluation and Validation – presents the evaluation and validation of the IT governance mechanisms baseline.

Chapter 6: Discussion and Conclusion - presents the discussion and conclusion of this thesis as well as the limitations and recommendations for future research.

2. IT GOVERNANCE MECHANISMS

This chapter sets the scope creating a clear view over the main topic of this study. The chapter is organised as follows: The first section provides a general overview of the topic and Information Technology Governance (ITG) concept and IT management. The second section presents an overview of the two main frameworks in IT governance. The third section presents the main studies on IT governance mechanisms in different types of industries. The fourth section shows the study on IT governance in the particular context of university. The fifth section gives information about the IT governance mechanism in the university with an analysis about the IT governance mechanism in universities.

2.1 Information Technology Governance (ITG)

Information Technology Governance(ITG) has been conceptualised in different ways (Webb et al. 2006) and it is presented in the literature many times without any distinction from IT management (Krey et al. 2011). What is meant by IT governance concepts needs to be clarified showing the evolution of the concept of governance from corporate governance to IT governance.

Corporate Governance – List of rules, processes, policies and laws that affect how an organisation can be managed and controlled (De Haes and Van Grembergen 2008b; Kooper et al. 2011).

Enterprise Governance – Responsibilities and practices exercised by managers and directors to achieve the goals and objectives of the organisation (De Haes and Van Grembergen 2008b). The managers need to manage the resources and risks of the organisation to be used with chariness.

IT Governance – IT governance is a new concept and its first definition appeared in the 90s in the literature for information systems (Henderson and Venkatraman 1993). Many authors define the concept of IT governance by different means. Therefore, to better understand the concept of each author, Table 5 provides many definitions.

Table 5. Definitions of IT Governance

Definition of IT Governance	Source
IT governance refers to the patterns of authority for key IT activities in business firms, including IT infrastructure, IT use, and project management	(Sambamurthy and Zmud 1999)
"IT governance is the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organisational structures and processes that ensure that the organisation's IT sustains and extends the organisation's strategies and objectives".	(ITGI 2003)
"IT governance as specifying the framework for decision rights and accountabilities to encourage desirable behaviour in the use of IT".	(Weill 2004)
IT governance is "the IT related decision-making structure and methodologies implemented to plan, organize, and control IT activities" (p.194).	(Bowen et al. 2007)
IT governance "consists of the leadership and organisational structures and processes that ensure that the organisation's IT sustains and extends the organisation's strategy and objectives" (p. 123).	(De Haes and Van Grembergen 2009)
"The goal of IT governance is "to direct and oversee an organisation's IT-related decisions and actions such that desired behaviours and outcomes are realized"(p. 289).	(Huang et al. 2010)
"A structure of relationships and processes to control the enterprise in order to achieve the enterprise's goals by adding value while balancing risk versus return over IT and its processes" (p. 180).	(Ali and Green 2012)
IT governance is "the capacity of top management to control the formulation and implementation of the IT strategy via organisational structures and processes that produce desirable behaviours, which will ensure that IT initiatives sustain and extend the organisation's strategy and objectives" (p. 157).	(Bradley et al. 2012)
IT governance is regarded as "a framework in specifying the allocation of IT related decision-making rights and responsibilities to the right organisational group and deploying relational mechanisms to support the alignment between business objectives and IT" (p. 34).	(Chong and Tan 2012)
IT governance is an "integral part of corporate governance", which "addresses the definition and implementation of processes, structures and relational mechanisms in the organisation that enable both business and IT people to execute their responsibilities in support of business/ IT alignment and the creation of business value from IT-enabled business investments" (p. 5036).	(Herz et al. 2012)
"IT governance essentially places structure around how organisations IT strategy aligns with business strategy. This IT-business alignment will ensure that organisations continue to achieve their strategies and goals, and implementing ways to evaluate its performance" (p. 201).	(Prasad et al. 2012)
"IT governance consists of decision-making processes that ensure the effective and efficient use of IT in enabling an institution to achieve its strategic objectives"	(Grama 2015)

Without being exhaustive, Table 5 presents an IT governance definition from leading researchers. The following definition of ITG is adopted in this thesis:

IT Governance

IT governance "consists of the leadership and organisational structures and processes that ensure that the organisation's IT sustains and extends the organisation's strategy and objectives"

(De Haes and Van Grembergen, 2009)

After presenting the concept of IT governance, the definition of IT management also found in the literature as Information Technology Service Management – ITSM is shown. In the next section the difference between IT governance and IT management is presented with a clear distinction between both concepts.

2.1.1 IT Management

Peterson and Fairchild, (2003) and Krey et al. (2011) argue that IT management results in the effectiveness and efficient provision of products and services of IT to contribute to the operation of organisations. IT management is the responsibility of managers to implement and monitor daily the strategies in IT (Gallagher and Worrell 2008).

IT management is responsible for providing services and products to the internal operation of IT. While, ITG is more in-depth with a focus on the future necessity of business and the external customer. (Lunardi et al. 2014b). IT governance is concerned with risk management and the control of IT resources in the organisation to survive despite external threats in the market.

However, IT governance and IT management must work together. To summarise, IT management comprises of the practices that help the organisation in its daily operation in providing the solution. These practices are framework standards developed by renowned organisation such as ISACA, ISO and ITGI. In this study, the best practices are included into the mechanism standards and frameworks for IT governance.

IT Management

IT management is responsible to provide services and products to internal operation of IT.

(Lunardi et al., 2014)

In the next section, the evolution of research in IT governance is presented, the aim being to justify the model under a stream pursued in this study.

2.1.2 Evolution of Research in IT Governance

The research in IT governance is divided into two streams Brown and Grant (2005), see Forms and Contingency Analysis (Figure 2).

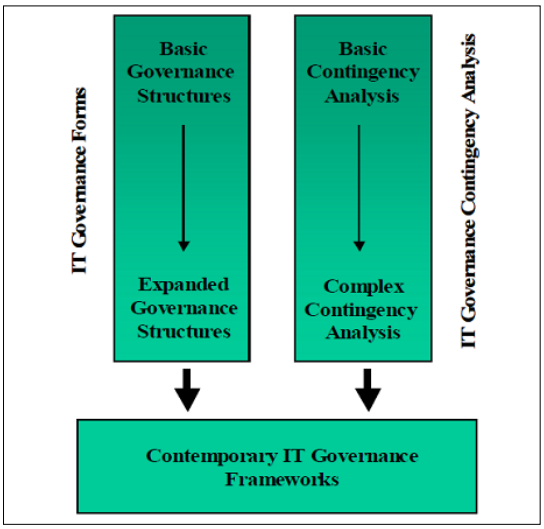

Figure 2. Conceptual Framework for IT Governance Research
(Brown and Grant 2005)

The framework proposed was developed based on the studies carried out by Brown (1997; 1999), Sambamurthy and Zmud (1999). The first stream of IT governance research is related the decision-making structures adopted by IT organisations Brown and Grant (2005). Research on this stream has investigated the decision making in the organisation, with the type of IT governance structure such as decentralised, centralised and federal. The decision making in centralised IT governace is made by business or IT management that can generate standardisation and efficiency. On the other hand, the decentralised IT governance the decisions making are made for business units. The best solution is the federal model, which is a combination of centralised and decentralised IT governance.

The second stream form dealing with IT governance relates to contingency analysis. In this stream, the research tries to uncover the factors for an effective IT governance framework in a particular organisation. Researchers in the literature are unanimous in arguing that a universal IT governance framework is not possible. The solution depends on contingency factors. In this stream of research, the authors present the contingency factors that can influence an IT governance framework such as organisational structure, competitive/ business strategy industry and firm size Brown and Grant (2005). The union of two stream results in a contemporary framework.

The study of Weill and Ross (2004b) is an example of the contemporary framework with the mix of two streams. In this way, the research on IT governance has followed this stream for trying to understand how IT governance can be implemented in different types of organisations and what the most appropriate configuration is. Therefore, we will be following this second stream in this research. In this thesis, the contingency factors proposed by the authors will be considered for the reality of universities. Therefore, it is necessary to adapt frameworks and IT governance practices according to the context and contingency factors.

Many organisations are implementing IT governance mechanisms to assist the operations (De Haes and Van Grembergen 2009). However, few studies can be found on how organisations are effectively implementing IT governance in day-to-day practice and what is the impact of IT governance implementation on business/IT alignment (De Haes and Van Grembergen 2009). Moreover, most of the IT governance studies have been in the financial industry.

An IT governance study from 64 IT executives in Thai universities pointed out that research regarding IT governance practices and guidelines needs to be further explored (Jairak et al. 2015). In the literature review process, an in-depth study was not found for IT governance in the universities.

According to Wu et al. (2015) few research papers have empirically and theoretically analysed the effect of IT governance mechanisms on strategic alignment. The strategic alignment requires integration between IT and business. For this alignment, it is essential to understand the mechanisms implemented to facilitate the relationship between IT and business (Wu et al. 2015).

Almeida et al. (2013a) also argue that it is essential to analyse and understand how organisations are adopting IT governance mechanisms, moreover, to explain future studies in which IT governance mechanisms are more appropriate for each organisation, in a particular context. In this case, we propose to identify the adequate mechanisms for universities. Researchers have investigated IT governance from different perspectives. In this chapter, we showed the evolution of studies in IT governance. Section 2.2 presents two different frameworks for IT governance.

2.2 IT Governance Frameworks

The literature shows two IT governance frameworks. These frameworks are also known as patterns. Firstly, Weill and Ross' (2004b) framework was introduced in subsection 2.2.1. Secondly, De Haes and Van Grembergen's (2008a) framework was introduced in subsection 2.2.2. Section 2.2.1 and 2.2.2 briefly present a description of these two frameworks.

2.2.1 Weill and Ross Framework

The first framework is the IT governance arrangement matrix provided by Weill and Ross (2004b). This study presents a matrix in five different IT domains (IT principles, IT architecture, IT Infrastructure, Business Application Needs, IT Investment) and six archetypes (Business Monarchy, IT monarchy, Feudal, Federal, IT duopoly, Anarchy) of ITG. Table 6 shows the matrix of arrangement.

Table 6. IT Governance Arrangement Matrix
Adapted from Weill and Ross (2004b)

Archetypes	**Decisions domain**									
	IT Principles		**IT Architecture**		**IT Infrastructure**		**Business Application Needs**		**IT Investment**	
	Input	Decision	Input	Decision	Input	Decision	Input	Decision	Input	Decision
Business Monarchy										
IT Monarchy										
Feudal										
Federal										
Duopoly										
Anarchy										

Weill and Ross (2004) identified five types of decisions. A description of each one is presented below.

1. IT principles: High-level of decision making in the strategy of ITG in the business
2. IT architecture: Definition of a list of technical choices to help the organisation satisfy the needs of the business
3. IT infrastructure: Consists of specific technical elements, printers, computers, software. Management of shared services.
4. Business application needs: Business requirements for developing internally or to be purchased.

5. IT investment and prioritisation: decisions to know how much and where to invest in IT.

The decisions in the organisation can be made with six different archetypes. These types of archetypes from more to less centralised are present below.

1. Business monarchy: A group of senior executives such as Chief Information Officer, Chief Executive Officer, Chief Operating Officer.
2. IT monarchy: Chief Information Officer and/or IT executives.
3. Feudal: People of each business unit make independent decisions
4. Federal: People of business and business IT with or without IT people make decisions.
5. IT duopoly: IT executives and business people.
6. Anarchy: Individual or a small group make the decision with base of the own necessity.

The approach of Weill and Ross (2004b) is focused on who and where the decisions are made. This framework does not describe suitable IT governance mechanisms. However, the approach is focused deeply on decision structures. Moreover, these structures can be useful to be discussed and used as a reference further in this thesis.

2.2.2 De Haes and Van Grembergen Framework

De Haes and Van Grembergen's (2008a) framework has a holistic approach in IT governance. The holistic approach provides an easy understanding of mechanisms such as structures, processes and relational IT governance mechanisms. The framework proposed by De Haes and Van Grembergen (2008a) presents the mechanisms for IT governance that financial organisations of Belgium need to have.

The study is focused only on the financial industry in a particular country. It is intended to propose also a set of mechanisms following a similar approach, emphasising contingency factors in another context, in this case universities to be used as a reference for building a model. The framework is a starting point for this thesis to use as a reference. The model will be used because it is the most cited in the literature. Figure 3 shows the framework that will be used.

Both frameworks from De Haes and Van Grembergen (2008) and Weill and Ross (2004) have the same purpose, to guide the implementation in the organisations. Both frameworks can be seen as

complementary to each other. In this thesis, both frameworks will be used as a reference to guide the development of the model.

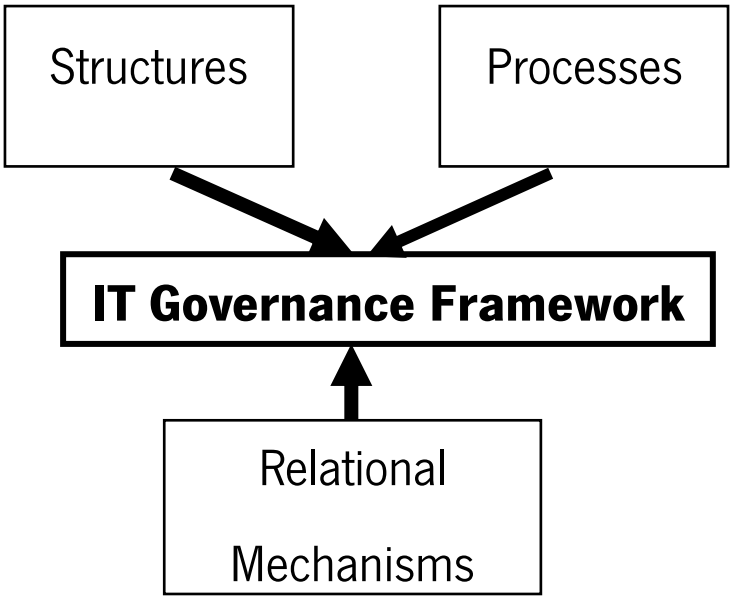

Figure 3. IT Governance Framework
Adapted from De Haes and Van Grembergen (2008a)

This thesis is intended to adopt the framework provided by De Haes and Van Grembergen (2008a) as a base to develop the IT governance baseline model as it is the most adopted and cited in the literature. Moreover, De Haes and Van Grembergen (2008a) also provide a holistic and recent approach.

However, an exploratory case study to identify the suitable IT governance mechanisms in the context of universities will be conducted. As noted by De Haes and Van Grembergen (2009) the use of IT governance mechanisms are not the same for different types of industries. We need to find out which ones are more effective in a particular type of industry, universities.

While applying their framework, De Haes and Van Grembergen (2009) revealed a list of 33 IT governance practices for the Belgian financial services sector using a Delphi study with IT experts. Something similar is intended for the university sector bearing in mind that the mix of structures, processes and relational mechanisms to choose may be dependent upon multiple contingencies according to the organisational context of universities. The next section, presents IT governance mechanisms for IT governance for all kinds of industries.

2.3 IT Governance Mechanisms

A framework for IT governance may be deployed with a set of mechanisms such as structures, processes, and relational mechanisms (De Haes and Van Grembergen 2004; De Haes and Van Grembergen 2005; De Haes and Van Grembergen 2009; Peterson 2004; Weill and Ross 2004b). The challenge is to choose the suitable mechanisms for a particular organisation to get better outcomes.

The literature shows many mechanisms that can be called practices, standards or patterns for IT governance. In this thesis, the concept of mechanism is being used. The aim is to adopt the same concept and definition found in the literature. These mechanisms are important and must be combined to achieve desirable performance. The next section presents a set of IT governance mechanisms from a literature review that is generic for all types of industry. The aim is to cover the maximum number of IT governance mechanisms available for ITG in the literature review.

Regarding the choice of IT governance mechanisms, some criteria was defined to include and exclude references. A mechanism with at least two references was chosen. In addition, several mechanisms without a clear definition and also not cited in other studies were excluded. Some mechanisms were merged into one with the same definition. This strategy is based on the study of IT governance mechanisms in the literature review, carried out by Almeida et al.(2013b) which was adopted as a reference for this study.

The IT governance mechanisms list presented by the authors was the best solution found in the literature. Moreover, since that the article is cited and used as a reference by other authors, it does not make sense to reinvent the wheel doing this literature review process again. However, it is noticed that some mechanisms have a brief definition, in this way, the authors' literature was sought again to complement the definition of each mechanisms presented by Almeida et al. (2013b).

The mechanism with a similar definition was merged into one mechanism. For instance, the mechanism Benefits management and reporting (Grembergen and De Haes, 2009) with the Formal Tracking of Business Value (Weill and Ross, 2004) were included into the Benefits management and reporting.

- The term Relational Mechanisms (De Haes and Van Grembergen 2009) was used rather than Communication Mechanisms that is used by (Weill and Ross 2004b). The choice is because the term Relational Mechanisms is the most used in the literature.

- The frameworks such as ITIL, COBIT, ISO/IEC 38:500, COSO/ERM, BS7799, ISO17799 and ISO27001, NIST: National Institute of Standards and Technology (U.S.), OCTAVE: Operationally Critical Threat, Asset, and Vulnerability Evaluation, MoR: Management of Risk (International) among other frameworks and standards were included in the process mechanism "ITG Frameworks".

One important thing perceived in the process is that the literature shows several practices that also can be considered as a mechanism. However, few studies adopt the concept of a mechanism which became a bit difficult to maintain the rigor. Therefore, although more than forty-six mechanisms were found in the literature review, it was not adopted due to the concept and definition. The aim is to ensure that the same definition is adopted by more than one author. There is an awareness that more mechanisms related to ITG may exist in the literature. However, the choice of forty six was based on the study in the literature review study realised by Almeida et al. (2013b).(Almeida et al. 2013b) Few details were found about the definition of each mechanism, where some mechanisms were not possible to describe in depth and others only via a brief description. The subsection 2.4.1 presents the list of structure mechanisms.

2.3.1 Structures

IT governance structure mechanisms define roles and responsibilities. Steering committees are an example of those structures composed of directors, managers and executives, in other words, people responsible for decision-making in the organisation (De Haes and Van Grembergen 2008b; Webb et al. 2006; Weill and Ross 2004b).

In this subsection the list of seventeen structure mechanisms will be presented from the literature review. This list will be presented as follows aggregating in accordance with the similarity. There are seven different types of committees: an IT strategy committee, IT project steering committee, IT security steering committee, architecture steering committee, IT audit committee at board of director's level, IT investment committee, and IT steering committee. There are two different councils: IT councils and IT leadership councils. Another three mechanisms such as the CIO on an executive committee, CIO reporting to CEO

and/or COO and IT expertise at board level are also part of this group. One mechanism is about IT governance function / office, one is related to the security / compliance / risk officer and one mechanism is related to the integration of governance/alignment tasks in roles& responsibilities. The last two mechanisms are Business/IT relationship managers and part of the IT organisation structure.

IT Strategy Committee - The IT strategy committee is a structure that operates at board of directors' level of the organisation. The mission of this committee is to ensure that IT is included on the agenda and assists the alignment between IT strategy and organisation strategy (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). In addition, it also should ensure that IT governance is inserted in corporate governance (Brown 2006). Moreover, the IT strategy committee should be composed of board and non-board people (ITGI 2003, p. 58). According to Yanosky and Caruso (2008) it is recommended to be composed by professors, students and administrative staff. The different experiences and perspectives are useful for developing IT strategy at university level and not only at IT department level. Therefore, the experiences of each area are important to be shared in this committee. This structure is cited in several studies with a positive impact in the organisation (Ali and Green 2006).

IT Steering Committee - The IT steering committee is a structure at executive level. It is responsible to create business priorities in IT investments to deliver value for the projects (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). Moreover, this structure is implemented in the IT strategy and executed the strategy information system plan, created in the process mechanisms. The member is an advisor in specific fields of IT, business executives and the CIO. While the IT strategy committee operates at board level, the IT steering committee is at executive level (ITGI 2003). This committee had a positive impact in the IT governance effectiveness in Brazilian public organisations (Heindrickson and Santos 2014) and in other studies in other countries such as Brown (2006), Maidin and Arched (2010), Ferguson et al. (2013) mentioned.

IT project steering committee – The IT project steering committee is composed of business and IT staff focusing on prioritising and managing IT projects (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). Therefore, in general, this is a mechanism to discuss the deadlines and priorities. Hence, it is important for IT and business people to reach a consensus and make decisions on IT projects.

Architecture Steering Committee - It is a committee composed of business and IT staff providing architecture guidelines and advice on applications. The main goal of this committee is to identify strategic technologies (De Haes and Van Grembergen 2008a; Van Grembergen and De Haes 2009; Weill and Ross 2004b).

IT audit committee at board of directors level - Independent committee at board of directors level overviewing (IT) assurance activities (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)

IT security steering committee - The steering committee is composed of business and IT staff focusing on IT related risks and security issues (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

CIO reporting to CEO (Chief Executive Officer) and/or COO (Chief Operational Officer) - The CIO (Chief information Officer) reports directly to the Chief Executive Officer or COO (Chief Operational Officer) (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). This ensures that IT is part of the executive team where most strategic discussions take place (ITGI 2003; Weill and Ross 2004b).

In this case, the CIO is the person responsible for the information technology of the university. The CIO of the university reports to the CEO (Chief Executive Officer) who executes this function as Rector and even reports to the COO Chief Operational Officer that can be a Pro-Rector. The interaction between the staff member responsible for IT with the Rector is essential to accomplish the mission of the university with effectiveness and efficiency (Brown 2006).

IT expertise at board of directors - The members of the board of directors have knowledge of the value and the impacts of IT on the organisation (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

Security / compliance / risk officer - This is a function responsible for security, compliance and/or risk, which possibly impacts on IT (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

IT governance function / officer – This is a function in the organisation responsible for driving, promoting and managing IT governance processes (De Haes and Van Grembergen 2008a). The professional to perform this function needs to have knowledge of the academic and business activities, with a view of how IT can assist to promote and optimise the core processes of teaching, research and extension.

Integration of governance/alignment tasks in roles & responsibilities - Definitions of the roles and the responsibilities of the stakeholders is essential for an effective framework of IT governance (De Haes and Van Grembergen 2008a). The board and executive of IT should document all tasks and be responsible executing. It is necessary to identify people responsible for each activity in the process of IT and ITG in the IT departments.

IT Councils - IT councils often report to the executive committee. These councils usually provide a focused environment to consider numerous levels of policies and investments. Thus, many items are discussed in these councils and reported to the executive committee with suggestions and advice. The mix of IT and business units working together enables the team to align business strategy and IT in constructing architecture, infrastructure and business application decisions (Broadbent 2002; Weill and Ross 2004b).

IT leadership councils – The IT leadership councils are particularly important for large multi-business enterprises where there is a mix of responsibilities for infrastructure services, some enterprise-wide and others, business-unit level. Leadership councils may comprise of IT functional heads, CIOs of business units or they may be a combination of the two (Broadbent 2002; Brown and Grant 2005; Weill and Ross 2004b).

Business/IT relationship managers- The business/IT relationship managers are prevalent in many organisations but with a variety of names such as account managers, business technology managers, and business information managers. They play an important role on a daily basis in understanding how the business operates and in interacting with their business peers. Moreover, the business/IT relationship managers act as intermediaries between business and IT, playing a critical daily role exchanging information with IT and business helping the understanding of the operation of IT and business (Broadbent 2002; Weill and Ross 2004b).

IT Organisational Structure – IT governance structures are the arrangement for IT decision making of an organisation. According to De Haes and Van Grembergen (2004) effective IT governance is also determined by the way the IT function is organised and where the IT decision-making authority is located within the organisation. These organisational structures are categorised in three types: centralised, decentralised and federal (Sambamurthy and Zmud 1999).

Centralised – The decision making in centralised IT governance is made by business or IT management that can generate standardisation and efficiency.

Decentralised - IT governance decisions are made by business units. This mode has more flexibility for the business units.

Federal- This is a mix of centralised infrastructure control and decentralised application control. The managers and IT staff share the decision making. Luftman (2003) also argues that the federal governance structure is the combination of decentralised and centralised structures.

According to Weill & Ross (2005) most organisations with the goal of profit tend to be centralised in their ITG approach, with emphasis on strategies for efficient operations. The study of Hicks et al. (2012) in eight Australian universities showed that the structure is highly decentralised. According to Chong and Tan (2012) the adoption of a federal structure is more appropriate for a collaborative network.

IT investment committee or capital improvement – This committee is responsible for evaluating and analysing the expenditure of the projects. (Weill and Ross 2004b).

CIO in the executive committee – Chief Executive Officer of the organisation is a member of the executive committee (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). The study of Yanosky and Caruso (2008) with 59 universities from the United States of America have identified the following results for IT governance mechanisms. It is important to consider the stakeholders as part of committees, including students, faculty, and staff since decision making requires input from all of their voices (Yanosky and Caruso 2008). At Emory University, for example, the steering committee for the university sits organisationally above a total of eight functional committees dedicated to such areas as finance, student services, research administration, and instructional technology, mostly staffed by non-IT participants (Yanosky and Caruso 2008).

2.3.2 Processes

Processes refer to planning and strategic decision making of IT based practices from ITIL, COBIT and Balanced Scorecard to name some examples, including techniques and appropriate tools to align business and IT for good performance (De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2008b; Webb et al. 2006; Weill and Ross 2004b). Processes are IT management techniques for securing widespread involvement in the effective management and use of IT (Weill and Ross 2004a). In this subsection the list of fifteen process mechanisms will be presented from the literature review that are presented as follows.

Strategic Information System Planning (SISP) - SISP involve formal processes to define and update the IT strategy of the organisation (De Haes and Van Grembergen 2009). Strategic information system planning is an essential activity for satisfactory performance of IT (Earl 1993). The elements of SIP include: aligning IT with business to help achieve the goals of the organisation, assisting for competitive advantage, the use of effective and efficient IT resources and in the development of policies and architecture. SISP has a function to assure the priorities and investment of IT area alignment with the mission, objectives and goals of the organisation.

IT Performance Measurement (IT balanced scorecard) - The Balanced Scorecard (BSC) is an important IT performance measurement. BSC is a part of strategic planning and management systems to align the business activities and strategy of the organisation. It is a tool to enhance internal and external communications. Moreover, the BSC is used internally by the organisation to assist with the indicators to achieve operational excellence. The BSC is essential to link the business with IT (Van Grembergen et al. 2004).

Portfolio Management (including business cases, information economics, ROI, payback) - It is a prioritisation process for IT investments and projects in which business and IT is involved (including business cases, information economics, ROI, payback)(De Haes and Van Grembergen 2009). The results Heindrickson and Santos's study (2014) of 57 Brazilian public organisation shows a positive impact on the organisation performance with the adoption of the portfolio management.

Charge Back – This is a methodology to charge back IT costs to business units. The purpose is to understand the cost of the ownership industry (De Haes and Van Grembergen 2009). The organisation

with shared services needs to know the cost of whole business units. In this way, charge back is a practice to help ITG in issues of decisions (Weill and Ross 2004b). A university has different business units namely a campus or centre. They have a budget for IT and sometimes IT employees working. This mechanism can be applied to measure the cost of these units. This practice is cited in the study of De Haes and Van Grembergen in the Belgium financial industry (De Haes and Van Grembergen 2009).

Service Level Agreements (SLAs) - These are formal agreements of IT and business in relation to IT operations (De Haes and Van Grembergen 2009). This agreement is important to define the contracts of outsourcing (Weill and Ross 2004b). The SLA helps ensuring the quality of service between external providers and with internal users. The definition of SLA helps the universities to create rules to solve the incidents in accordance with the impact of the organisation. Furthermore, the definition of SLA to internal users shows the good management of problems and total control of the situation.

IT Governance Frameworks/Standards - The literature shows many IT governance frameworks also named as best practices and standard guidelines that assist the organisation in the management of its technology infrastructure. The most relevant with the majority number of citations are ITIL, COBIT and ISO/EIC 38500. The study of De Haes and Van Grembergen (2008a) only cite COBIT. However, the literature shows that the most adopted are ITIL, COBIT and ISO/EIC 38500. The framework ITIL and COBIT are the IT governance drivers most frequently cited by the companies in the studies of Lunardi et al. (2014b). IT governance mechanisms such as COBIT and ITIL can help firms to monitor and control IT and IT services, improving the IT infrastructure efficiency and the quality of internal, external and outsourced IT services.

These measures lead to a reduction in IT costs and, consequently, in the operating expenses of the company. Nevertheless, it was not possible to statistically verify these benefits (Lunardi et al. 2014b). Several authors listed the ITIL such as the main framework for IT governance. The organisations had adopted IT governance mechanisms improved in terms of efficiency in accordance with Lunardi et al.(2014b).

IT Governance Assurance and Self-Assessment - The organisation often does self-assessments on ITG, regular self-assessments or independent assurance activities on the governance and control of IT. (De Haes and Van Grembergen 2009).

Project Governance/Management Methodologies - This encompasses processes and methodologies to govern and manage IT projects (De Haes and Van Grembergen 2009). The most known methodologies used in project management are the PMBOK guide and Prince 2. It is not an objective to describe all methodologies. However, it is essential for any type of organisations including universities to adopt and follow guidelines in IT projects. Moreover, to govern IT projects, the adoption of suitable software compliances with project management methodologies is essential. Software compliances with PMBOK or other methodologies allow the control and management of whole steps with the definition of dates, stakeholders and reports of decision making.

Project Tracking - This is used to control the deadline and progress of individual projects with tools. The dashboard is a common resource to show the current status of projects in real time (Weill and Ross 2004b). On the other hand, it is an interactive interface showing the status of project decision making.

Business/IT Alignment Model - This is the adoption of models for business/ alignment models (Van Grembergen et al. 2004).

IT Budget Control and Reporting - This process is responsible for controlling and reporting the investment of IT projects into organisations. It is a process to manage budgets in accordance with the definition of roles (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

Benefits Management and Reporting - In this practice, the benefits to the business are monitored and managed during and after the implementation (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). Indeed, it is important to communicate the benefits of the project to the organisation or a new resource which has been implemented. In this way, the employees have knowledge of the real IT function and how the information has helped to improve the process and real benefits in daily tasks.

IT Governance Maturity Models - The organisations need to implement and improve an IT governance framework to analyse and diagnose their environment. It is essential to measure the effectiveness of ITG and identify the opportunities to improve IT (Peterson and Fairchild 2003). Organisations can use a model to measure how mature the strategic alignment of the process is grading

it from non-existent (0) to optimised (5) (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

The analysis of the maturity level of the process is an interesting tool for organisations to understand the real state "as-is" identifying gaps and opportunities to get there "to-be" in accordance with enterprise strategy. Moreover, the organisation can carry out benchmarking with other organisations and best practices and standard guidelines. According to the study conducted by Grama (2015) , many universities have attempted to do this benchmarking.

Demand Management - Demands for IT resources come from all directions and in all forms (i.e. by phone, software or even personally. Some demands are routine inside the IT department, other demands are considered strategic and complex. However, demand management forces all IT demands through a single point, where the demands can be consolidated, prioritised and fulfilled (Heier et al. 2007; Symons 2005).

Architectural Exception Process – The technology standards are critical to IT and business efficiency in any type of organisation. But occasionally exceptions are not only appropriate, they are necessary. Enterprises use the exception process to meet unique business needs and to gauge when existing standards are becoming obsolete. Without a viable exception process, business units ignore the enterprise wide standards and implement exceptions with no approval. The effectiveness of the architecture exception process depends on the ability of the IT unit to research and define standards and on the enterprise's commitment for technology standards. (Weill and Ross 2005; Weill and Ross 2004b).

2.3.3 Relational Mechanisms

Relational mechanisms include the participation and interaction between IT and the business. An appropriate communication and knowledge sharing with learning and coaching is important (De Haes and Van Grembergen 2008b; Webb et al. 2006; Weill and Ross 2004b). "The degree to which the organisation has established channels to ensure proper communication and disseminate IT governance principles " (Wu et al. 2015). In this subsection the list of fourteen relational mechanisms is presented.

Cross-Functional Business/IT Job Rotation - The IT job rotation is a merge of IT staff working in business units and business staff working in IT (De Haes and Van Grembergen 2006; De Haes and Van

Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000).

Business/IT Co-Location - This means physically locating business and IT members of staff close to each other (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000).

Cross-Functional Business/IT Training - This concerns training business employees about IT and/or training those in IT about business (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000).

Knowledge Management (On ITG) - This incorporates the use of portals, a system to share and transfer knowledge in IT governance frameworks, tasks, and responsibilities, (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000). Lunardi et al. (2014b) also argue the importance of having an internal portal to share information on IT. Knowledge management is an important issue to be explored in ITG, for example via portals, e-learning platforms such as Moodle, SharePoint for the dissemination of the information to employees and the stakeholders. In this way, the use of applications looking to improve the processes and document the knowledge of the organisation is extremely recommended. Manuals, videos, and guidelines can be included in the practice of knowledge management.

Business/IT Account Management - This concerns bridging the gap between business and IT by means of account managers who act as the in-between (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000).

Executive / Senior Management Giving the Good Example - This means senior business and IT management acting as "partners" (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). In the case of higher education, the rector works together with the CIO to define the strategies of IT in the institution.

Informal Meetings Between Business and IT Executive/ Senior Management - An example of this includes informal meetings without being on the agenda for example during lunch time to discuss general activities (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). An informal meeting between an IT executive and IT senior manager is an

important moment of brainstorming to direct activities of IT governance

IT Leadership -This is the of ability of the CIO or responsible member of staff from the organisation to articulate the IT vision of the company. IT leadership ensures that the vision is clearly understood by the managers (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

Corporate Internal Communication Addressing IT on a Regular Basis - Regular internal corporate communication addresses general IT issues (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). According to Weill,(2004) this is effective communication. The adoption of effective communication is essential for good IT performance. The use of different ways for announcing IT governance can be used (Weill 2004).

IT Governance Awareness Campaigns - These are campaigns to explain the need for IT governance to business and IT staff (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). The campaigns are necessary to explain the importance of IT governance for the organisation to the managers of the business. This way it is essential to use campaigns in the organisation to ensure the benefits of the processes of ITG.

Partnership Rewards and Incentives - Rewards and incentives are ways of motivating employees to achieve the performance and objectives of the organisation. (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

Shared Understanding of Business/IT Objectives – A shared understanding of business/IT objectives is the ability of IT and business staff, on a deep level, to understand and be able to participate in the other key processes and to respect each other's unique contribution and challenges (Luftman 2000; Reich and Benbasat 2000).

Senior Management Announcements- Senior management needs to have commitment and attention on strategic objectives of the organisation. Moreover, it is important to assist all employees in clarifying priorities and roles (ITGI 2003; Weill and Ross 2004b).

Office of CIO or ITG – The office of IT governance is a mechanism to ensure the place of the CIO has been allocated. Moreover, the office of the CIO or the office of IT governance are effective mechanisms

for advocating and educating about issues on IT governance in the organisation. (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

In this sub-section, a list of IT mechanisms is presented generically for all types of organisations. This list is constituted by seventeen mechanisms of structure, fifteen of processes and fourteen relational mechanisms. The next subsection presents an overview of studies on IT governance mechanisms in service industries.

2.3.4 Research on IT governance mechanisms

As previously stated, an IT governance framework is composed of structures, processes and relational mechanisms (De Haes and Van Grembergen 2004) . The endeavor is to choose the right mechanisms to achieve the best results in a particular context (Lunardi et al. 2014b). A mechanism that is suitable for an organisation may not be suitable for another. Although, the literature shows many studies of IT governance implementation such as ITIL, COBIT, ISO:385000, this is one type of process mechanism. The studies that will be looked at include structures, processes and relational mechanisms. Table 7 shows the summary of the main research on IT governance mechanisms.

Table 7. Research on IT governance mechanisms

Source	Purpose	Findings
(Ali and Green 2006)	"To examine empirically the individual IT governance mechanisms that influence the overall effectiveness of IT governance in public sectors" IT Strategy Committee, IT Steering Committee, Corporate Performance Measurement Systems, Corporate Communication Systems.	The study shows the mechanism of the IT strategy committee and corporate communication systems which has a positive relationship in the maturity level of ITG.
(Huang et al. 2010)	To better understand the nature of effective IT steering committees.	IT governance structures in SMEs tend to be centralised rather than decentralised or hybrid. IT steering committees and communication policies has an influence in the effective ITG of the organisation.
(Prasad et al. 2010)	"To obtain a deeper understanding of the effectiveness of firm's IT governance initiatives"	The firms' effectiveness of IT steering committee driven ITG initiatives positively relates to the level of their IT-related capabilities.
(Ali and Green 2012)	"To examine empirically the individual IT governance mechanisms that influence the overall effectiveness of IT governance"	IT governance mechanisms: the involvement of senior management in IT, the existence of ethic or culture of compliance in IT, and corporate communication systems has a positive impact in the level of effective ITG.
(Chong and Tan 2012)	"To explore the impacts of socio-technical factors on the effectiveness of IT governance for a collaborative network by examining three IT governance elements: structure, process and relational mechanism"	Effective collaborative ITG is associated with the active involvement of a governing body; a coordinated communication process; and the presence of relational culture and attitudinal commitment which would influence relational mechanisms.
(Herz et al. 2012)	"(1) What are relevant IT governance mechanisms based on the current body of knowledge? (2) Which mechanisms could a multisourcing Governance framework in a business group encompass?"	ITG mechanisms for the financial services industry. There are overall nine mechanisms, three structures, three processes and three relational.
(Prasad et al. 2012)	"What are the effective IT governance structures for collaborative organisational structures? How do we evaluate the effectiveness of these IT governance structures?"	ITG structures such as an IT steering committee, and IT strategy committee are necessary to have a better understanding of the use of resources of IT.

Source	Purpose	Findings
(Pereira et al. 2014a)	Analyse the ITG mechanisms in the Portuguese financial industry.	The minimum baseline mechanisms for Portuguese financial services organisations are based on six case studies. The effective and easy ways to implement the mechanisms were shown.
(Pereira et al. 2014c)	Analyse the ITG mechanisms in the Portuguese healthcare services organisations.	The baseline mechanisms for Portuguese healthcare services organisations are based on six case studies. The effective and easy ways to implement the mechanisms were shown.
(Schlosser et al. 2015)	"How can firms improve the degree of social alignment between their business and IT units?"	The social alignment is driven by varying degrees by a broad variety of ITG mechanisms such as IT on an executive board, top management support, IT planning, IS training, and regular meeting cycles.
Wu et al. (2015)	How organisational value is created through an ITG mechanism?	A Positive impact of ITGmechanisms on organisational performance with the main influencer strategic alignment.

It is quite clear that IT governance mechanisms affect the organisational performance (Lunardi et al. 2014b). However, given each organisation's context, it is necessary to understand which mechanisms work better. In addition, as pointed out, the solutions for IT governance depends on contingency factors such as: the size of the organisation, type of organisation, regional differences, organisational structure and strategy Ribbers et al. (2002), Brown and Grant (2005).

As noted by De Haes and Van Grembergen (2009) ITG that is suitable for an industry might not be for other types of industry. Therefore, this study is using the following contingency factors: Size, Culture, Industry, Type, Regional Differences and Structure by Pereira and Silva (2012a).

Research from Ali and Green (2007), (2006) with 54 members of the ISACA (Information Systems and Audit Control Association) in the public sector organisations shows that the IT strategy committee and the corporate communication systems improve the overall effectiveness of IT governance.

The adoption of web portal is an example of relational mechanisms for disseminating IT governance information. The results of Ferguson et al.'s (2013) studies reveal positive relations between the level of maturity and the effectiveness of ITG in the following mechanisms: IT steering committees, senior management involvement in IT, and corporate performance measurement. Similarly, Heindrickson and Santos (2014) shows a positive impact in the adoption of the portfolio management in 57 public organisations of the Brazilian federal administration.

Another study in Brazilian companies show that the formal adoption of IT governance practices improved the profitability (Lunardi et al. 2014b). In other words, formal mechanisms have directly affected financial performance.

Héroux and Fortin (2014) identified the IT governance mechanisms' structures, processes and relations with 102 Financial Services and Telecommunications – IT, Manufacturing, and a Service Canadian organisation. The results show the degree to which different ITG mechanisms are used according to the IT mode of each organisation. The authors concluded that more empirical studies are necessary in ITG in different contexts.

Pereira et al. (2014a) proposed a minimum baseline of IT governance mechanisms for financial services and the healthcare industry in Portugal. The base of the study is De Haes and Van Grembergen's (2009) model. They suggest that it is necessary to research ITG mechanisms in different contexts.

Schlosser et al. (2015) using a survey data from 132 US banks show that social alignment is driven by varying degrees by a broad variety of IT governance mechanisms from top management support and IT representation on the executive board to link IT planning and IS training and regular meeting cycles.

Recently, the Wu et al. (2015) study from 131 Taiwanese companies states the positive impact of IT governance mechanisms on organisational performance with strategic alignment as a main influencer. The authors still argue that the aim of IT and IT governance mechanisms is seeing to enhancing business/IT alignment with a positive association with ITG performance.

It is quite clear that IT governance mechanisms affect the organisational performance. However, it is necessary to figure out which are these mechanisms. The studies are limited to some industries and in particular countries. Studies on IT governance mechanisms in higher education institutions in particular in Brazil and Portugal were not identified.

In addition, as pointed out , the solutions for IT governance depend on contingency factors such as: the size of the organisation, type of organisation, regional differences, organisational structure, strategy (Ribbers et al. 2002) (Brown and Grant 2005; Brown 2006). As noted by De Haes and Van Grembergen (2009), the IT governance mechanisms that are suitable for an industry may not be for other types of industry. Therefore, contingency factors are used to compare across different types of industries. The following table shows the IT governance baseline in different industries.

Table 8. IT governance baseline in different industries

Belgium Financial Services Industry De Haes and Van Grembergen (2009)	**Portuguese Financial Services Industry** Pereira et al. (2014b)	**Portuguese Healthcare Industry** Pereira et al. (2014c)
IT strategy committee	IT strategy committee	Business/IT relationship managers
IT project steering committee	IT project steering committee	IT leadership
CIO on board	CIO on board	IT organisational structure
Portfolio management	Portfolio management	IT strategy committee
IT budget control and reporting	IT budget control and reporting	Service Level Agreement
IT leadership	IT leadership	Integration of governance/alignment tasks in roles & responsibilities
IT steering committee	Business/IT relationship managers	Security/compliance/risk officer
CIO reporting to CEO and/or COO	IT organisational structure	Strategic Information System Planning
Project governance /mang. methodologies	Service Level Agreement	
Strategic information systems planning	Partnership rewards and incentives	
	ITG frameworks	

The purpose of this thesis is not to select a standard such as ITIL, COBIT, ISO: 38500 and customise it to a specific university. Structures, processes and relational mechanisms are used to compose an IT governance framework. This approach is intended to identify recommended and suitable IT mechanisms to universities. The process of trying to identify suitable mechanisms is a big endeavor. Moreover, according to Tonelli et al. (2015) the results show that IT governance mechanisms can bring different results in different contexts. Therefore, the mechanisms presented above may not be suitable for universities and more mechanisms may need to be identified to develop a baseline for this particular type of industry.

2.3.5 Summary of Research on IT Governance Mechanisms

While research in the literature has attempted to figure out IT governance particularly in private organisations, this study will contribute to research in public higher education institutions. Indeed, more research is necessary in IT governance in the higher education industry especially in universities. The authors are unanimous in stating that it is necessary to have more empirical studies in IT governance in different contexts.

Heroux and Fortin (2014) argue that more empirical knowledge is necessary in the antecedents of IT governance in different contexts. In addition, it is recommended to compare IT governance mechanisms in different types of organisations. The lack is great in the higher education industry in particular universities. As a result, the contributions of this study is relevant to this context and type of industry.

Table 9 summarises the research on IT governance mechanisms. The studies presented in Table 9 is focused mainly on private organisations or in a specific type of public organisation. Therefore, studies on IT governance mechanisms in higher education institutions are necessary, since they are scarce or limited. Table 9 showed the evolution of the studies in IT governance mechanisms in different regions. Moreover, most research has only investigated specific mechanisms without the concern to propose a minimum baseline.

Table 9. Summary of research on IT Governance Mechanisms

Authors	Country	Industry Sector
(Prasad et al. 2012)	Australia	(Banking, Finance, Hospitality, Tourism, Travel, Media, Entertainment, Publishing, Retail, Wholesale, Distribution, Telecommunications, Transportation, and Logistics).
(Ali and Green 2007) (Ali and Green 2006)	Australia	Public Organisations
(Lunardi et al. 2014b)	Brazil	Financial Services
(Heindrickson and Santos 2014)	Brazil	Public Organisation
(Héroux and Fortin 2014)	Canada	Financial Services and Telecommunications
(Nijaz et al. 2011)	Croatia	Banks
(Alagha 2013)	Emirates	Financial Organisations
(Pereira et al. 2014b)	Portugal	Financial Industries- Banks
(Pereira et al. 2014b)	Portugal	Healthcare
(Wu et al. 2015)	Taiwan	Services, IT, Manufacturing
(Nfuka et al. 2009)	Tanzania	Public Organisation
(Schlosser et al. 2015)	United States	Financial – Banks
(Bradley et al. 2012)	US	Healthcare – Hospitals
(Huang et al. 2010)	US, Europe	Healthcare, Agriculture, Pharma
(Huang et al. 2010)	Worldwide	Retail/Wholesale/Distribution, Banks, Finance, Transport and Logistics

Pereira et al.'s (2014c) studies are in-depth but limited to the context of healthcare and the financial services. A similar approach is intended for to be pursued but in the context of public higher education. In addition, Pereira et al. (2013) has realised a literature review with fifty case studies on IT governance mechanisms. Regarding the relevance of this study, it is interesting to use as reference to compare the IT governance mechanisms with other types of industry. The section 2.4 presents the studies on IT governance in universities.

2.4 IT Governance in Universities

IT has an enormous impact on higher education institutions featuring universities on educational performance, learning systems, research productivity, experiences with students, internationalisation and integration projects with universities from other countries. IT governance is an essential and important area of study in IS, and fortunately has gained more attention recently (Wu et al. 2015). However, empirical studies in this field are still scarce particularly in universities (Jairak et al. 2015).

As pointed out previously, the IT governance topic is emerging (Wu et al. 2015). IT governance is an instrument to control and manage the IT resources such as infra-structure technology and people in many kinds of organisations, including universities (Bajgoric 2014; De Haes and Van Grembergen 2009; Hicks et al. 2012). Despite ITG relevance being recognised among university executives, the adoption level is low (Yanosky and Caruso 2008).

Universities from many countries, have increasingly recognised the importance of IT governance (Jairak et al. 2015). Complex organisations, such as universities, should frequently review their IT governance mechanisms to deal with innovation and changes in their environment and adapt to new technologies (Hicks et al. 2012). It is not only necessary but also essential for this kind of organisation to reduce risk and resolve vulnerabilities to provide an efficient and high-quality service.

A search from January 2000 to November 2017 was conducted in databases such as Web of Science, SCOPUS, AIS eLibrary; a publication written in English and available in full text; using keywords “ITG in higher education”, “ITG in universities”, “Information Technology for universities”, “Information Technology for higher education”, “ITG” and “University”, “Universities”, “higher education” with the combination of the topic and title. For instance, in the database of AIS searching by abstract with these keywords, only 4 articles were found (Bhattacharjya and Chang 2006; Hicks et al. 2012; Huang and Lucas 2015; Kam et al. 2016). Few studies about IT governance can be found in universities. A limited number of institutions have been utilising frameworks and standards for ITG. Table 10 summarises the findings of these studies.

Table 10. Research in IT Governance in universities

Source	Purpose	Findings
(Bhattacharjya and Chang 2006)	Exploratory study of IT governance implementation in two Australian institutions of higher education	Adoption of industry best practice frameworks such as COBIT, ITIL and ISO17799 have been utilised in implementation; institutions of higher education may benefit from experiences gained in ITG implementation in other industries.
(Coen and Kelly 2007)	To present the Information Systems Management and Governance framework developed for UK Higher Education (JISC model)	Built around five perspectives; governance, management, resources, structures and services.
(Zhen and Xin-yu 2007)	To develop an IT Service Model for a Chinese university	Based on ITIL and realities of Chinese universities, it is a framework composed of three models: organisation model, process model and technology model.
(Wan and Chan 2008)	To improve ITSM for managing campus-wide IT operations in Hong Kong	Based on ITIL, utilises business continuity planning processes to identify the relationships between business services and IT resources.
(Fernández and Llorens 2009)	To present ITG4U, a university-oriented IT governance framework to be promoted by the Spanish Association of University Rectors	Applying six ISO38500 principles, it is an adaptation of the JISC model designed for UK universities.
(Ribeiro and Gomes 2009)	Case study of the implementation and use of COBIT for ITG in a High Public Portuguese Educational Institution	Quality of services significantly improved, time for tasks reduced by about 25%, number of incidents reduced by 30%, and the number of reopened incidents reduced by 10%.
(Ko and Fink 2010)	To understand IT governance using a case study approach in four universities in Australia. They analysed mechanisms including Structures, Processes and Relational mechanisms.	The organisational structure of a centralised mode is the most appropriate for universities according to the CIO. A decentralised IT organisational structure was seen as high risk because it weakened control over IT. Limit the number of committees and ensure clear committee responsibilities to maintain IT decision-making effectiveness. Adoption of the best practice ITG framework to get the most benefits from ITG mechanisms.
(Hicks et al. 2012)	To examine how IT governance has evolved in eight public universities in Australia using a case study approach.	All of the universities examined shared common history of highly decentralised, faculty-based IT functions which appeared to be a natural evolution. These included a duplication of resources, difficulty in achieving institution wide alignment with strategic business objectives, and IT risks that were not being managed.
(Saleh and Almsafir 2013)	Explanatory study of ITIL adoption in a Malaysian university	KPI improvement, intellectual capital and organisation size (in terms of annual budget) are the drivers in the adoption of ITIL.
(Jairak et al. 2015)	To develop a formal set of IT governance practices to fit the context of Thai universities.	Based on sufficiency economy philosophy (SEP). ITG practices are mapped to ISO/IEC 38500.
(Huang and Lucas 2015)	Analyse IT governance Structure on Open Online Courses (MOOCs)	ITG structure plays an important moderating role. For example, the positive effect of educational IT capabilities only has an effect when it is also coupled with decentralised provision of IT supporting services. When these services are primarily provided by central IT, the effect of educational IT capabilities decrease.
(Kam et al. 2016)	"To compare the management styles and organisational practices between higher education and the banking industry"	The results reveal that higher education operates in an open environment that supports employees' participation for policy compliance. In comparison to the banking industry, open management in higher education is more effective in facilitating employees' participation in decision making for ISP compliance. Moreover, new paradigm of ITG framework (ITG) is necessary for addressing the unique culture of higher education.

The studies presented in Table 10 cover part of the IT governance mechanisms but most of them aim to develop a framework or a model to a particular reality. Some universities have used ITIL as the main practice to implement IT governance, others include COBIT, ISO/IEC 38500, ISO 27001, or ISO 20000.

While building upon the findings from the studies mentioned in Table 10, their specificities and limitations have to be recognised. For instance, the study of Bhattacharjya and Chang (2006) in Australia is limited in scope to a number of processes from ITIL and COBIT in only two universities. Another three studies, Zhen and Xin-yu (2007), Wan and Chan (2008) and Saleh and Almsafir (2013), are limited to a specific university to implement two or three processes from ITIL without any justification for their selection. How the model was designed and proposed for UK universities is unknown, Coen and Kelly (2007), the same model that Fernández and Llorens (2009) used without any significant changes for Spanish universities. Jairak et al.(2015) is the most relevant study so far, since the model was developed and validated with the CIOs of 20 universities and five IT experts, but this is limited to the specific context of Thailand.

Authors Ko and Fink (2010) proposed a theoretical framework for IT governance based on structure, processes and people. The framework proposed is based on four case studies in Australian universities. Therefore, the authors propose a minimum baseline of IT governance mechanisms for universities. This study will complement the body of knowledge of previous research. Overall, studies have been too limited in scope and without adequate justification for the adoption of mechanisms from known, general frameworks.

2.5 IT Governance Mechanisms in Universities

As mentioned earlier, a list of ITG mechanisms from a literature review were identified. These mechanisms can be adopted for all types of industries (see Section 2.5). After the identification of the ITG mechanisms, case studies on universities were selected to identify the mechanisms that the universities have already implemented. The objective of this process is to know what the ITG mechanisms are that the other universities have already implemented as well as the effectiveness to take in account in our model.

Therefore, an extensive search in was conducted in databases such as Web of Science, SCOPUS and AIS eLibrary (Association for Information Systems). Furthermore, the most important academic portals regarding ITG in higher education, two associations of information systems in universities EDUCAUSE in the United States of America and UCISA in United Kingdom, were examined. The following criteria for the review process search which was performed from January 2000 to November 2017; publications were written in English and available in full text; with the keywords “IT governance in higher education”, “IT governance in universities”, “Information Technology for universities”, “Information Technology for higher education”, “IT governance” and “University” with the combination of the topic and title. Other articles regarding this topic were found, but were not considered, since access was only had to the abstract.

Pereira et al.(2014a) have developed a study with a focus on the Portuguese financial and healthcare industry These studies build upon the research of De Haes and Van Grembergen (2009) in the Belgium industry and this study will follow similar recommendations, but with a focus on higher education institutions.

Regarding the case studies from the literature review, 27 articles were found that account for 34 case studies in ITG at universities showing some empirical results. The term “university” was used rather than “higher education” because it is the most adopted in the literature review. The 34 cases studies in ITG at universities are described in the following publications (see Table 11).

Table 11. IT Governance Case Studies in Higher Education

Article	Case Study	Title	Country	Reference
1	1	IT Governance at QUT	Australia	(Fraser and Tweedale 2003)
2	2	Using an IT Governance Structure to Achieve Alignment at the University of Cincinnati.	United States of America	(Albrecht and Pirani 2004)
3	3-4	Adoption and implementation of IT governance: Cases from Australian higher education.	Australia	(Bhattacharjya and Chang 2006)
4	5	Evolving IT governance practices for aligning IT with business—A case study in an Australian institution of higher education	Australia	(Bhattacharjya and Chang 2007)
5	6	An ITIL-based IT service management model for chinese universities.	China	(Zhen and Xin-yu 2007)
6	7	IT governance using COBIT implemented in a high public educational institution: a case study.	Portugal	(Ribeiro and Gomes 2009)
7	8-11	Information technology governance: An evaluation of the theory-practice gap.	Australia	(Ko and Fink 2010)
8	12	A study of the review and improvement of IT governance in Australian universities.	Australia	(Hicks et al. 2012)
9	13	IT governance from practitioners' perspective: Sharing the experience of a Malaysian university	Malaysia	(Ajayi and Hussin 2016)
10	14	Information technology governance, funding and structure: A case analysis of a public university in Malaysia	Malaysia	(Ismail 2008)
11	15	A network analysis of IT governance practices: A case study of an IT centralisation project	Malaysia	(Mohamad Hsbollah et al. 2012);
12	16	IT governance in organisations facing decentralization-case study in higher education	Australia	(Zdravkovic et al. 2014)
13	17-20	IT strategy and decision-making: a comparison of four universities	Australia	(Wilmore 2014)
14	21	UCISA ITIL Case Study on Cardiff University	United Kingdom	(Ucisa 2009a)
15	22	UCISA ITIL Case Study on Coventry University	United Kingdom	(Ucisa 2009b)
16	23	UCISA ITIL Case Study on Edinburgh Napier University	United Kingdom	(Ucisa 2009c)
17	24	UCISA ITIL Case Study on Nottingham Trent University	United Kingdom	(Ucisa 2009d)
18	25	UCISA ITIL Case Study on the University of Birmingham	United Kingdom	(Ucisa 2009e)
19	26	UCISA ITIL Case Study on the University of Dundee	United Kingdom	(Ucisa 2009f)
20	27	UCISA ITIL Case Study on The University of Exeter	United Kingdom	(Ucisa 2009g)
21	28	UCISA ITIL Case Study on the University of Huddersfield	United Kingdom	(Ucisa 2009h)
22	29	UCISA ITIL Case Study on the University of Leicester	United Kingdom	(Ucisa 2009i)
23	30	UCISA ITIL Case Study on The University of Ulster	United Kingdom	(Ucisa 2009j)
24	31	UCISA ITIL Case Study on The University of Edinburgh	United Kingdom	(Ucisa 2009k)
25	32	UCISA ITIL Case Study on The University of Nottingham.	United Kingdom	(Ucisa 2009l)
26	33	UCISA ITIL Case Study on Sheffield Hallam University	United Kingdom	(Ucisa 2009m)
27	34	Getting Your Ducks in a Row:IT Governance, Risk, and Compliance Programs in Higher Education	United States of America	(Bichsel and Patrick 2014)

Table 11 provided information regarding the case studies on IT governance in higher education. There are thirteen articles from the United Kingdom, seven articles from Australia, three articles from Malaysia, two from the United States of America, one article from Portugal and one article from China.

2.5.1 Implementation

To identify the ITG mechanisms implemented in case studies, a list with 46 IT governance mechanisms were adopted and identified in the literature (Section 2.3). The aim at identifying each mechanism is to know if the mechanism adopted may impact somehow ITG at universities. Moreover, if the mechanism was adopted by other case studies, it is an indication that might have positive empirical results and must be included in the baseline. It was quite clear that we have found only thirty-four case studies at universities on IT governance, while other types of industry have more research. Moreover, as stated previously the studies on this type of organisation are limited and scarce.

To identify the mechanisms, all the articles were carefully read more than once trying to perceive the effectiveness of each mechanism as well as its implementation. The process of identifying each mechanism was a huge endeavour, because most of the studies did not adopt the same definition with the generic ITG mechanisms in the literature review (Section 2.3). In addition, sometimes there was a lack of information regarding the mechanisms. Therefore, the definition of each mechanism was compared from the literature review with the definition of each mechanism revealed in the case studies. For instance: Where the word "strategy "was mentioned, although the "IT strategy committee" was not clear in the article or evident, the "IT strategy committee" was considered as implemented. The same role was adopted for all mechanisms. Another example is the mechanism "Strategic information systems planning". If the study had a formal plan for IT as well as this plan, it was pointed out as important and the "Strategic information systems planning" was considered as implemented.

In addition, to assist the process of identifying the mechanisms implemented, the software NVIVO (Bazeley and Jackson 2013) was used. The entire article was imported in "PDF" format to NVIVO and using the function "Query-> Text Search, the name of each mechanism was searched - For instance: "IT Strategy Committee", "IT steering Committee", "Service Level Agreement", "Partnership rewards and incentives" and others from the universe of 46 mechanisms. Each mechanism was also searched partially (i.e. "Partnership", "rewards", "incentives", "SLA").

To identify if the mechanisms were presented in the case study the following notation was adopted:

- When the mechanism is totally implemented in the case study, the cell is filled with "x"
- When the mechanism does not exist, the cell is left as empty

In contrast with the study conducted by Pereira et al. (2014a), the mechanisms are not considered as partially implemented. The aim is only to identify the mechanisms totally implemented. The authors have read many times the article to be certain that the mechanism implemented had the same meaning of the same mechanism identified in the literature review.All case studies were analysed in the article. Indeed, the studies on IT governance are scarce in this type of industry, higher education in comparison with the financial industries. The main difficulty found in the article was the definition of each mechanism. Table 12 presents the frequency of each IT governance structure mechanism implemented in the case studies in the literature review.

Table 12. IT Governance Structure Mechanisms CS

	Structure Mechanisms	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	F
1	IT strategy committee	X	X	X		X	X		X	X	X	X	X		X			X		X	X															14
2	IT audit committee						X																													1
3	CIO on executive committee	X	X										X	X	X					X															X	7
4	CIO reporting to CEO/COO			X					X	X	X	X																								5
5	IT steering committee	X	X		X		X		X	X	X	X	X	X	X			X		X	X															14
6	IT governance function / officer			X	X								X		X																					5
7	Security / compliance / risk officer						X						X																						X	3
8	IT project steering committee														X					X																2
9	IT security steering committee				X		X																													2
10	Architecture steering committee				X		X								X																					3
11	Integration of governance/ alignment tasks in roles& responsibilities			X	X				X	X	X	X	X	X	X			X		X																11
12	IT councils			X	X															X																3
13	IT leadership councils	X																																		1
14	Business/IT relationship managers			X	X																															2
15	IT investment committee														X				X	X	X															4
16	IT expertise at level of board		X															X		X																3
17	IT organisation structure	X	X	X		X			X	X	X	X	X	X	X	X	X	X	X	X	X																18

Table 12 presents the IT governance structure mechanisms implemented in the literature review. As you can see the most implemented structure mechanism is the IT organisation structure. It shows that independently if the organisation structure is centralised, decentralised or federal, all universities have an IT governance structure. Higher education institutions have implemented different types of committees. The two main committees implemented are the IT strategy committee and IT steering committee. The

other committees such as the IT investment committee, IT audit committee among others appeared with a low frequency of implementation. Each one of these committees has an objective and a goal in the IT governance of the institution. For example, the strategy committee has the mission of ensuring that IT is included on the agenda to assist the alignment with IT strategy. Other committees, such as IT steering or the IT project committee, have the goal of managing IT investments and IT projects. The adoption of formal committees composed of executives (rectors, directors, researchers) of higher education institutions and IT people can affect the alignment business/IT positively. It is not necessary to have too many steering committees. In practice, it is more relevant to create working groups such as IT security, IT projects, IT investments, among others within the steering committee.

Other structure mechanisms with a significant frequency implemented are roles & responsibilities, the CIO on the executive committee and the IT governance function/officer. It shows that the universities have the concern in defining clearly the roles and tasks in the IT department. The studies show that the CIO is a member of the executive committee in the universities. It means that the CIO has an active voice in the decision making of the institution. Also, the universities have implemented an ITG function for special issues in this topic. The universities have also implemented other structure mechanisms, however these mechanisms appear at a low frequency. This analysis aimed to present an overview of the frequency of implementation in the structure mechanisms. Table 13 shows the frequency of each ITG process mechanism identified in the case studies of the literature review.

Table 13. IT Governance Process Mechanisms CS

	Process Mechanisms	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	F
18	Strategic information systems planning	X		X	X								X	X	X			X	X	X	X														12
19	IT performance measurement	X							X		X	X	X	X						X																10
20	Portfolio management	X		X	X										X			X	X	X	X															7
21	Charge back	X																																		1
22	Service Level Agreement																																			
23	ITG frameworks /standards			X	X	X	X	X	X	X	X	X	X									X	X	X	X	X	X	X	X	X	X	X	X	X	X	24
24	IT governance assurance and self-assessment						X																													1
25	Project governance / management methodologies			X	X				X										X	X																6
26	IT budget control and reporting	X		X	X				X	X	X	X		X				X		X	X															11
27	Benefits management and reporting			X										X						X																3
28	Business/IT alignment model			X					X	X	X	X		X																						6
29	ITG maturity models CMM			X			X																													2
30	Project Tracking	X																																		1
31	Demand management	X																																		1
32	Architectural exception process																																			

As you can see, Table 13 presents the most implemented process mechanisms in the case studies in

the literature review. Concerning the processes, the most implemented process mechanism is IT governance frameworks/standards. It is quite clear since the institutions choose a standard such as ITIL, COBIT ISO/IEC 38500 and customise it to a specific reality. However, the Information Technology Library, ITIL, is the driver for IT governance in a significant number of case studies. In the case of UCISA, there are thirteen case studies for the implementation of ITIL in the universities of the United Kingdom. The outcomes of processes are the standard and are essential to start creating ITG implementation. Some institutions, for any reason, choose one and customise it to reality.

Other process mechanisms that appear with a high frequency in implementation in universities are strategic information systems planning, IT performance measurement, project governance/management methodologies, IT budget control and reporting and portfolio management. The adoption of a strategic plan to define the goals and objectives in IT is considered the main IT document in IT in the universities. The adoption of surveys to measure the services quality for students is another example of performance measurement adopted by universities. Regarding project governance management methodologies, the universities have implemented different types of methodologies and standards such as PMBOK and PRINCE. In addition, the definition of an IT budget and the control of resources are also appreciated by institutions. Table 14 shows the frequency of each ITG relational mechanism identified in the case studies of the literature review.

Table 14. IT Governance Relational Mechanisms CS

	Relational Mechanisms	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	F
33	Job-rotation												X																							1
34	Co-location			X	X																															2
35	Cross-training												X					X	X	X	X															5
36	Knowledge management (On IT governance)			X	X	X						X	X						X																	6
37	Business/IT account management																																			
38	Executive / senior management giving good example							X	X	X	X		X						X																	6
39	Informal meetings																																			
40	IT leadership							X	X	X	X			X				X																	X	7
41	Corporate internal communication addressing IT			X	X	X						X																						X	5
42	ITG awareness campaigns							X	X	X	X																									4
43	Partnership rewards and incentives																																			
44	Shared understanding of business/IT objectives			X	X	X		X	X	X	X	X		X					X	X																11
45	Senior management announcements																																			
46	Office of CIO or ITG			X	X							X		X																						4

Lastly are the relational mechanisms. The adoption of portals for sharing knowledge on IT governance and the formal way of communication, are the main mechanisms that universities have implemented. A mechanism such as "partnership rewards and incentives" was not cited and identified as implemented in the universities. Regarding this mechanism, it would be interesting to understand the program of rewards and incentives for employees. In public higher education institutions, due to legislation, it is more difficult to make use of financial rewards. However, public higher education institutions have incentives for promotion and some financial rewards when an IT employee gets a master or a doctorate. Public and private higher education institutions can make use of incentives through training for employees to get official certifications such as PMI, ITSM, ISCA among others. The subsection presents the ITG mechanisms effectiveness analysed in the case studies from the literature review

2.5.2 Effectiveness

In this subsection, the effectiveness of IT governance mechanisms following their implementation has been analyzed looking at different case studies in the literature. When the mechanisms did not get to be implemented but they were recognized by the people involved in the cases and by the researchers' evaluation as essential to be adopted and expected to have a positive impact in the organization, they were taken in account for our evaluation.

Effective – If the mechanism is implemented and has a positive impact on IT governance in the institution or if it is recommended.

Not Effective – If the mechanism is implemented and has a negative impact on IT governance in the institution.

No significant results – if the mechanism is implemented but no positive or negative impact has been found in the institution.

No evidence – If there is not clear evidence of the impact or the results on IT governance mechanisms in the institution as well as the importance of this mechanism for IT governance.

The analysis process was based on the findings in each mechanism. Quotes were identified for all mechanisms. For instance, "IT strategy is necessary to be clear and understood by the board of directors"

(Fraser and Tweedale 2003). This example shows that the IT strategy committee is effective because it ensures the IT strategy on the agenda of the institution.

Another example is the relational mechanism, knowledge management (in ITG). The quote identified in the article is: "Knowledge about IT governance should not be only created inside the research community but disseminated through dialogue and collaboration between the academic community and industry" (Ko and Fink 2010). Findings in this quote reveal that the knowledge of IT Governance needs to be shared. Therefore, this mechanism was considered as effective for IT governance. This strategy was followed for all mechanisms. Table 15 shows the analysis of IT governance structure mechanisms from literature review.

Table 15. Analysis of IT Governance Structure Mechanisms from the Literature Review

Structure Mechanisms	Empirical Results	References
IT strategy committee	Effective	Fraser and Tweedale (2003), Albrecht & Pirani (2004), Ko and Fink (2010), Wilmore (2014), Ajayi and Hussin (2016)
CIO on executive committee	Effective	Ajayi and Hussin (2016)
CIO reporting to CEO and/or COO	Effective	Ko and Fink (2010)
IT steering committee	Effective	Ismail (2008), Ko and Fink (2010),
ITG function / officer	Effective	Wilmore (2014)
Security / compliance / risk officer	Effective	Bichsel and Patrick (2014)
Integration of governance/alignment tasks in roles & responsibilities	Effective	Bhattacharjya and Chang (2006), Ismail (2008), Ko and Fink (2010), Wilmore (2014), Ajayi and Hussin (2016)
IT councils	Effective	Bhattacharjya and Chang (2006)
IT expertise at board level	Effective	Wilmore (2014)
IT organisation structure		
Decentralised	Not effective	Ko and Fink (2010), Hicks et al (2012), Zdravkovic et al.(2014)
Centralised	Effective	Bhattacharjya and Chang (2006), Ko and Fink (2010), Hicks et al.(2012), Mohamad Hsbollah et al.(2012)

Regarding the IT governance mechanisms effectiveness in the literature review, some conclusions can be drawn. The strategy committee is pointed out as the most essential committee for IT governance in case studies in different countries. Indeed, since that the strategy committee has the mission of ensuring that IT includes on the agenda to assist the alignment with IT strategy.

The Chief Executive Officer on the Executive Committee and IT expertise at board level are also two important mechanisms for effective IT governance. Findings also reveal that it is important to have an IT active voice on board to show the IT importance for the other members as well as to the university members. Concerning the steering committee, the universities emphasise the effectiveness in having

this type of committee for IT governance. A formal IT governance function to support key issues regarding IT is pointed out as an essential element for an IT governance framework. The clear definition of roles and responsibilities for IT with formal functions has a positive impact on IT governance and is considered effective.

It is not necessary to have too many steering committees. In practice, it is more relevant to create working groups such as IT security, IT projects, IT investment, among others within the steering committee.

According to most organisations, with the goal of profit, tend to be centralised in their approach of IT governance, with emphasis on strategies for efficient operation. The study of Hicks et al. (2012) in eight Australian universities shows that the structure is highly decentralised (Hicks et al. 2012). According to Chong and Tan (2012) the adoption of a federal structure is more appropriate for a collaborative network. In the case of universities, the federal mode might be the most appropriate with the centralised control and decentralised IT functions in faculties and business units (Ko and Fink 2010). To summarise, it is adequate to control IT in a central way through an IT governance office. Indeed, with a federal mode, universities have standardisation and decentralisation in business units. This solution has been pointed out and may be the best scenario. Table 16 shows the analysis of IT governance process mechanisms from the literature review.

Table 16. Analysis of IT Governance Process Mechanisms from the Literature Review

Process Mechanisms	Empirical Results	References
Strategic information systems planning	Effective	Fraser and Tweedale (2003), Albrecht and Pirani (2004), Bhattacharjya and Chang (2006), Ajayi and Hussin (2016)
IT performance measurement (BSC)	Effective	Fraser and Tweedale (2003), Bhattacharjya and Chang (2006), Ajayi and Hussin (2016)
Portfolio management	Effective	Fraser and Tweedale (2003), Wilmore (2014)
Service level agreements	Not significant results	Ko and Fink (2010)
ITG frameworks and standards	Effective	Fraser and Tweedale (2003), Bhattacharjya and Chang (2006), Ucisa (2009), Ko and Fink (2010), Ajayi and Hussin (2016)
Project governance / management methodologies	Effective	Fraser and Tweedale (2003), Wilmore (2014)
IT budget control and reporting	Effective	Fraser and Tweedale (2003), Albrecht and Pirani (2004), Ko and Fink (2010), Ajayi and Hussin (2016)
Benefits management and reporting	Effective	Albrecht and Pirani (2004), Ko and Fink (2010), Wilmore (2014)
ITG maturity models CMM	Effective	Ajayi and Hussin (2016)
Project tracking	Effective	Fraser and Tweedale (2003)

Several authors stress the importance of having strategic information system planning IT governance aligned with business needs. Moreover, this plan has the function to assure the priorities and investments of IT area alignment with the mission, objectives and goals of the organisation.

Regarding IT performance measurement, the results show that the adoption of a customer satisfaction survey for students, professors and administrative staff is crucial to measure the IT service quality for effective IT governance.

The universities have implemented different types of frameworks for IT governance (i.e. ITIL, COBIT and ISO 27001). However, the framework ITIL is the most implemented and seen as more practical and effective for ITG. The main ITIL processes implemented are the help desk and incident management. Such evidence shows that it is important to implement at least these processes for effective IT governance. Findings in case studies about ITIL in the renowned British organisation named UCISA show that it is essential to have a tool for an online service desk and in compliance with the ITIL process. The results also reveal that it is not effective that universities develop their own tools. Thus, it shows that to have an effective process, ITIL is fundamental to have a good tool. Yet, according to the ITIL process, the investment in an appropriate service desk is essential for the delivery of high service quality for all of the academic community. Therefore, a well-defined service catalogue is considered crucial. Indeed, in a complex environment like a university all IT services need to be mapped.

Also, the IT budget with the control of IT projects, reports on the impacts of IT in activities including teaching, learning and research which are stressed as effective mechanisms for IT governance. Some process mechanisms, even though are indicated that they are implemented, have no evidence about their effectiveness in ITG. Some examples include “ITG assurance and self-assessment”, “Charge back” among others that are not denoted in Table 16. Table 17 shows the analysis of ITG relational mechanisms from the literature review.

Table 17. Analysis of IT Governance Relational Mechanisms from the Literature Review

Relational Mechanisms	Empirical Results	References
Cross-training	Effective	Bhattacharjya and Chang (2006), Wilmore (2014), Ajayi and Hussin (2016)
Knowledge management (On ITG)	Effective	Bhattacharjya and Chang (2006), Ko and Fink (2010),Wilmore (2014), Ajayi and Hussin (2016),
Executive / senior management giving good example	Effective	Wilmore (2014), Ajayi and Hussin (2016)
Informal meetings between business and the IT executive/ senior management	Effective	Bhattacharjya and Chang (2006), Ko and Fink (2010),
IT leadership	Effective	Ko and Fink (2010), Wilmore (2014)
Corporate internal communication addressing IT on a regular basis	Effective	Bhattacharjya and Chang (2006), Ko and Fink (2010),
Shared understanding of business/IT objectives	Effective	Bhattacharjya and Chang (2006)
Office of CIO or ITG	Effective	Albrecht and Pirani (2004)

Table 17 presented the IT governance effectiveness mechanisms identified in the case studies. Concerning the relational mechanisms, some conclusions can be drawn. Cross-training is recognised as an effective mechanism for IT governance. Several authors point out that it is essential to have a training program for effective IT governance. The knowledge management (in ITG) with the adoption of portals and wikis is also noted as an effective mechanism to compose a model or a framework.

Executive / senior management leading by good example is also a relational mechanism which is pointed out as effective for ITG. Findings reveal that it is necessary to have engagement and strong relationships between IT and the business staff. IT Leadership is also noted in several articles that is essential for ITG. Proactive strategic leadership is essential for effective IT governance in universities. Concerning communication, informal meetings and corporate communication are also noted as essential for effective ITG.

Table 18 summarises the IT governance mechanisms (Frequency of Implementation vs. Effectiveness) regarding the structure, process and relational mechanisms from the literature review.

Table 18. Summary of IT Governance Mechanisms (Frequency of Implementation vs. Effectiveness)

	Structure Mechanisms	Frequency of Implementation	Effectiveness
1	IT strategy committee	14	Effective
2	IT audit committee	1	No evidence
3	CIO on executive committee	7	Effective
4	CIO reporting to CEO/COO	5	Effective
5	IT steering committee	14	Effective
6	IT governance function / officer	5	Effective
7	Security / compliance / risk officer	3	Effective
8	IT project steering committee	2	No evidence
9	IT security steering committee	2	No evidence
10	Architecture steering committee	3	No evidence
11	Integration of governance/ alignment tasks in roles & responsibilities	11	Effective
12	IT councils	3	Effective
13	IT leadership councils	1	Effective
14	Business/IT relationship managers	2	No evidence
15	IT investment committee	4	No evidence
16	IT expertise at board level	3	Effective
17	IT organisation structure	18	
	Decentralised		Not Effective
	Centralised		Effective
	Process Mechanisms		
18	Strategic information systems planning	12	Effective
19	IT performance measurement	10	Effective
20	Portfolio management	7	Effective
21	Charge back	1	No evidence
22	Service level agreement	-	No significant results
23	ITG frameworks /standards	24	Effective
24	ITG assurance and self-assessment	1	No evidence
25	Project governance / management methodologies	6	Effective
26	IT budget control and reporting	11	Effective
27	Benefits management and reporting	3	Effective
28	Business/IT alignment model	6	No evidence
29	ITG Maturity Models CMM	2	Effective
30	Project tracking	1	Effective
31	Demand management	1	No evidence
32	Architectural exception process	-	No evidence
	Relational Mechanisms		
33	Job-rotation	1	No evidence
34	Co-location	2	Effective
35	Cross-training	4	Effective
36	Knowledge management (On ITG)	6	Effective
37	Business/IT account management	-	No evidence
38	Executive / senior management giving good example	6	Effective
39	Informal meetings	-	Effective
40	IT leadership	7	Effective
41	Corporate internal communication addressing IT	5	Effective
42	ITG awareness campaigns	4	No evidence
43	Partnership rewards and incentives	-	No evidence
44	Shared understanding of business/IT objectives	11	Effective
45	Senior management announcements	-	No evidence
46	Office of CIO or ITG	4	Effective

Table 18 summarises the IT governance mechanisms (Frequency of Implementation vs. Effectiveness). Some mechanisms, even though indicated that they are implemented, share no evidence about their effectiveness in IT governance in the case studies. For example, the following process mechanisms: the

"IT audit committee", "IT project steering committee", "IT security steering committee", "Architecture steering committee", "Business/IT relationship managers" and "IT investment committee". Process Mechanisms: "Charge back", "Service level agreement", "IT governance assurance and self-assessment, "Business/IT alignment model", "Demand management" and "Architectural Exception Process". Relational mechanisms: "Job-rotation", "Business/IT account management", "IT governance awareness campaigns", "Partnership rewards and incentives" and "Senior management announcements". Therefore, more empirical studies are necessary to comprehend the effectiveness of these mechanisms as well as the importance of ITG in universities. Chapter 3 presents a multiple case phase to accomplish this gap. Figure 4 summarises the step of design and development of the ITG mechanism's baseline carried out in the literature review.

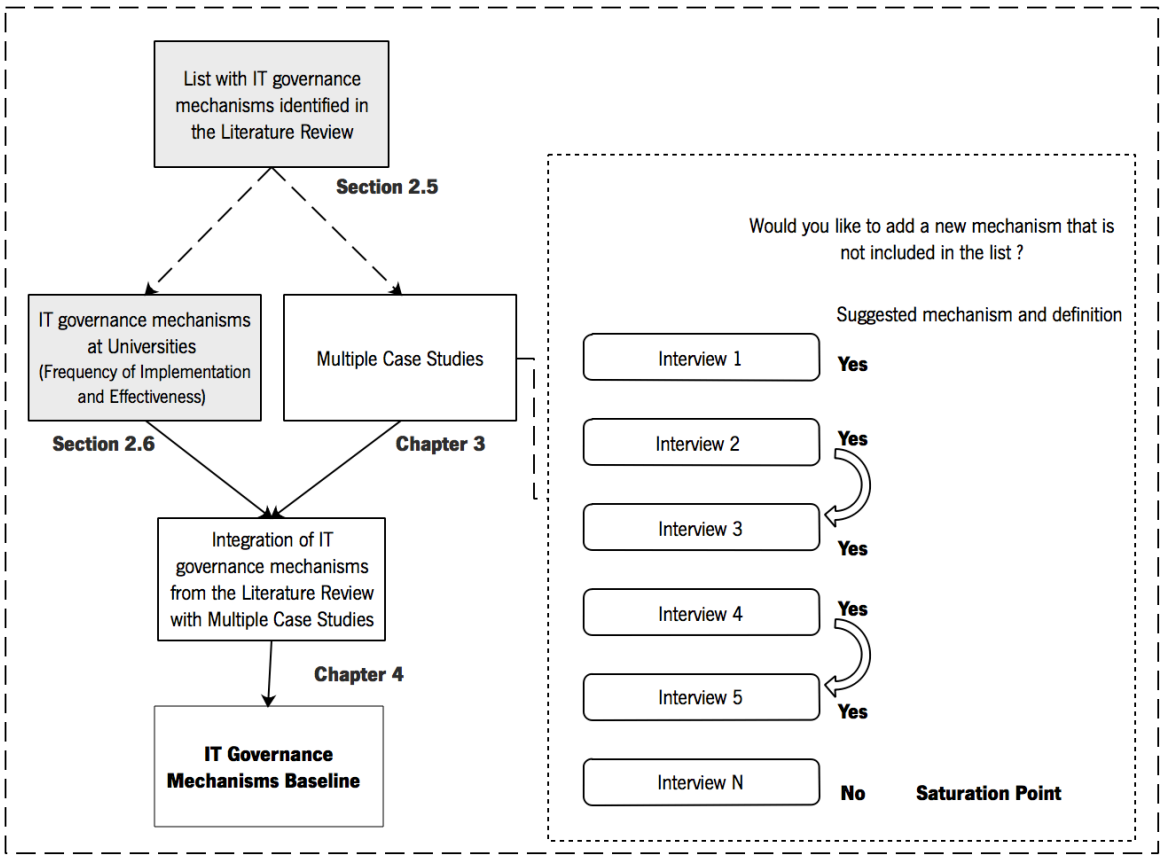

Figure 4. Design and Development – Literature Review

Figure 4 showed two literature review's useful phases in the development of the artefact. Chapter 3 presents the multiple case studies, another phase in the design and development of the ITG mechanisms baseline.

3. Design and Development: Case Study

3.1 Multiple Case Studies

Previous studies have examined IT governance in different industries, but few attempted to identify suitable IT governance mechanisms for universities. This is an exploratory study in its nature looking for a minimum set of essential IT governance mechanisms to be implemented in universities, something that was explored very little so far and calls for a better understanding. The case study method is particularly appropriate for these types of studies and well-suited to capture knowledge and develop theories (Benbasat et al. 1987). Consequently, this study chose the case study method since case studies are a valuable way to look at the world around us and have been gaining special importance in the last few years in the IT area (Pereira et al. 2013).

A multiple case approach (Yin 2009) was used in which IT governance mechanisms are examined across ten universities, each one a case under study. These ten cases, were selected bearing in mind diversity in size, culture, strategy, structure and process to reduce contextual bias (Dubé and Paré 2003).
Figure 5 illustrates the case of higher education with multiple units of analysis (from Unit of Analysis Unit1 to Unit 10).

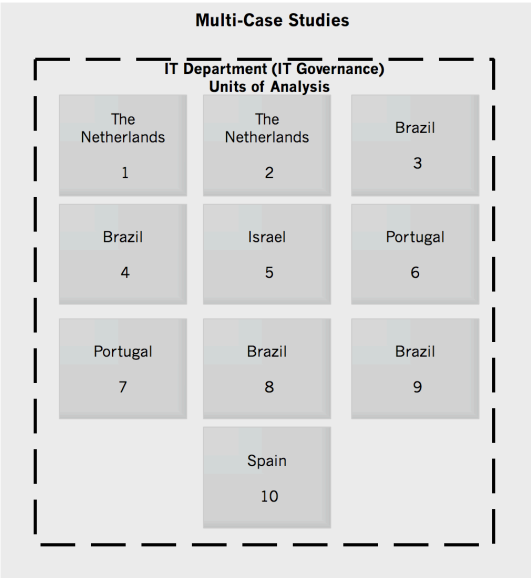

Figure 5. Multiple Case Studies

While attempting to answer which is the minimum set of suitable IT governance mechanisms for universities, unlike other studies focusing on a specific country, we selected five countries. The next section then presents the data collection.

3.2 Data Collection

In order to identify implemented IT governance mechanisms as well as new mechanisms at universities, semi-structured interviews were conducted in ten universities across five different countries: Brazil, Portugal, the Netherlands, Spain and Israel (see Table 19). Even if it is a convenient sampling of universities that were available to participate in the study, a mix of different ones according to institutional size, culture, strategy, structure and process were selected to reduce contextual bias (Dubé and Paré 2003).

Interviews were conducted with the universities' IT decision-makers at the top and medium management levels (CIO, IT Coordinator and IT Director) usually responsible for all concerns IT (ITGI 2003). The researcher adopted the following contact strategy: access to the IT website at the institution to get in contact with the CIO or some IT decision-maker for information such as name and e-mail. Then, an e-mail was sent to the individual explaining the objective of the research and the purpose of the interviews, including an invitation to participate in the questionnaire as a guide for the interview. A document with the ITG mechanisms' definition was also included to ensure that all interviewees had the same interpretation for each IT governance mechanism during the interview.

Table 19. Information about interviewees

	Country	Position	Education	Experience in IT (years)	Experience in the position (years)	Duration of Interview (hours)
1	Netherlands	CIO	Master	25 or more	3 or less	1.5
2	Netherlands	CIO	Master	25 or more	10 or more	1.5
3	Brazil	IT Coordinator	Master	14-20	4-6	3.0
4	Brazil	IT Coordinator	Master	14-19	3 or less	2.5
5	Israel	CIO	PhD	25 or more	10 or more	1.5
6	Portugal	IT Director	Master	20-24	3 or less	2.0
7	Portugal	IT Director	Master	14-19	3 or less	1.5
8	Spain	IT Director	Master	25 or more	10 or more	1.5
9	Brazil	IT Coordinator	Master	14-19	4-6	3.0
10	Brazil	IT Director	Master	14-19	10 or more	2.5

Finally, following a positive answer from the invited individuals, the interviews were scheduled. Over twenty universities from ten different countries were contacted and ten positive answers were received. Table 19

provides some information regarding the interviewees and Table 20 provides some information regarding their institutions.

We used the classification of QS World University Rankings (QS 2017) based on the Carnegie Classification of Institutions of Higher Education to classify the universities' size: extra-large for more than 30.000 students; large for more than 12.000 students; medium for more than 5.000 students; and small for less than 5.000 students.

Table 20. Information about universities

	Country	ITG Structure	Type of Control	Information about Universities		
				Size	IT employees	Focus
1	Netherlands	Federal	Public	Extra Large	100-300	Teaching
2	Netherlands	Centralised	Public	Medium	100-300	Research
3	Brazil	Federal	Public	Extra Large	50-99	Research, Teaching, Community
4	Brazil	Federal	Public	Extra Large	100-300	Research, Teaching, Community
5	Israel	Federal	Public	Extra Large	100-300	Research, Teaching, Community
6	Portugal	Centralised	Public	Medium	10-24	Research, Teaching
7	Portugal	Centralised	Public	Medium	10-24	Research, Teaching
8	Spain	Centralised	Private	Medium	10-24	Teaching
9	Brazil	Centralised	Private	Large	100-300	Research, Teaching, Community
10	Brazil	Federal	Private	Large	10-24	Research, Teaching, Community

Between August of 2016 and January of 2017, face-to-face interviews were conducted in the Netherlands, Portugal, Spain and Israel and Skype interviews in Brazil. Interviews in Brazil and Portugal were conducted in Portuguese, the native language of the interviewer and interviewees, while interviews in the Netherlands, Israel and Spain were conducted in English. "ECAM call recorder" was used for to record the interviews via Skype and "Quick Time player" for face-to-face interviews.

The questionnaire and interview were designed according to Myers' recommendations (2007, pp. 16-17). The recommendations were followed to make the interview process more effective. Table 21 provides information and a justification.

Table 21. Myers' Interview Recommendations

Myers GUIDE	Justification
1. Situating the researcher	The researcher is an IT employee in a public university and has been working in IT for over seven years as well as investigating IT governance in universities.
2. Minimise social dissonance	Creating a comfortable atmosphere for the interviewee during the interview was focused on. Moreover, good impressions with the interviewed were demonstrated, sharing the researcher's practical experiences in IT in universities to create a great environment with the interviewee.
3.Representing a variety of voices	Interviews were conducted with the universities' IT decision-makers in the middle and top management levels (Chief Information Officer - CIO, IT Director, IT manager, IT coordinator) so the most accurate IT governance information could be collected since it is linked to all major issues regarding IT (ITGI 2003).
4. Everyone is an interpreter	The data were revised. NVIVO software was also used to help in the identification of patterns and assist in data interpretation. The researcher did all the interviews as well as the transcription of the interviews.
5. Use Mirroring in questions and answers.	Mirroring was used in the interview guide during the interview to enhance the comments and focus on specific topics or subjects of the interview.
6. Flexibility	A semi-structured interview was used with a guide to making the most of the experiences of the interviewer, consequently giving more value.
7.Confidentiality of disclosures	The researcher asked for permission to record the answers and confidentiality of institution's information was assured. In addition, we informed that the data could be used in academic publications.

The questionnaire to frame the interview was developed in four parts: the first part, with general questions about the institution; the second part, with personal questions about the interviewee; the third part, with questions regarding the level of implementation, effectiveness, ease of implementation and the importance of each mechanism and inclusion; and the fourth part, with the option to suggest new mechanisms in particular in the context of universities and the choice of the ten most important mechanisms (Appendix G – IT Governance Mechanisms Questionnaire). The question was repeated for each one of the 46 mechanisms that are presented in tables 12, 13 and 14. For each one of these mechanisms, a definition was previously provided and some practical examples were given. Many of the mechanisms were familiar to almost all interviewees which in turn, made the interviews easier to conduct.

In addition, observations, documents, the IT website and IT strategic plans' analysis were also used to confront the interviewees and ensure an awareness and certainty of their answers. Table 22 shows the secondary sources provided by the universities. Due to the geographical distance, it was not possible to make observations and notes on field in Brazilian universities.

Table 22. Secondary Sources in the Data Collection

Unit of Analysis	Secondary Sources
1.Netherlands	Observation and Notes on Field, IT Website, Intranet
2.Netherlands	Observation and Notes on Field, IT Website, IT Strategic Plan
3. Brazil	IT Website, IT Strategic Plan
4. Brazil	IT Website, IT Strategic Plan
5. Israel	Observation and Notes on Field, IT Website
6. Portugal	Observation and Notes on Field, IT Website
7. Portugal	Observation and Notes on Field, IT Website
8. Brazil	IT Website
9. Brazil	IT Website
10. Spain	Observation in Field, IT Website

The next table presents the data collection collected from the interview. Each Table presents the results from one question. The following question was posed, “What is the level of implementation of the <IT Governance mechanism> in your institution?” on a scale of 0 to 5, where 0 means “not implemented”, 3 means “partially implemented” and 5 means “totally implemented” in Table 23 .

Table 23. Data Collection – Level of Implementation

Structure Mechanisms	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
IT strategy committee	2	5	0	0	5	3	0	0	3	1
IT audit committee at level of board of directors	4	5	0	0	2	0	0	0	0	0
CIO on executive committee	1	2	0	0	0	0	0	0	5	0
CIO reporting to CEO and/or COO	5	5	2	5	0	5	5	0	5	5
IT steering committee	2	5	2	0	3	5	5	2	3	0
IT governance function / officer	0	5	5	5	3	5	5	3	5	5
Security / compliance / risk officer	5	5	0	0	1	4	5	0	3	0
IT project steering committee	5	5	1	0	2	0	0	4	0	0
IT security steering committee	0	5	0	5	3	5	0	3	3	0
Architecture steering committee	4	3	0	5	3	0	0	2	5	0
Integration of governance/alignment tasks in roles& responsibilities	0	4	4	0	4	5	5	3	4	5
IT councils	3	4	4	0	0	0	0	0	5	0
IT leadership councils	0	0	0	0	0	0	0	5	0	0
Business/IT relationship managers	3	5	3	0	1	5	0	2	3	0
IT investment committee	2	3	0	0	2	0	0	4	3	0
IT expertise at level of board	2	4	3	0	0	5	0	3	4	0
IT organisation structure	4	5	3	5	5	5	5	5	5	5
Process Mechanisms										
Strategic information systems planning	5	4	4	5	4	5	3	3	5	5
IT performance measurement (BSC)	3	2	0	1	3	5	3	3	0	0
Portfolio management	5	4	4	0	4	3	3	3	1	3
Charge back	0	3	2	0	0	5	3	2	5	0
Service level agreements	2	3	1	3	4	3	0	2	3	3
IT governance Frameworks /Standards	3	4	2	1	3	5	0	3	3	4
IT governance assurance and self-assessment	4	3	1	3	1	4	4	2	0	5
Project governance / management methodologies	4	4	2	1	4	5	0	4	3	3
IT budget control and reporting	3	4	0	1	4	5	0	4	2	4
Benefits management and reporting	2	0	0	0	3	5	3	3	2	3
Business/IT alignment model	3	3	0	0	3	0	3	2	2	0
ITG Maturity Models CMM	3	1	0	0	1	0	3	2	0	2
Project Tracking	4	4	2	1	3	0	0	4	2	2
Demand management	3	4	4	2	4	5	5	4	4	3
Architectural Exception Process	2	0	0	0	4	5	3	3	3	3
Relational Mechanisms										
Job-rotation	0	1	2	4	2	0	0	0	3	0
Co-location Business/IT collocation	3	3	3	4	2	0	0	0	3	5
Cross-training	2	4	2	3	4	5	0	1	4	4
Knowledge management (On IT governance)	4	3	4	3	5	5	5	2	1	5
Business/IT account management	3	5	0	0	3	5	0	0	4	4
Executive / senior management giving the good example	4	3	0	2	4	4	5	1	3	4
Informal meetings between business and IT executive/ senior management	5	5	5	4	5	5	5	5	5	5
IT leadership	3	4	1	2	4	5	5	3	3	4
Corporate internal communication Addressing IT on a regular basis	3	2	4	4	5	5	5	5	4	5
IT governance awareness campaigns	2	0	2	1	3	5	5	4	5	3
Partnership rewards and incentives	0	2	0	1	0	0	0	1	4	0
Shared understanding of business/IT objectives	2	3	2	1	3	4	3	3	2	3
Senior management announcements	2	3	2	3	2	5	2	1	3	3
Office of CIO or ITG	3	4	5	5	4	5	5	5	5	5

Table 24 looks at the following question, "What is the perceived effectiveness of the <IT Governance mechanism> in your institution?" on a scale of 0 to 5, where 0 means "not effective", 3 means "partially effective" and 5 means "very effective".

Table 24. Data Collection – Effectiveness of Mechanisms

Structure Mechanisms	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
IT strategy committee	0	4	0	0	3	4	0	0	3	3
IT audit committee at level of board of directors	3	5	0	0	3	0	0	0	3	0
CIO on executive committee	0	4	0	0	4	0	0	0	5	0
CIO reporting to CEO and/or COO	3	3	3	4	3	5	0	0	4	5
IT steering committee	0	3	4	0	3	5	0	1	3	0
IT governance function / officer	0	4	4	4	4	5	5	3	4	5
Security / compliance / risk officer	4	4	0	0	3	4	5	0	3	0
IT project steering committee	3	5	2	0	3	0	0	3	0	0
IT security steering committee	0	5	0	1	3	5	0	3	3	0
Architecture steering committee	3	3	0	1	3	0	0	2	4	0
Integration of governance/alignment tasks in roles& responsibilities	0	4	2	0	5	4	3	3	3	5
IT councils	1	4	2	0	3	0	0	0	4	0
IT leadership councils	0	0	0	0	1	0	0	5	0	0
Business/IT relationship managers	1	5	3	0	3	5	0	2	3	0
IT investment committee	0	3	0	0	3	0	0	3	4	0
IT expertise at level of board	2	3	2	0	2	5	0	2	3	0
IT organisation structure	3	4	4	3	3	5	3	5	2	5
Process Mechanisms										
Strategic information systems planning	3	5	2	3	5	5	3	3	4	4
IT performance measurement (BSC)	3	3	0	1	2	5	3	4	0	3
Portfolio management	4	4	4	0	3	5	3	4	1	3
Charge back	0	4	4	0	3	5	4	3	5	0
Service level agreements	2	3	2	1	3	5	0	3	3	3
IT governance Frameworks /Standards	3	4	2	2	4	3	0	3	2	3
IT governance assurance and self-assessment	3	4	1	4	1	5	3	3	3	5
Project governance / management methodologies	4	4	1	2	3	5	0	5	3	4
IT budget control and reporting	4	4	0	1	3	5	0	5	2	4
Benefits management and reporting	2	0	0	0	3	5	3	4	3	4
Business/IT alignment model	3	4	0	0	2	0	3	4	3	0
ITG Maturity Models CMM	2	2	0	0	1	0	3	4	0	2
Project Tracking	4	4	3	1	4	0	0	5	3	2
Demand management	3	2	4	2	4	5	5	5	3	2
Architectural Exception Process	2	0	0	0	4	5	3	4	4	3
Relational Mechanisms										
Job-rotation	0	0	3	3	0	3	0	1	3	0
Co-location Business/IT collocation	3	4	4	4	5	0	0	1	3	5
Cross-training	2	4	2	4	5	3	0	2	3	5
Knowledge management (On IT governance)	4	3	4	3	5	4	5	4	0	5
Business/IT account management	2	4	0	0	4	5	0	2	3	4
Executive / senior management giving the good example	4	1	0	2	4	4	3	3	3	4
Informal meetings between business and IT executive/ senior management	2	4	2	4	5	5	4	4	5	5
IT leadership	3	3	1	2	4	4	3	4	3	4
Corporate internal communication Addressing IT on a regular basis	2	2	4	5	3	4	3	3	3	3
IT governance awareness campaigns	2	0	3	2	3	4	3	4	3	3
Partnership rewards and incentives	0	2	0	1	0	0	0	4	4	0
Shared understanding of business/IT objectives	2	2	4	1	3	5	3	4	2	3
Senior management announcements	2	2	1	3	3	5	2	3	2	3
Office of CIO or ITG	3	3	4	4	5	5	5	3	4	5

Table 25 then looks at the following question, "What is the perceived ease of implementation of the <IT Governance mechanism> in your institution?" on a scale of 0 to 5, where 0 means "very easy", 3 means "partially easy" and 5 means "not easy".

Table 25. Data Collection – Ease of Implementation

Structure Mechanisms	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
IT strategy committee	2	2	5	0	1	2	5	2	3	2
IT audit committee at level of board of directors	1	0	5	5	4	5	5	1	2	5
CIO on executive committee	3	2	5	4	1	5	5	3	0	5
CIO reporting to CEO and/or COO	0	2	2	0	1	0	1	5	1	0
IT steering committee	1	2	3	0	4	5	5	2	2	5
IT governance function / officer	2	2	0	0	4	1	1	2	2	0
Security / compliance / risk officer	1	0	5	3	4	1	0	2	3	5
IT project steering committee	2	1	3	2	4	5	4	1	5	5
IT security steering committee	5	1	5	0	4	5	5	1	3	5
Architecture steering committee	2	3	5	0	4	0	5	2	1	5
Integration of governance/alignment tasks in roles& responsibilities	4	2	3	2	5	5	5	1	0	5
IT councils	2	2	3	5	2	5	5	2	2	5
IT leadership councils	2	5	5	5	4	5	5	0	5	5
Business/IT relationship managers	3	2	3	2	2	0	5	1	2	2
IT investment committee	2	2	5	0	2	0	5	2	1	2
IT expertise at level of board	3	3	2	2	4	5	5	3	1	5
IT organisation structure	2	3	1	0	3	2	2	0	3	5
Process Mechanisms										
Strategic information systems planning	2	3	2	3	1	0	4	1	1	1
IT performance measurement (BSC)	1	4	5	2	2	0	2	1	5	2
Portfolio management	0	3	3	3	3	0	2	2	3	3
Charge back	5	2	4	2	5	5	2	2	5	5
Service level agreements	3	4	4	2	3	0	5	1	2	2
IT governance Frameworks /Standards	2	2	3	2	2	2	5	2	1	1
IT governance assurance and self-assessment	1	2	4	1	2	0	3	2	2	0
Project governance / management methodologies	1	3	3	1	2	5	3	1	2	1
IT budget control and reporting	0	2	5	3	2	2	5	1	2	1
Benefits management and reporting	3	5	5	2	2	2	3	2	1	2
Business/IT alignment model	2	3	5	3	3	2	2	2	2	3
ITG Maturity Models CMM	2	3	5	3	4	2	3	2	5	2
Project Tracking	1	2	2	1	2	5	5	1	2	3
Demand management	2	3	2	2	2	0	5	1	2	3
Architectural Exception Process	3	5	5	3	4	0	5	2	2	3
Relational Mechanisms										
Job-rotation	5	4	3	1	3	5	5	3	1	5
Co-location Business/IT collocation	2	3	2	1	2	5	5	3	1	1
Cross-training	2	1	3	1	1	5	5	3	2	0
Knowledge management (On IT governance)	1	2	2	1	1	0	0	1	2	0
Business/IT account management	1	2	5	3	2	0	5	3	1	1
Executive / senior management giving the good example	0	4	5	3	2	0	0	3	1	1
Informal meetings between business and IT executive/ senior management	0	1	0	1	0	0	0	2	5	0
IT leadership	1	3	3	3	1	1	0	1	0	2
Corporate internal communication Addressing IT on a regular basis	0	3	2	2	0	0	0	2	1	0
IT governance awareness campaigns	1	5	2	3	2	0	0	1	3	1
Partnership rewards and incentives	5	3	5	3	2	0	5	3	2	5
Shared understanding of business/IT objectives	2	4	3	4	4	2	2	2	2	2
Senior management announcements	1	4	2	2	1	0	5	3	1	2
Office of CIO or ITG	1	3	2	0	1	0	0	2	1	0

The last question asked was: "Would you like to add other mechanism that is not on the list and do you think that it is relevant to IT governance in universities?" In doing so, it was intended to uncover other mechanisms from the practitioner's experience that have not been adequately covered in the literature, in particular for universities. Figure 6 shoes the collection process from interviews.

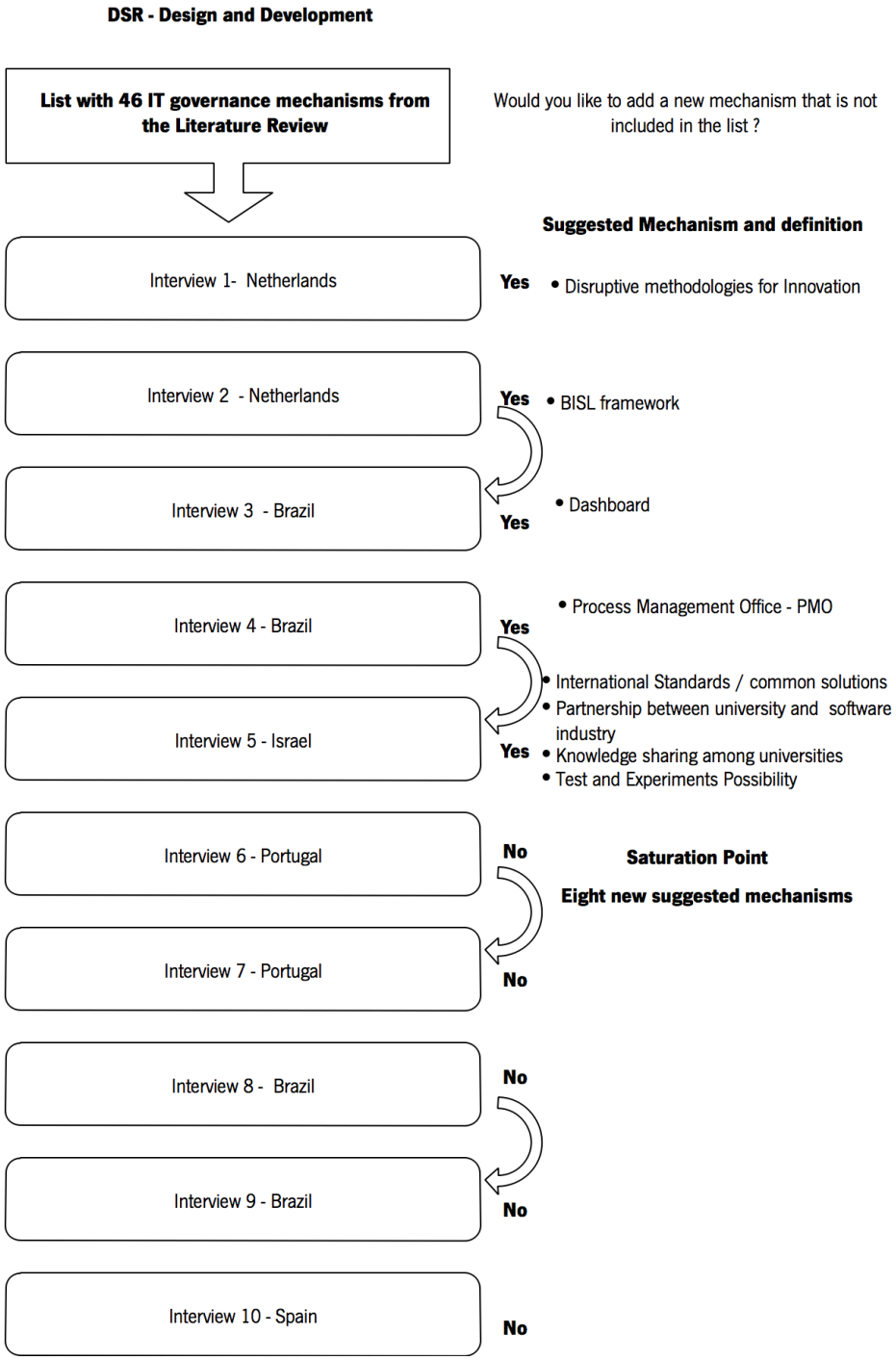

Figure 6. Data Collection Process from Interviews

Regarding the number of interviews necessary in qualitative research, Myers (2013) argues that there is not a specific number. It depends on the research question and what answers are being looked for. A saturation point is reached when a new insight for your research question is not found. In this thesis, an appropriate set of mechanisms are being sought, and the saturation point was reached in the fifth interview. From the fifth to tenth interview no mechanism was added to the IT governance list. Table 26 shows the quotes of new IT governance mechanisms proposed by the interviewees.

Table 26. New IT Governance mechanisms proposed by interviewees

	Suggested Mechanism	Quote
1	**Methodology to manage disruptive innovation**	*"I am not sure how to pronounce .... Innovation Disruptive. Only focus we could know. Not only have we this but focus on innovation, how to manage innovation in this institution? Not same in place for that. Discuss I have. We should do something. Because this institution is a teaching class room. What are the mechanisms that could help management innovation" [1]*
2	**BISL**	*"The reference framework following is BISL. BISL is a framework developed to the Dutch reality. We follow all recommendations of this framework and methodology in the institution [...] Therefore, this could be included on the list" [2]*
3	**Dashboard**	*[...] "Tools such as dashboard should be used by IT people and academic staff aiming to analyse organisational data, a tool that's [...] Easy to import data and create a panel with KPIs to analyse. It is something intuitive that people without a high technical knowledge can use and understand." [3]*
4	**Process management office**	*[...] "In my opinion a mechanism that could be included is a process management office (PMO). I think that a PMO is an important function at IT level that could help to improve the research and administrative area results... It should be composed by people with knowledge in IT and universities' business so the process could be either better modelled and improved [...] People with IT and business knowledge are ideal to transcribe the requirements." [4]*
5	**Knowledge sharing among universities**	*"To share knowledge on courses means that training is important in IT governance at university. Moreover, it improves the level of IT as well as the IT quality at university. [5] Because the private sector is our competitor [...] Not specifically, but it's not usual to share information about IT with them [...] by sharing information with other institutions we would be promoting training, and reducing costs in the case of software developing" [...] [5]*
6	**Partnership between university and software industry**	*[...] "A partnership and agreement between the university and the software industry to solve education for software licensing (e.g. Microsoft program, IBM among others) could be applied with other industries to provide a range of technologies to students, academic and administrative staff to test and use. In an open environment that is the university, it is important to provide a range of technologies" [5]*
7	**International standards / common solutions**	*[...] "To adopt the international standards... a solution adopted by universities in the same country for instance... only public. For instance, if all universities of the same sector adopted the same software it would be easier to exchange information and even promote a course of new software, technology, and management for all IT employees." [5]*
8	**Test and experiments possibility**	*[...] We are in an open environment. You understand what I mean. Universities are different compared to industry. Here, we can do experiments and test a range of solutions, if we make an error it does not impact the organisation. While, in industry it is not possible due to operational efficiency which is necessary. "[5]*

The last question asked the interviewees was to choose the ten most important mechanisms from a list of 46 mechanisms regardless of having or not having been implemented in their institutions. Table 27 shows the ten mechanisms chosen by each interviewee from 1 (most important) to 10 (least important).

Table 27. Ten most important mechanisms for each interviewee

Structure Mechanisms	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Frequency**
IT strategy committee	1	6	1	1	7		1	1	1	1	9
IT organisation structure			3	6	8		3		2	10	6
ITG function / officer				2		10	8		3		4
Business/IT relationship managers		10	10	9		4					4
IT steering committee	10		4	4							3
Integration of governance tasks in roles & Responsibilities							2			3	2
Security / compliance / risk officer	4										1
Architecture steering committee								3			1
Process Mechanisms								**Sum**			**30**
Strategic information systems planning		4	7	3	2	1	4	5	8	2	9
Frameworks ITG	5	9	5	5	9	5	6	2		6	9
Project governance / management methodologies	8		8	10			10			4	5
IT budget control and reporting					10		5	7	10	5	5
Demand management	2						9	9			3
Portfolio management		1				2		6			3
IT performance measurement (BSC)								4		9	2
ITG assurance and self-assessment	6								9		2
Project Tracking			6					8			2
Service level agreements						3					1
Benefits management and reporting	3										1
Test and Experiments Possibility					1						1
International Standards / common solutions					4						1
Relational Mechanisms								**Sum**			**44**
Knowledge management (on ITG)	9	8	9	8		7	7	10	4	8	9
Office of CIO or ITG	7	2	2								3
Informal meeting		7				8					2
Corporate internal communication					6	9			6		3
Business/IT account management		5				6					2
Cross-training									5		1
IT governance awareness campaign									7		1
IT leadership				7							1
Co-location Business/IT collocation		3									1
Shared understanding of business/IT objectives										7	1
Knowledge sharing among universities					5						1
Partnership between university and software industry					2						1
								Sum			**26**

Concerning the choice of the ten most important mechanisms, it is vital to note that the collected data IT governance regarding the level of implementation (Table 23), effectiveness (Table 24), ease of implementation (Table 25), were significant for the interviewed to understand the context of IT governance in their universities. Moreover, in this process the interviewee rethought the actual IT governance model in their university and understood the definition of each mechanism to make it easier to choose the ten most important.

The researcher had an essential function in leading the selection process for the chosen mechanisms in accordance with the interview, documents provided and notations from the field. For instance, during the interview the interviewee mentioned the word "strategy" on several occasions featuring the importance of having a well-defined strategy at the institution. Nonetheless, the "IT strategy committee" mechanisms were not pointed out as essential on the list. Hence, the researcher asked the interviewee if the mechanism "IT strategy committee" should not be on the list because it was marked as important in the interview process as well as in other previously analysed sources. The "Frequency" column accounts for the number of respondents that have selected that particular mechanism as one of the most important.

3.2.1 Quality of Case Study

In this thesis, the criteria by Yin (2009) was followed to provide high quality in the research design. Moreover, other recommendations also were adopted for effectively designing the case study (Barratt et al. 2011; Ketokivi and Choi 2014; Voss et al. 2002). It is shown how to achieve some criteria in the quality design in the case study.

The construct validity in this study was achieved with the identification of appropriate IT governance mechanisms to develop an IT governance baseline in the phenomena of the universities. The constructs used in this study were proven by several studies where the IT governance mechanisms list was adopted, for example (Ko and Fink 2010; Qassimi and Rusu 2015; Tonelli et al. 2015).

A pre-test and a pilot test were performed. In addition, before choosing the interview method, an online instrument was developed to collect data on Lime Survey software with the same characteristics of this data collection instrument. A pre-test was carried out with two experts that have been working on IT governance and also been teaching this topic in public universities in Portugal as well as with the CIO in a large university in Brazil. The feedback received were that the instrument was exhausted to respond as

well as the number of questions. Moreover, the definition of each mechanism was necessary to explain before the use of the questionnaire. Therefore, according to experts in the Pre-Test, the involvement of research was essential. The research could also not interact with the interviewed discussing and explaining as well as confronting the data with other sources from the university. In addition, this method was not suitable because the interviewed could not suggest and include new mechanisms. Therefore, the interview method was one of the most appropriate to collect data.

The external validity of this study was achieved defining the domain to be studied where the cases were carefully selected. Moreover, the external validity assured the replication logic of multiple units of analysis in universities from different contexts (size, focus, country).

The reliability of this study was achieved with the clear definition and process of data collection procedures where data could be repeated for other universities or even a lager sample. A case study protocol was developed to repeat the data collection procedures, using the instrument developed.

3.2.2 Triangulation

In the process of identification of the ten most important mechanisms in the interviews, a triangulation of different sources was carried out (i.e. interviews, documents and field notes). Before the interviews the IT website was accessed in the institution to gather data and the documents provided were also studied by the interviewed. For instance, in the Netherlands the researcher stayed ten days in loco making observations and analysing the documents. Thereafter, the researcher did the interview. All interviews in loco, followed the same process. One important point to note is that the researcher used a significant amount of secondary data to confront the interviewed during the interview.

The majority of secondary data was collected on the IT website in the institution where the IT strategic plan was available. According to IT decision makers by the institution, the IT strategic plan was the main IT document updated. Therefore, the entire IT plan can be read carefully, the majority of universities had a complete and detailed IT plan. After, reading the IT plan, it can be concluded that several mechanisms were implemented, however in interviews where the interviewed was asked, it was perceived that the information that was in the document was totally different than practice. Moreover, the IT strategic plan sometimes was a document to put inside the drawer. This type of information was useful to compare and

confront the answers during the interviews as well as in choosing the ten most important mechanisms. The next section provides analysis of the collected data.

3.3 Data Analysis and Findings

The previous section presented the collected data regarding the IT governance mechanisms in ten units of analysis in five different countries. In this section, the collected data was analysed. The collected data was quantitative, which is shown in Table 20 to Table 24 where a scale from 0 to 5 applies in each mechanism to calculate in terms of average and sum, also qualitative about in-depth information collected in each mechanism during the interviews.

In qualitative analysis, the text and image data are so dense and rich, not all information can be used in the analysis (Creswell 2013). Thus, in the data analysis, the researcher needs to focus on the representative and important data regarding the topic of study. To acquire more advantages from the data, Creswell (2013) suggests to aggregate data into a small number of themes.

The last question asked the interviewees was to choose the ten most important mechanisms from a list of 46 mechanisms regardless of having or not having been implemented in their institutions. Table 27 shows the ten mechanisms chosen by each interviewee from 1 (most important) to 10 (least important).

Table 27 presented the collected data from the interviews (columns 1 to 10) with ten mechanisms chosen by each interviewee from 1 (most important) to 10 (least important).

The data was analysed using Microsoft Excel, creating a frequency count of each mechanism and the average. Additionally, the software “NVIVO” (version 11.3.2 for mac) was used to transcribe and analyse the qualitative data. Three main pre-defined categories were created namely, Structure, Process and Relational Mechanisms to code the data (Bazeley and Jackson 2013).

Using “NVIVO” (version 11.3.2 for mac) to analyse data, an open, axial, and selective coding for qualitative analysis was conducted following recommendations by Strauss and Corbin (1998). Such data enabled identifying the IT governance mechanisms implemented in universities as well as the effectiveness of these mechanisms in practice. We began with the initial list (Table 12, 13 and Table 14) until no more mechanisms were proposed which was evident after the fifth interview.

Table 25 provides the designation and the quote from the interviewee to support the proposal of a new mechanism. Doing an interpretative analysis of interviewees' suggestions for new mechanisms, Structures, Process and Relational Mechanisms were used as the three main categories to code the data.

For example, quote 1 was inserted into the Process category at the selective code created, "Methodology to manage disruptive innovation". Table 26 provides a definition for each new mechanism as well as its classification regarding structure, process and relational mechanism.

Even though the literature review showed a list with appropriate IT governance mechanisms for universities, the challenge is to identify the effectiveness and ease of implementation of these mechanisms, additionally, to complement the IT governance mechanisms list to satisfy the artefact solution. Design Science Research is an interactive process to build an artefact to fulfil a solution of a specific problem. Thus, we used an IT governance mechanisms list showed in Table 12 as a starting point. The interview is one of the most known methods to collect data and build and evaluate an artefact. In this sense, we are using this method to collect data on ITG mechanisms in universities.

This chapter discusses the findings and results from the case studies regarding the collected data from interviews in a multiple case study with ten units of analysis. The ten units of analysis were analysed together under the three ITG dimensions namely: Structure, Process and Relational Mechanisms.

Table 28 gives information regarding the average and sum of level of implementation (IM), effectiveness (EF) and ease of use (EI) in Structure, Process and Relational Mechanisms. This data was calculated based on Table 22 to Table 24.

Table 28. Level of Implementation, Effectiveness and Ease of Use of Mechanisms

	Average			Sum		
Structure Mechanisms	IM	EF	EI	IM	EF	EI
IT strategy committee	1.9	1.7	2.4	19	17	24
IT audit committee at level of board of directors	1.1	1.4	3.3	11	14	33
CIO on executive committee	0.8	1.3	3.3	8	13	33
CIO reporting to CEO and/or COO	3.7	3.0	1.2	37	30	12
IT steering committee	2.7	1.9	2.9	27	19	29
IT governance function / officer	4.1	3.8	1.4	41	38	14
Security / compliance / risk officer	2.3	2.3	2.4	23	23	24
IT project steering committee	1.7	1.6	3.2	17	16	32
IT security steering committee	2.4	2.0	3.4	24	20	34
Architecture steering committee	2.2	1.6	2.7	22	16	27
Integration of governance/alignment tasks in roles& responsibilities	3.2	2.8	3.2	29	25	32
IT councils	1.6	1.4	3.3	16	14	33
IT leadership councils	0.5	0.6	4.1	5	6	41
Business/IT relationship managers	2.2	2.2	2.2	22	22	22
IT investment committee	1.4	1.3	2.1	14	13	21
IT expertise at level of board	2.1	1.9	3.3	21	19	33
IT organisation structure	4.7	3.7	2.1	47	37	21
Average	**2.3**	**2.0**	**2.7**	**22.5**	**20.1**	**27.4**
Process Mechanisms						
Strategic information systems planning	4.3	3.7	1.8	43	37	18
IT performance measurement (BSC)	2.0	2.4	2.4	20	24	24
Portfolio management	3.0	3.1	2.2	30	31	22
Charge back	2.0	2.8	3.7	20	28	37
Service level agreements	2.4	2.5	2.6	24	25	26
IT governance Frameworks /Standards	2.8	2.6	2.2	28	26	22
IT governance assurance and self-assessment	2.7	3.2	1.7	27	32	17
Project governance / management methodologies	3.0	3.1	2.2	30	31	22
IT budget control and reporting	2.7	2.8	2.3	27	28	23
Benefits management and reporting	2.1	2.4	2.7	21	24	27
Business/IT alignment model	1.6	1.9	2.7	16	19	27
ITG Maturity Models CMM	1.2	1.4	3.1	12	14	31
Project Tracking	2.2	2.6	2.4	22	26	24
Demand management	3.8	3.5	2.2	38	35	22
Architectural Exception Process	2.3	2.5	3.2	23	25	32
Average	**2.5**	**2.7**	**2.5**	**25.4**	**27.0**	**24.9**
Relational Mechanisms						
Job-rotation	1.2	1.3	3.5	12	13	35
Co-location Business/IT collocation	2.3	2.9	2.5	23	29	25
Cross-training	2.9	3.0	2.3	29	30	23
Knowledge management (On IT governance)	3.7	3.7	1.0	37	37	10
Business/IT account management	2.4	2.4	2.3	24	24	23
Executive / senior management giving the good example	2.9	2.7	1.9	26	24	19
Informal meetings	4.9	4.0	0.9	49	40	9
IT leadership	3.4	3.1	1.5	34	31	15
Corporate internal communication Addressing IT on a regular basis	4.2	3.2	1.0	42	32	10
IT governance awareness campaigns	3.0	2.7	1.8	30	27	18
Partnership rewards and incentives	0.8	1.1	3.3	8	11	33
Shared understanding of business/IT objectives	2.6	2.9	2.7	26	29	27
Senior management announcements	2.6	2.6	2.1	26	26	21
Office of CIO or ITG	4.6	4.1	1.0	46	41	10
Average	**3.0**	**2.8**	**2.0**	**29.4**	**28.1**	**20.2**

The next subsection discusses the findings in the qualitative data collection from the interviews.

3.3.1 Structures

In this section, the structure mechanisms are analysed and discussed as perceived from the interviews in ten universities. The words and phrases in "**Bold"** in the tables in the interviewee's quotes represent the data coded and used to generate the code. The same words or phrases that appeared in different quotes, codes were created in the format of words or phrases to translate/represent the meaning of those quotes. This strategy was used to analyse all the IT Governance mechanisms.

ITG Organisation Structure

Table 29 shows the collected data from the interviews where the current ITG governance structure adopted was asked for and suggestions for the best model.

Table 29. ITG Organisation Structure (quotes from interviewees)

University	Quotes from interviews
1	*... Is centralised and federal. We are still moving to more centralised, especially in the research area. The main benefits in the **centralised** mode are **economising on skills**, **economising on applications**, and **cost reduc**tion*
2	*... Is centralised. The benefits of this type are in **cost reduction** and **standardisation**.*
3	*Currently, we have the most centralised structure. However, some IT technicians work at the faculties reporting directly to the faculty directors not to IT directors. Therefore, we can consider that the IT governance structure is federal. The ideal is to have a decentralised structure where the central point defines **roles and procedures**, and **the execution** to be **decentralised**. In my opinion, it is an ideal model. The core structure is centralised to **avoid wasting resources** and the **execution decentralised** with the **distribution of tasks** for better execution. The best of both worlds is the **strategy** and **definitions** to be **centralised** and the **operations to be decentralised**. However, we are so far from this model in our institution. I think that it is not good to decentralise all IT.*
4	*Our structure is federal. We have some **decentralised departments** ... this is a serious **problem.** An ideal model from my point of view is **centralised decision making** and the **decentralised operation**, the decentralised operation with a relationship with the central IT structure, IT with **centralised infrastructure** and the operation decentralised. The decentralised IT at faculties has several **problems**, **cost** is one. Others include the **communication** with the central IT, the autonomy of developing their own software and not sharing with us. Most of the time they are **doing the same things**, it generates a **duplication use of resources**. Moreover, the decentralised IT is only to meet the local demand and not at institution level like the centralised IT.*
6	*(...) The structure is centralised. IT is a big advantage on issues of **cost reduction**. Moreover, it is harder to manage a team when people have to work in different places even to create new team procedures or methods is tough to implement*
7	*It is centralised at services level ... The ideal is to have all centralised. **Centralisation** is good for management and to **save resources**. Each faculty has their own data centre and it is more expensive for the university. For instance: All faculties have an e-mail server, an authentication server, among others... all have the same servers **duplicate** to do the same thing and each unity do it individually. Moreover, it is necessary to have a team in each unit. It is **resource wasting** and as human resources and technical resources are scarce... Then, this model is not efficient in practice.*

After analysing the transcripts from interviews, open, axial, and selective coding was performed for qualitative analysis following and adapting the recommendations by Strauss and Corbin (1998). Moreover, the guides provided by Saldaña (2016) were also used for this analysis. Such data enabled identifying the open code. A pre-defined category was created for ITG structure with the selective codes Centralised, Decentralized and Federal. Table 30 provides this analysis.

Table 30. ITG Organisation Structure (Coding)

Category	Sub-Category	Codes
IT Governance Structure	Centralised	Strategy Definition; Infrastructure; Economise on skills; Economise on applications; Cost reduction; Standardisation; Institutional level; Management; Saving resources
	Decentralised	High cost; Duplication of resources; Waste resources; Operations: Execution; Faculty level; No relationship with main IT at university; Difficulty of control; Not efficient
	Federal	Centralised strategy definition and Infrastructure with decentralised operations and execution

There is a consensus for all the interviewed that the centralised mode is the most suitable- Even though, some universities have adopted the federal model. Moreover, a totally decentralised model is not seen as appropriate for this type of organisation.

Regarding the ITG structure adopted by universities, some conclusions can be drawn. The federal mode is the most adopted by large and extra-large universities. Due to the size of these universities usually with more than one faculty, structure becomes essential. On the other hand, the centralised structure is adopted by medium universities where the ITG infra-structure is central and does not have several campuses. No university adopts a totally decentralised structure. Moreover, the adoption of a centralised structure has some benefits such as economising on skills, economising on applications, cost reduction and standardisation.

The results of this study show that the universities with a decentralised structure share the same problem regarding issues of high costs, duplication and waste of resources, difficulty of control and difficulty in their relationship with the central IT. These findings are in consonance with the literature review identified by (Hicks et al. 2012) in eight Australian universities. Furthermore, a decentralised model is not effective in practice due to difficulties of standardisation and the relationship with other faculty areas.

The evidence of this research leads to drawing the following conclusions. The IT structure tends to be centralised rather than decentralised or federal. The federal structure is applicable mainly in universities

with more than one campus that have local IT in the faculties to assist their demands. In practice, this model is not effective because the IT staff in these faculties do not report to an IT person. However, it is necessary to have IT people in faculties supporting all IT activities as well as a business relationship between IT and business. In an academic environment where there are several decentralised technologies, for laboratories to have this structure means it is necessary for supporting even the geographical issues. It can be concluded that both worlds have a federal structure where the infra-structure, strategy, roles and procedures are centralised to avoid wasting resources and the execution and operations are decentralised.

IT Strategy Committee

The strategy committee was also one with a high frequency in the interviews. It is quite obvious that strategy is in the top concerns of the interviewees. Table 31 shows some quotes from the interviews.

Table 31. IT Strategy Committee (Quotes from interviewees)

University	Quotes from interviews
3	***The strategy committee is the most important mechanism***. *Strategy is the main issue in IT*
5	*The strategy committee is one of the* ***most important committees*** *in the institution.*
7	*We haven't implemented the IT strategy committee. But, it is* ***important*** *to have a strategy committee to* ***define the strategy clearly***.
9	*It is* ***important*** *to have this committee to* ***define such decisions and practices in the institution*** *and the best ways for IT.*

After analysing the transcripts from interviews, we performed open, axial, and selective coding for qualitative analysis following recommendations by Strauss and Corbin (1998). Such data enabled us to identify the open code. Table 32 provides information of this analysis.

Table 32. IT Strategy Committee (Coding)

Category	Sub-Category	Code
Structure	IT Strategy Committee	IT Strategy is the most important mechanism; it is very important to define a strategy; unfortunately, we don't have a well-defined strategy; members with different expertise

The definition of an IT strategy at institutional level is mentioned as one the most important mechanisms for IT at universities (Albrecht and Pirani 2004). Hence, the strategy is also pointed out as the main concern in most case studies. Another important reason identified in the case studies is the importance of having an IT strategy committee to align IT with the business. Additionally, IT must have the organisation credibility operating at a high maturity level and in the long term not just short term and in

crisis. Therefore, it is necessary to define an IT strategy clearly (Albrecht and Pirani 2004; Fraser and Tweedale 2003).

Even though, some universities analysed do not have a formal strategy committee at institutional level and the strategy is defined in the IT department, there is a consensus regarding the importance of strategy. The results show that an IT strategy committee is crucial to ensure that IT is on the agenda at the institution, to define the budget and investment in IT, to have a plan for the long term, and to define priorities in different areas of teaching, learning and administrative areas. Thus, to ensure that the IT strategy is on the agenda at the institution it is necessary to create an IT strategy committee composed of administrative staff, academics and students.

IT Steering Committees and IT Councils

Another mechanism pointed out as important in ITG in universities is the steering committee and council. In practice, the councils as well as the steering committees have a similar function. The councils and committees are essential to insights and suggestions to improve IT in universities. However, for small and medium universities to have many committees is not effective due to the lack of human resources and time for scheduling meetings. Therefore, a mechanism namely IT Steering Committees / Councils were created. Table 33 shows the quotes from the interviews.

Table 33. IT Steering Committee (Quotes from interviewees)

University	Quotes from interviews
1	*Many committees were implemented,* ***a lot of steering committees*** *to implement* ***specific solutions****. We have more than one steering committee. Implementing the scheduling solution, implementing HR solutions, implementing testing and assessment, and different committees where the CIO is a member in all parts of the committee. We have a lot of steering committees but not one steering committee for all of IT.* ***The architecture steering committee is difficult to implement*** *because of the legacy of* ***knowledge*** *in the rest of the organisation. The IT governance committee and security committee are totally implemented and are important for the institution. Otherwise, the* ***IT investment committee*** *is* ***not*** *considered an* ***important*** *committee because it is not possible to spend money.*
2	*Various committees are entirely implemented such as strategy, teaching and learning, security, and projects. In general, all of these committees are considered important. These committees are composed by business and IT staff.* ***Moreover, the professors from faculties and experts in each area of the committees are invited to be membe****rs. Their knowledge and expertise can help for better decision making.*
3	*At institutional, there are only institutionalised in the* ***IT Council*** *that can be considered a committee. This committee is more involved in organisational management and* ***the members are the CIO, Rector, Director of the Faculty among others****. It is and* ***advisor committee*** *and the strategy is not discussed. We have a steering committee, an internal strategy committee in the IT department not at institutional level, institutionalised. These committees are created at of the IT department level and have a positive impact in the process helping to govern IT. However, a better solution is creating these at institutional level clarifying the goals and objectives for everyone. In practice, it is difficult to implement all IT governance committees in accordance with the recommendations from literature.*

University	Quotes from interviews
5	*We have **few committees** and **difficulty in interaction** with people from different departments and faculties. It is **difficult** to have many committees.*
7	*We do not have IT committees. It is **important but** it is not easy to implement. There are many difficulties such as financial difficulties and a lack of people, moreover, and the conflict of interest in the institution. At least regarding the strategy definition, developing procedures, the definition of roles and politics, committees are important. (See original Quote in Appendix L).*

Table 34 provides information regarding to the qualitative analysis.

Table 34. IT steering committee (Coding)

Category	Sub-Category	Codes
Structures	IT steering committees	It is important but not easy; Few committees at university; Difficulty of interaction with other areas; Lack of human resources for having many committees; Useful for insights; It is not necessary to have many committees; One committee can have many functions or tasks
	IT councils; IT leadership councils	

While the literature suggests several committees for ITG (i.e. IT steering committee, IT project steering committee, IT audit committee, IT security committee, among others) our exploratory study showed that to have a lot of committees is not effective in practice. Moreover, as pointed out by an interviewee, there is a difficulty in creating different formal committees, due to the lack of people and engagement with areas in the institution.

The most important and mandatory committee is the IT strategy committee. The other committees and councils can be a part of the steering committee, for example an IT security committee, IT project steering committee, among others. Only universities 1 and 3 have more than one IT steering committee in their IT department, moreover it is pointed out that there's a difficulty in having many committees, due to the lack of human resources and knowledge. Councils are more effective in practice than committees due to the fact that councils are more useful for recommendations.

Committees are important for the definition or procedures, roles, IT internal politics such as the use of e-mail, wireless, etc. However, it is necessary to have staff from business and from the IT department to build these committees. Indeed, in an academic environment like a university, there is a range of people with different knowledge (i.e. IT security, management, information systems education) and a good deal is to interact these experts from different departments and schools to be members of the committee as well as the council. In addition, there are political issues and conflicts of interests. Thus, the committee members need to have decision makers based at institutional level rather than at faculty level. Other

committees such as the IT audit committee at board of director's level and the IT security steering committee are not pointed out as essential and important by the interviewees.

Definition of Roles and Responsibilities

The structure mechanism "Definition of Roles and Responsibilities" received frequency 2, which means that IT was chosen by two universities as an important mechanism to compose a baseline of 10 possible choices. Table 35 shows the collected data from the interviews, regarding this mechanism.

Table 35. Definition of Roles and Responsibilities (Quotes from interviewees)

University	Quotes from interviews
1	The roles and responsibilities are **clear** with the **definition of each IT activity or area.**
2	The roles and responsibilities are **clear with the definition of each responsibility**. The institution is based on **formal functions and roles**
3	We have **clearly defined the roles and responsibilities** in the IT department. We created a RACI Matrix. The aim is avoiding the activities and projects without responsible people. Moreover, with this Matrix, it is possible to verify the capacity and demand to execute the tasks in different areas such as support, system development, and infrastructure among others.

Table 36 provides information of the transcripts analysis from interviews, summarising the analysis in coding.

Table 36. Definition of Roles and Responsibilities (Coding)

Category	Sub-Category	Codes
Structure	Definition of Roles and Responsibilities	Formal functions; Clear definition; Divided into different areas, Support, System development, IT infrastructure.

According to the perception of the interviewees, in the context of universities it is important to have all IT roles and responsibilities clearly defined for each IT activity or area. The use of the RACI MATRIX has been pointed out to define the roles and responsibilities. Another example, are that the roles and responsibilities are clear with a definition of each IT area based on formal IT functions (i.e. support, infrastructure, administrative systems, networks and information security among others).

It is definitely important to have well defined roles and responsibilities for better performance in ITG in the institution. Another conclusion is that most IT departments are divided into formal IT areas, for example, developing systems, hardware, and network management, among others. Each one of these functions in an IT department has roles with experts in this area and are detailed in a document. This type of function allows IT in universities to output better performance

In addition, the mechanism had a significant level of implementation, receiving a score of 3.2 on a scale of 0 to 5. Also, the effectiveness of this mechanism can be considered high compared with other mechanisms, showing a score of 2.8, above the average of 2.0 for the structure mechanisms.

Business Process Office (BPO)

The third mechanism suggested is the Business Process Office (BPO), which is classified as a structure mechanism. Table 37shows some quotes from the interviews.

Table 37. Business Process Office (Quotes from interviewees)

University	Quotes from interviews
4	(...) In my opinion a mechanism that could be included is a business process management office (BPO). I think that a BPO is an important function at IT level that could **help to improve the research and administrative area results** (...) It should be composed by people with knowledge of IT and universities business so the process could be either better modelled and improved (...) People with IT and business knowledge are ideal to transcribe the requirements."

Table 38 provides information of the transcripts analysis from interviews, summarising the analysis in coding.

Table 38. Business Process Office (Coding)

Category	Sub-Category	Codes
Structure	Business Process Management Office (BPO)	Help improving the research and administrative area; formal function to improve and management processes; should be composed by IT and business staff

Business Process Management (BPM) is an emergent and recent approach discussed in organisations. Organisations are a collection of processes, even though for the most part, the processes are not well defined and documented. A formal BPO brings IT and business closer together to work as partners. It is an interesting mechanism to identify bottlenecks and process improvements. The goal of this BPMO is to discover, analyse and propose areas to be optimised. These proposed areas can be discussed by an IT strategy committee.

CIO reporting to CEO and/or COO

The structure mechanism "CIO reporting to CE and or COO" was not selected for the ten most important mechanisms. Table 39 shows some quotes from the interviews.

Table 39. CIO reporting to CEO and/or COO (Quotes from interviewees)

University	Quotes from interviews
1	*"I **report** (....) one the board members. But **I am not part of the board**"*
3	*The CIO **reports directly to the rector**. But this is not formalised. It does not impact on getting resources or anything.*

Table 40 provides information of the transcripts analysis from interviews, summarising the analysis in coding.

Table 40. CIO reporting to CEO and/or COO (Coding)

Category	Sub-Category	Codes
Structure	CIO reporting to CEO/COO	The CIO usually reports to the directors, rector; vice-rector; it is mandatory in the institution; hierarchical organisational structure.

Most of the universities in this exploratory study, the CIO, IT director and the person in the highest position in IT report directly to a financial director, management director or rector. It is quite clear at universities that IT follows a hierarchical organisational structure once IT is not at the same level as teaching, research and other areas. However, as pointed out by interviewee three, the CIO reporting directing to the dean to other board members does not impact on getting funding for the university. It is quite clear that this mechanism received significant scores for effectiveness of 3.0 and ease of implementation, 3.6 which means that in practice, it is easy to implement because it is mandatory. Thus, in accordance with the findings these mechanisms are not important to compose the ITG baseline.

CIO on executive Committee and IT expertise at board level

The two structure mechanisms "CIO on executive Committee" and "IT expertise at board level" are analysed together. Such mechanisms in our analysis have the same meaning and function in the case of universities. Table 41 shows some quotes from the interviews regarding these two mechanisms.

Table 41. CIO on executive Committee and IT expertise at board level (Quotes from interviewees)

University	Quotes from interviews
1	*(...) "**I am not part of the board**.* CIO on executive committee, no".
6	*(...) I **am not a member of the board.** The board is only the rector, vice-rector and the administration staff. There is no board specifically for IT. There is a port with service directors from different areas where IT is a part of this. It is **important, to have someone who speaks the IT language on the board.** IT has its own language as in any other profession, such as medicine. Someone who **knows the same language**, who knows the same difficulties, is fundamental, someone that is sensitive to us, when we are asking for money for a particular project, realising the investment reach of this project.*
7	*(...) "I think it's important, it may not be me, but to have **an IT voice on the board is essential**. Sometimes the decisions are made without the consequences in IT, so it is **important** that there **is someone with more technical know-how**. "*

Table 42 provides information of this analysis about quotes from interviews.

Table 42. CIO on executive Committee and IT expertise at board level (Coding)

Category	Sub-Category	Codes
Structures	CIO on executive committee	CIO is not a member of the executive committee; CIO is not on the board; however, is important to have a person on the board with IT knowledge; A person that speaks the IT language; with more technical know-how
	IT expertise at board level	

Findings show that in the majority of universities the CIO is not a member of the executive committee. The members of the board are usually directors, the vice-rector and the rector.

However, there is a consensus by the interviewed on the board of the institution that it's necessary to have an IT member of staff with technical knowledge with the aim of "selling" the IT for the directors and executives in the institution. As noted, information technology has a particular language like other areas, thus to have a person with technical knowledge is really important. From our point of view, the CIO is the most suitable person with the challenge in presenting IT on board as well as speaking a language that is clear and understandable for everybody. Moreover, it is argued that to have the CIO on the executive committee may have a positive impact on IT to sensitise the members about the importance of IT for the institution. Furthermore, from our point of view it is necessary that the CIO is engaged and interacts with strong networking and with a board of the institution with an active voice, formal or informal. Therefore, analysing the two mechanisms together, to have the CIO close to the board or a person with the IT expertise at board level could be interesting for effective ITG.

Business/IT relationship managers

The Business/IT relationship managers structure mechanism, received a frequency of 4, which means that IT was chosen by four universities as an important mechanism to compose a baseline of 10 possible choices. Table 43 shows some quotes from the interviews regarding this mechanism.

Table 43. Business/IT relationship managers (Quotes from interviewees)

University	Quotes from interviews
6	(...) The role of the IT director is also an evangeliser. The IT director function is this, to be the **relationship with other areas**, explaining the services, identifying the need in other departments, showing how things work and why. I'll give you an example, in wireless, we have one authenticated access, and the password changes all week, the role of evangelism is to explain this to people. The password changes every week, so people authenticate on the authenticated network. That is the role of the evangeliser to **explain the information technology services to users**. The role of the IT director is to set up the machine to respond to the business. What a time that is hard to find all people like to explain why things, as long as there is time (...)
9	(...) IT alone does not work, so we need to **know the business demands.** Thus, we need a **person in faculties or departments to make this bridge for us.** Because, most of the time the departments do not have knowledge about their demands and necessities. Thus, an IT member os staff close to these people, **interacting and speaking the same language is essential.** But, it is not easy, it is important to have a good relationship and sometimes you do not get it. We have people with good technical skills, but you do not have strong relational skills. So, it's also complicated (...)

Table 44 provides information of this analysis about quotes from interviews. It is a summary of some important codes.

Table 44. Business/IT relationship managers (Coding)

Category	Sub-Category	Codes
Structure	Business/IT relationship managers	To make the bridge between the business and the faculties; to share experiences; to identify demand; to help to solve daily problems; to identify opportunities; to explain IT using a common language.

Findings from interviews reveal the importance in having an IT member of staff making the bridge with the business and identifying the demands. This person could be the CIO, IT director or another IT person who explains to the business how IT works and vice versa. In the case of universities, due to the size and complexity, this person plays a key role in explaining IT, and the functionality of many issues for the various departments. It helps IT to be proactive and work close with the business assisting the units when necessary. Therefore, the Business/IT relationship managers are an important mechanism to compose the ITG baseline.

Security / compliance / risk officer

It is not a surprise that the process mechanism related to security and risk was chosen by one university. Moreover, as can be seen this mechanism has a low level of implementation in universities that is in consonance with the findings from the literature review. Table 45 shows some quotes from the interviews regarding this mechanism.

Table 45. Security / compliance / risk officer (Quotes from interviewees)

University	Quotes from interviews
1	*"We have **ISO 27001** for security"*
2	*"For security the framework adopted is **ISO 27001**"*
3	We use some of **ISO 27001** for security. But it is the initial level
9	We had **many problems related to security with people at board level** such problems like malware in computers, problems related to passwords and control in the active directory. Business staff sometimes **do not understand the technical impact on IT related to these issues**. It is not easy to convince them to make investments.

Table 46 provides information of this analysis about quotes from interviews.

Table 46. Security / compliance / risk officer (Coding)

Category	Sub-Category	Codes
Structure	Security / compliance / risk officer	Little attention on security by directors; no formal function related to these issues; most universities use ISO 27001 as a reference for security.

Findings reveal that the board of the institution do not have the awareness of the importance of plans for risks and security activities. A formal function or an office to discuss these topics is considered relevant especially in IT risks and the impact on the institution.

As pointed out by a university, the issues of security are internal risks for the network at university. Although, the university is an open environment to test different solutions and doing experiments, it is necessary to have control about risks and security issues in compliance with some government laws. Indeed, it is necessary to have control over all security issues to avoid attacking governmental agencies as origins from universities. Therefore, it is an interesting mechanism that the board of the university need to pay attention to and to include on the IT strategy plan agenda.

3.3.2 Processes

A This section discusses the ITG process mechanisms chosen by the interviewee in Table 25. Each one of these mechanisms are analysed and discussed below in accordance with the sum of frequency, as well as the two mechanisms suggested by the ten interviewees to compose the ITG baseline named Test and Experiments Possibility and International Standards/Common Solutions. Other mechanisms that were also suggested but not chosen as the ten most important are also presented.

Strategy Information System Planning

The first process mechanism to be considered in the baseline is Strategy Information System Planning also known as the IT Strategic Plan. Strategy Information System Planning had a frequency of 9 out of 10 interviews. Strategy Information System Planning (SISP) is a process mechanism that is point out as important in most studies. SISP is noted by nine universities. Universities as complex organisations need to develop long-range strategic planning to justify funding requests for research and teaching activities as well as projects. Table 47 shows some quotes from the interviews regarding this mechanism.

Table 47. Strategy Information System Planning (Quotes from interviewees)

University	Quotes from interviews
3	The plan should be more effective in practice. The plan is **to get resources in the strategic** plan in the university. Currently, **the board do not give proper attention to this plan.** The plan is only a beautiful document on the website. The plan is **a tool to justify things**. The **board should pay attention to this plan and what is require**d. The effectiveness is low, actually due to the management of the university. The plan is **really important.**
6	We have a plan for each year. We define all the activities in this plan each year. At the end of the year, we create a report of the achievements in each objective and goal. To have a plan is **easy because** to implement it is because it **is mandatory.**
7	Currently, we do not have a plan. We had a plan for four years last year. A **plan is an interesting guide**. It is enlightening and **very useful.**
9	We have (...) a strategic plan for IT. The plan is following the strategic plan by the university. Each period of the strategic plan of the university, we organise or **IT plan to align with the business goals**. We are using a **simple document that is possible to achieve all goals** at the end of each year with a number of reduced activities. Before, the plan was so long with many actions and objectives that in practice was not good. Moreover, **a complex plan is also difficult to achieve**.
10	We have a **plan for each year**. The document is **good,** because at the end of the year, we can know what are the goals and objectives that were fulfilled.

Table 48 provides information of this analysis about quotes from interviews.

Table 48. Strategy Information System Planning (Coding)

Category	Sub-Category	Codes
Process	Strategy Information System Planning	Tool to get funding; tool to justify IT issues; the most important IT document needs to be summarised with affordable IT goals to be reached; Plan for each year

The IT strategic plan, as noted by the interviewed, is considered the most important document in IT. This document is a crucial tool to justify IT activities at institutional level and must have the recognition of senior management of the institution, in this case the rector, pro-rectors and directors and administrative people.

Frameworks and Standards ITG

The mechanism frameworks and ITG standards encompass all kinds of frameworks for ITG such as ITIL, COBIT, and IS0 27001 among others. However, the aim is to understand what the frameworks the universities have used are as well as the most implemented processes. The mechanism frameworks and Standers on ITG had a frequency of 9 out of 10 interviews. Table 49 shows the quotes from the interviews.

Table 49. Frameworks and ITG Standards (Quotes from interviewees)

University	Quotes from interviews
1	Most frameworks implemented are **ITIL, and ISO 27001** for security, and COBIT is not implemented. COBIT is hard to use. **ITIL is better and easy to implement. ITIL is more practical**, I would not say better but more practical. However, it is not easy because it is necessary to compile the processes. The framework SOX is not implemented. It is typical in America. We use mostly the framework BISL, it is typical in the Netherlands.
2	We use **ITIL** for IT **service management**. Some processes are implemented (problem **management, incidents management, configuration, service desk). ITIL is more practical than COBIT and easier to implement.** We have **the service desk well-structured on all the levels**. For the security of the framework **ISO 27001** is adopted**.** However, the reference framework following is BISL. BISL is a framework developed to the Dutch reality. We follow all recommendations of this framework and methodology in the institution. Prince is the project management methodology used.
3	We have implemented the framework **ITIL,** particularly in **incident management, Help Desk** and **Configuration Management Database (CMDB).** We do not have COBIT implemented. However, COBT is important for development. Unfortunately, we do not have many processes implemented internally. Regarding security framework, we do not have any institutionalised
5	A portal is necessary to show the IT solutions. **Help Desk** is very important to have quality for the final user.
6	We use the **ITIL** process. We conduct the management demand with a tool (...) in the Help Desk. I would like to be certified in security, **ISO 27001.**
8	We try following **ITIL,** we have implemented **Incident Management**. We use a **service desk** tool for management demands.

Table 50 provides information of this analysis about quotes from the interviews.

Table 50. Frameworks and ITG Standards (Coding)

Category	Sub-Category	Codes
Process	Frameworks and Standards ITG	ITIL; Incident management; Help Desk is very important; Configuration Management; ITIL is more practical than COBIT and easy to implement;

The ITG frameworks were selected by all interviewees. It was not surprising, since the studies found in the literature show frameworks such as ITIL, COBIT and ISO/IEC 38500 as a starting point to implement IT governance. From the interviews, we understood that ITIL is more practical and it is the most common ITG framework implemented. Service desk and incident management are the most common ITIL processes implemented in all universities. It is remarkable that the IT at universities have a focus on operational services taking into account the number of IT users and quality of service to deliver to students, professors and administrative staff.

Findings in the exploratory case study are in line with the literature where it is argued that the level of maturity in ITG frameworks as well as in best practices is still low. The process in the framework ITIL such as Service Desk, Service Catalogue, Problem Management is seen as essential for universities in particular for management IT issues.

As mentioned, IT at university aims to deliver services with the best quality as possible to students, professors and administrative staff. Therefore, the way to reach it, is using known best practices on the market. Among several frameworks, the ITIL framework seems the most practical, moreover, it is the most adopted by all universities. The ITIL framework provides 27 processes, however, to implement all these processes in an academic context is a huge endeavor, requiring a lot of people and, human and knowledge resources. Thus, the universities have implemented at least the most essential ITIL process focused in operational management.

Business Information Service Management Library (BISL)

The second mechanism, the Business Information Service Management Library (BISL) framework, was suggested by two universities in the Netherlands. BISL was developed and customised in practice in the Dutch education system. In the literature, not a lot of documentation in English was found. It is a framework that is restricted to a country and, in fact, something already covered in the initial list as ITG frameworks. Thus, this specific mechanism shouldn't be included as part of the proposed new set of mechanisms.

Methodology to manage disruptive innovation

The mechanism proposed by the first interviewee is named "methodology to manage disruptive innovation". Table 51 shows the quotes from the interviews.

Table 51. Methodology to manage disruptive innovation (Quotes from interviewees)

University	Quotes from interviews
1	*"Only focus we could know. Not only we have. But focus in innovation. How do you manage innovation in this institution? Not same in place for that. Discuss I have. We should do something because this institution is a teaching class room ...* ***The goal of IT governance is transforming education****. We are a very old model of classroom. In ten 10 years we will transform this model. A full generation will be fully native in IT. They will table natives. IT governance will be one of the leading to* ***transform education,*** *open access and a lot of American universities. We can follow all kinds of courses on the internet for free. But we have to pay for the certificate. Knowledge will be open in more and more universities. I think the classroom will be dead in 20 years in the current model"*
8	*We are always looking for* ***opportunities.*** *It is important that it is our thing that we never get settled. We are always looking for alternatives, today I use storage of one brand, tomorrow I use another, looking at the market. IT is* ***very dynamic****, what is good today is no longer tomorrow.*

Table 52 provides information of this analysis about quotes from interviews.

Table 52. Methodology to manage disruptive innovation (Coding)

Category	Sub-Category	Codes
Process	Methodology to manage disruptive innovation	To be innovative in the classroom; provide new ways in the classroom; look at alternative solutions for IT; innovate the IT process; search for IT solutions

Universities provide a suitable environment to test different solutions to stimulate research, teaching, and innovation to be further applied to other industries. Moreover, it is necessary to identify opportunities on how to be innovative in a classroom environment and provide disruptive innovation in the teaching-learning process. Therefore, a methodology to assist in selecting and governing these technologies would be important. As a summary, methodology to manage disruptive innovation is an important IT area in the literature and should compose of the IT governance mechanisms baseline.

Dashboard

One suggested mechanism to be added to the initial list of ITG mechanisms is named "Dashboard". Interviewee 3 indicated that it is an important mechanism for ITG in universities. During the qualitative analysis, we also identified another quote in interview seven, regarding the importance of dashboards for universities. Table 53 shows the quotes from the interviews.

Table 53. Dashboard (Quotes from interviewees)

University	Quotes from interviews
3	*(...) "**Tools** such as dashboard should be used by IT people and **academic** staff aiming to analyse **organisational data**. It's a tool that is **easy to use** [...] I mean, easy to import data and create the panel with KPIs to analyse. Something intuitive that people without high technical knowledge can use and understand."*
7	*(...) A tool for dashboard is **very important.***

Table 54 provides information of this analysis about quotes from interviews.

Table 54. Dashboard (Coding)

Category	Sub-Category	Codes
Process	**Dashboard**	Very important tool for academic and business people; a tool that is easy to use and analyse data without high technical knowledge to use.

The dashboard was also identified as another possible new mechanism. As a panel with key indicators to be used by IT and business to control the most relevant areas, it is essentially a tool that facilitates the access and analysis of data from teaching, learning and research areas.

Possibility of Tests and Experiments

Another mechanism suggested in interview 5 is to compose the ITG baseline named "possibility of tests and experiments". Other evidence and quotes identified in this mechanism are also shown in Table 55 about the quotes from interviews.

Table 55. Possibility of Tests and Experiments (Quotes from interviewees)

University	Quotes from interviews
5	"We are in an **open environment**. You understand what I mean. **Universities are different than industry.** Here, we can **do experiments and test a range of solutions**, if we **make an error** it **does not impact on the organisation**. While, in industry it is not possible due to operational efficiency that is necessary to have"
6	It is always possible to **set up laboratories where people install prototypes before the running solution in the production.** The employees create an environment to **test different types of solutions** and install what are proofs of concept. Thus, employees can **test** these **solutions** to identify the better choice. (see original quote in Appendix L)

Table 56 provides information of this analysis about quotes from interviews.

Table 56. Possibility of Tests and Experiments (Coding)

Category	Sub-Category	Codes
Process	**Possibility of Test and experiments**	Universities are different than industry; do experiments and test solutions; making an error does not impact in the organisation; creating an environment for testing.

As suggested by interviewee 5, universities are different than industries. In this type of environment, it is possible to test different types of solutions and if you make some error it does not impact directly on the business. Therefore, this mechanism is very important to take into account in IT departments of universities.

IT Performance measurement (BSC)

The performance measurement that is also known as BSC, is a process mechanism that had a frequency of 2 by the interviewed. Table 57 shows the quotes of the interviews.

Table 57. IT Performance measurement (Quotes from interviewees)

University	Quotes from interviews
1	We measure **students** and **staff's satisfaction** regarding IT service desk, services provided. IT is an internal role with financial satisfaction. We usually use **surveys** to measure satisfaction
2	**Customer satisfaction** is often monitored on social media and also with **surveys.**
3	We don't measure **customer satisfaction**. It is important but it is not easy to implement in the institution. We do not have commitment by **staff** and **students** to fulfil the questionnaire correctly

Table 58 provides information of this analysis about quotes from interviews.

Table 58. IT Performance measurement (Coding)

Category	Sub-Category	Codes
Process	IT performance measurement (BSC)	Student and staff satisfaction; use of survey to measure the quality services; focus on operational issues.

BSC is not a mechanism adopted by universities in general for the vision and strategy. Findings in the exploratory study show universities are in an initial phase in the implementation of this mechanism. The main focus of the adoption of BSC is on operational measures, mainly to monitor users' satisfaction, especially for students. The universities have measured the user IT satisfaction through surveys. It can be argued that in a university environment where there are over thirty thousand users, measuring the user's IT satisfaction of services in an important indicator to evaluate IT in the university.

International standards/common solutions

Another mechanism proposed was international standards/common solutions. Table 59 shows the quotes from the interviews.

Table 59. International standards/common solutions (Quotes from interviewees)

University	Quotes from interviews
5	(...) "To adopt the international standards... **solution adopted by universities in the same country** for instance... only public. For instance, if all universities of the same sector adopted the **same software** it would be easier to exchange information and even promote a course of new **software, technology**, and management for all IT employees.

Table 60 provides information of this analysis about quotes from interviews.

Table 60. International standards/common solutions (Coding)

Category	Sub-Category	Codes
Process	International standards/ common solutions	Adopt the same solutions by other universities; same software; type of technology

Universities have characteristics which are different from those of financial and health care industries. This mechanism requires making a benchmark with other universities to adopt the same international standards and solutions. Moreover, purchasing a new technology to interact with the CIOs from other universities to exchange ideas and discuss experiences can bring insights as well as benefits in terms of cost reduction before implementing new software, for example, in the process of implementing new IT service management software (ITSM). Several open source and commercial tools are available. Nevertheless, few of these tools are known in the context of universities and the process of implementing and training may be too expensive. Therefore, adopting tools common to other universities can be

advantageous to foster partnership among universities to promote courses, exchange information and reduce costs.

Service Level Agreement (SLA)

The process mechanism "SLA" had a frequency of once among ten universities. University 6 exhibited this mechanism to be part of the ITG baseline. Table 61 shows the interview quotes regarding to SLA.

Table 61. SLA – Service Level Agreement (Quotes from interviewees)

University	Quotes from interviews
1	*"SLA is implemented but could be improved. It is hard to implement the effectiveness of this instrument in general or in my organisation. Here this* ***instrument*** *is* ***not very effective*** *so this instrument is not applicable."*
3	*We have SLA only for IT outsourcing such as a printer service. It is* ***difficult to implement*** *SLA because the people do not register correctly on the system. SLA* ***does not impact the loss to the institution****. If we do not achieve the SLA defined on time, it is not significant.*
7	*The SLA was defined to be fulfilled. If it does not comply, it does not affect financial loss for the institution*

Table 62 provides information of this analysis about quotes from interviews.

Table 62. Service Level Agreement (Coding)

Category	Sub-Category	Codes
Process	SLA	The instrument is not very effective; it is difficult to implement; it does not impact on the loss to the institution; it's necessary to fulfil the SLA; if it does not comply it does not affect financial loss.

Findings reveal a consensus between the interviewee that the SLA does not seem an essential and effective mechanism for universities. Moreover, as noted, an SLA with a definition of time in each service were created to be fulfilled, as a result if it is not achieved it does not impact on the loss to the institution. However, interviewees have an awareness that it is important to define time for the services, at least for monitoring the internal performance or some IT staff members.

Such data in the quotes are supported in Table 24, where the effective level received a score of, 2.5 and the ease of implementation received a score of 2.6. Such results give information that is not effective in practice and also difficult to implement due to correctly filling the system. In spite of the SLA, it was selected by one university, this mechanism does not deserve attention to be included in the ITG baseline.

The empirical findings regarding SLA are in accordance with Ko and Fink (2010) and also show that SLA at universities is not effective or pointed out without high relevance. Thus, it is not a crucial mechanism that is necessary to have for an effective ITG baseline.

IT budget control and reporting

The process mechanism "IT budget control and reporting" was frequent five times by the interviewed among ten possible choices. It shows that it is an important mechanism to compose the ITG baseline.

Table 63 shows the interview quotes regarding to IT budget control and reporting.

Table 63. IT budget control and reporting (Quotes from interviewees)

University	Quotes from interviews
3	*So, we need X to buy Y, otherwise the services will stop. Ok, you can take the money to buy. We do not have an IT budget, only a forecast for expenditure (...) to have a* ***budget*** *is* ***necessary*** *in IT.*
7	*We do not have a budget. I* ***would like to have a budget*** *each year to know where to* ***invest in IT****. It is* ***fundamental*** *to* ***work with an IT budget.***
9	*I think, I must have the* ***amount to spend****. I have to know what our limits for IT investment are****.*** *The IT team do a lot of* ***projects*** *and at the moment to approve it, the university says no money is available for all this. Thus, it is important to know* ***how much is available*** *to develop and* ***spend on the projects****. Therefore, we can develop the projects based on the IT budget defined.*

Table 64 provides information of this analysis about quotes from interviews

Table 64. IT budget control and reporting (Coding)

Category	Sub-Category	Codes
Process	IT budget control and reporting	Fundamental to have an IT budget; to know how much the budget to spend is; essential for strategic projects; to define the IT budget per year.

As you can see in the quotes and in the analysis with codes from the interviews, all universities have a concern and a need in having an IT budget. Most of them do not have a defined budget for IT which is a problem in accordance with the interviewed. The findings show that to have proactive and innovative IT focusing on the improvement of a process as well as developing new technologies is important to know the budget. Indeed, the IT departments need to develop projects or even invest in new technologies and the board of universities need to ensure financing.

Moreover, the process mechanism "IT budget control and reporting"" showed an average score in effectiveness (2.8) and a score of difficulty of implementation (2.3). It means that in general in practice the universities with a defined IT budget are considered important in ITG. As mentioned earlier, the effectiveness of each mechanism is based on the mechanisms that universities have implemented. Thus, the average this represents is significant in accordance with the diversity of the university. Therefore, to promote better IT in the university as well as developing strategic projects that affects the activities of teaching and learning is crucial to have as well as IT budget control and reporting.

IT Project Governance/Methodologies Management

The process mechanism "IT Project governance/methodologies management" displayed a frequency of five by the interviewed among ten possible choices. It shows that it is an important mechanism to compose the ITG baseline. Table 70 shows the interview quotes.

Table 65. IT Project governance/methodologies management (Quotes from interviewees)

University	Quotes from interviews
1	*We use **Prince 2, it** is the effective **standard in the Netherlands**.*
2	***Prince** is the project management methodology used.*
3	We use the **software Readmine** but it is not specific for Project management, it is just for tracking. It is simple to use. A **tool for Project management must be simple to register the tasks**. Since a project management tool makes it difficult to keep a project's status up to date, it is not a good tool. Microsoft Project is simple to keep up to date, it is a good tool
6	We are following the **PMBOK** guide for **project management.**
8	(...)We are at a level of maturity in project management in the institution. We have a **project management position within the IT department**. We have people certified in **PMBOK.** We use PMBOK as a reference for project management. We also use Scrum. We try to get pieces of each methodology, not just following one. (...)We have adopted **Microsoft EPM, Enterprise Project Management**. It's the Enterprise project. The project is used locally on the machine and uploads to a repository. And there we manage the resources, the project is very interesting. The project is very interesting but it starts to have a lot of limitations when you get to have many projects with shared resources which is our case. We play a dozen projects in parallel in a team of 40 people. So, I have an employee who is working on three projects at the same time. But the culture of the company forces us to work like that, and the project begins to leave a lot to be desired when you have a project portfolio that shares many resources, and the **EPM for being the enterprise of the project gives us this usability**. There are many reports to the sponsor to analyse the projects. Microsoft Project is a simple tool to use in project management. The control of acquisitions, budget, and all areas of the PMBOK are managed there.
9	(...) I like to follow a methodology for project management. These best practices are already consolidated in the organisations and its guides. However, it is necessary to have a level of maturity in the organisation to implement the methodologies and best practices. I need to have a base for it to be possible to implement a methodology. After this, I can implement any kind of methodology.

Table 66 provides information of this analysis about quotes from the interviews.

Table 66. IT project governance/methodologies management (Coding)

Category	Sub-Category	Codes
Process	IT project governance/methodologies management	Dutch universities adopt PRINCE for project management; Brazil and Portugal prefer to follow PMBOK; Methodologies are guides not the solution for project management; Software for project management should be simple and easy to use; the software Readmine and Microsoft Project Enterprise are used to manage several projects in the institution

Findings in the interviews reveal that PRINCE is a standard for project management in Dutch universities. On the other hand, the universities in Brazil and Portugal prefer to follow PMBOK. However, there is a consensus that the universities need to work with the culture of project management, the methodology is just a known guide to structure and help to implement the best practices in project management. Also, a

tool for project management is seen as essential in tracking the projects as well as controlling the budget and tasks. As stressed by the interviewed, a tool for project management needs to be simple to use and to insert the information. University three has adopted the software Readmine and the software Microsoft Project. The software, Microsoft Project Enterprise is also referred to by two universities as an interesting tool for project management. University eight which has a high level of maturity in project management adopts Microsoft Enterprise Project Management, such a tool has helped the institution. This university has managed several projects at institutional level with this software where it is possible to control many processes in accordance with PMBOK inside this project. Thus, from our point of view, this software can be an alternative for universities to manage projects once the universities have an agreement with Microsoft. Furthermore, the software can be used for all of the university to manage all types of projects, not only IT. Therefore, in accordance with the findings, project management is an interesting mechanism for universities.

3.3.3 Relational Mechanisms

The last mechanisms analysed and discussed are relational mechanisms. Due to the lack of details and in-depth qualitative information some mechanisms are analysed together. Such analysis is also due to the mechanisms which have a similar function in the context of universities.

Cross-functional business/IT job rotation and co-location business/IT co-location

The two relational mechanisms cross-functional business/IT job rotation and Co-location business/IT collocation are analysed together. Such mechanisms in universities have a similar function. The cross-functional mechanism is the IT staff working in the faculties or other departments at the university as well as the business staff working on IT. Co-location is the IT and business staff working closely with each other physically. Table 67 presents the quotes from the interviews.

Table 67. Cross-functional business/IT job rotation and Co-location business/IT co-location (Quotes from the interviewees)

University	Quotes from interviews
3	Now, **job rotation is not effective because the IT technicians working in the faculties have few interactions with IT.** They **report directly to the faculty director who is not an IT member of staff**, it is a **problem.** However, it is really important to have the IT staff working in the faculty. They solve daily problems. From my point of view, it is important to implement a support centre in the faculties. For instance, we intend to implement Libre Office as a stander software to document editing. We need to have a support centre for the IT technician to give training to the professors and administrative staff. IT people allocated in faculties should connect with IT and assist the strategic process, not only to solve incidents (e.g. Facebook is not available, connect the projector cable, among others).
6	It is more **difficult to manage a team when you have people working in different locations**, even when it is to create teams, and working methods, it is more difficult to implement. IT employees are IT employees, they are IT resources and they are not allocated in other departments. The **effectiveness of job rotation would be much smaller**, and it is very simple to put in place, it has to do with team energy if I have a person in a place alone to support what goes, the experience that will have, will be smaller, than you are in 3 people, one next to the other, there was a problem with a colleague and it will be easier to notice. It's not very important. IT staff are exclusively in IT. I do not think that's important.
7	It is important to share experiences with other centres to get to know other ways of working, I do not know how these experiences can be made, it may be an email, but sharing experiences is very important. Because of them working in other centres, in our case this does not happen, the professional ends up almost not being in our area. They end up not being our employee. They **respond to the centres and often the centre is not a technical person and it is not at all effective to have these people working** alone, then there is no passing of knowledge, we are always facing the same things about new employees and even when changing their coordinators, and the way their work changes.
9	(...) **IT in other areas, areas feel invaded.** There is a bit of protectionism among the sectors, it is not so simple.

Table 68 provides information of this analysis about quotes from the interviews.

Table 68. Cross-functional business/IT job rotation and Co-location Business/IT collocation (Coding)

Category	Sub-Category	Codes
Relational Mechanisms	Job-rotation	It is not effective; few interactions with central IT; IT staff work in the faculties only solve daily problems; the most important is the interaction; IT staff go directly to the faculty director who is not an IT member of staff; IT staff working in isolated environments is not effective; the most important is to share experiences and with faculties knowing different work methods. IT staff working so far in IT is not effective.
	Co-location business/IT collocation	

Job rotation received a low score of effectiveness, 1.3 and a high score of difficult of implementation, 3.5. -location received a score to effectiveness of 2.9 and a high score of difficult of implementation of 2.5. It means that in the context of universities both mechanisms are not effective and difficult to implement. Indeed, co-location was viewed once in the choice process of the ten most important mechanisms.

Findings in the interviews revealed that both mechanisms do not seem as effective in universities. IT staff working in faculties are usually isolated without the agreement of the central IT department. Moreover, as argued such IT staff work and report directly to the faculty director, not an IT representative. Even though, these people are essential for the faculties to solve daily and operational problems, the central IT

department is not effective with difficulty and few interactions. Another finding, perceived by one university is that IT staff have been working so far in the central IT hub to create a difficulty in the interaction and synergy with the working group. As noted, what's important is to share experiences with other faculties and to know the ways of working towards a common objective in the university. Thus, in accordance with the results identified in the exploratory case, they do not seem as important to compose as the ITG baseline.

Cross-functional business/IT training

The relational mechanism "Cross-training" received an average score of effectiveness of 3.0 and a score of difficulty of implementation of 2.3. This mechanism was selected as important to compose the ITG baseline in only one interview among ten interviews. However, during the interview transcripts, a lot of qualitative information was identified regarding this mechanism. Table 69 shows the quotes from the interviews.

Table 69. Cross-functional business/IT training (Quotes from the interviewees)

University	Quotes from interviews
1	*The employees **are frequently in training**. The **portal** (...) provides a lot of courses in many areas for employees' qualifications as well as to students.*
4	*Nowadays, we have a need for **training**, because we have this reality with decentralised units with a technician without any support, we need to improve their operational vision, a more tactical view, management knowledge for this employee and also, technical knowledge to operate. The training gets an extremely highlight.*
6	It is easy to have training, if you have the budget. Here the **identification of needs** is constructed and the training and measurement are created. An annual training plan is made to understand what the training path each person wants to go through and that is the **training plan.**
8	Currently, the training is **based on demand.** A new person arrives on the team, and we identify which kind of training she/he needs. I think it is **important to have a plan for training, especially for new technologies**, it is mandatory to create a training plan for all of the team. I intend to **create a training plan** this **identifies the need of each emplo**yee. Thus, after this survey to elaborate a plan.
9	The university pays the course. To this day I've never been denied this kind of help, the area of systems support, is an area you're waking up to now, but now that you've understood what ITIL stands for, and how they act as service management, now we'll start with the support area to qualify. **The area of infrastructure is a more difficult area, it is where most people are self-taught, and they do tests, they research, they learn for themselves, they are more self-taught, but it's** ... we brought the IPV6 course to them, because we participated in an event and brought the IPV6 so we brought the course for them to participate in, to trigger the implementation. **I have provoked them to attend conferences.** But then you realise the needs, the area of infrastructure today, is the area that has the least acting at this level, because the agent leaves. What is my perception if we leave the area? Stay only in accordance with the courses of your interest, or doing only the training, what is in your interest so we risk being the same and do not evolve so I see that it has to be mixed. That's what the development team has, done, **participate in an event, open your mind, see other possibilities and for specific courses not only the training of what it understands as need to implement.**

Table 70 provides information of this analysis about quotes from the interviews.

Table 70. Cross-functional business/IT training (Coding)

Category	Sub-Category	Codes
Relational mechanism	Cross-functional business/IT training	Distance courses; virtual courses; portal for courses for all employees at the university; training plan; IT is self-educated on IT topics; necessity of strategic and process training; attending conferences and seminars to have a different perspective on IT in education and a holistic vision.

Even though the training was selected by one university to compose the ITG baseline, findings in the qualitative data in the interviews reveal that training a program and a continuous plan for training is crucial for IT employees in universities. Indeed, the results show that it's more important to have training in a specific technology than to have a continuous program and training. Thus, as noted a good option to have more spread is to adopt a portal for training and create e-learning courses not just for IT employees but for all stakeholders in the universities.

As noted IT employees are self-educated in technical areas such as infrastructure, networking, and operational systems. Employees create a laboratory for tests and experiments of solutions for software, network equipment or recent technology. Thus, there is a need for training focused on management and strategic issues regarding the context of higher education. Once having more knowledge about the process with a different perspective and a holistic view of the university, it is easier to improve the process using technical knowledge. Thus, to promote courses and training for IT staff as well as other areas in universities, it is an interesting mechanism to compose the ITG Baseline.

Partnership rewards and incentives

Table 71 shows the quotes regarding the mechanism partnership reward and incentives. This mechanism was not cited by the interviewed and also had a low efficiency and level of implementation.

Table 71. Partnership rewards and incentives (Quotes from interviewees)

University	Quotes from interviews
3	Promotions, rewards and incentives are **forbidden**. We are a **public organisation,** it is **not easy to implement.**
4	Incentives are **limited.** We would like to consider the incentives, but it is not possible due as the organisation has **public control.** The rewards and incentives does have in particular on IT in our university.
6	The financial incentives are **forbidden by national law.** Due to the **law and rules,** we can't do it. As all occupations, people want to have a reward. But, the law does not allow us to give it. We **don't have opportunities for promotions in all careers**, they have been frozen at national level for years. It is not a problem in this university but at national level.
8	The incentives are some compliments and encourage continuing to do a good job.

Table 72 provides information of this analysis about quotes from interviews.

Table 72. Cross-functional business/IT training (Coding)

Category	Sub-Category	Codes
Relational mechanism	Partnership rewards and incentives	Few rewards; not allowed to implement in public universities due to the laws; no promotions or opportunities in public universities; limited possibility of growing.

A practice such as "partnership rewards and incentives" was not cited. Regarding this practice, it would be interesting to understand the program of rewards and incentives for employees. In public higher education institutions, due to legislation, it is more difficult to make use of financial rewards. The difficulty of implementation especially financial rewards is due to legislation and laws in most of countries and universities. Therefore, this mechanism is not included and considered important to compose the baseline.

Share Knowledge (on ITG)

The relational mechanism "Knowledge management (on ITG)" was viewed in nine of the ten universities. It shows that the mechanism shares knowledge (on ITG) which is crucial to compose an ITG baseline in the universities. Moreover, the average score of effectiveness received is 3.7, which means that it is an effective mechanism if implemented. The ease of implementation received a score of 1.0 where 0 represents that a mechanism is very easy to implement. Table 73 shows the quotes from the interviews.

Table 73. Knowledge management (on ITG) (Quotes from the interviewees)

University	Quotes from interviews
3	(...)We have a **services portal** in (...) there is everything about IT services from the information of (...) tutorials, manuals for both students and teachers.
7	(...)A **portal is important, for people to know the services provided by the university.**
8	(...)" We have **many portals**. We have wikis for the internal team, each team have their own wiki to share knowledge. There is a tool called One Note to register daily activities. We use the intranet on Microsoft Share Point. It is difficult to find out the information. The **information must be centralised**, and frequently updated.
9	"(...) All documents are stored on Google Drive such as the responsibilities, plan, among others. **A portal is interesting for the academic community.**

Table 74 provides information of this analysis about quotes from the interviews.

Table 74. Knowledge management (on ITG) (Coding)

Category	Sub-Category	Codes
Relational mechanism	Knowledge management (on ITG)	Share knowledge on intranet and portals; important to the community to know about the services; many tools used such as intranet; it is better to centralise the information in a unique place;

As you can see from the findings, the quotes in the qualitative interviews are in line with the choice of this mechanism as well as the score received. Findings reveal that the shared knowledge on ITG should be in line with all of the academic community and with other courses.

As you can see universities have adopted different types of systems and solutions to store and share knowledge regarding the task, frameworks and responsibilities. Some examples are portals to publish the services for IT employees and the academic community. Other tools also used include Google Drive, wikis, Microsoft Share Point and other Microsoft Solutions. As mentioned by interviewee number six, to have many portals, wikis to share and to store information is not effective in practice due to the difficulty in finding out where the information is. As a recommendation, to share knowledge on IT at university to have one unique portal software to centralise the information is more suitable. The results show that to centralise the information is better for management and to search for information.

Thus, in accordance with the results, to share knowledge internally on ITG at university as well as to the academic community is an important mechanism to compose the ITG baseline.

Informal Meetings

The informal meeting mechanism received a high score of average of 4.0 and a low score of difficulty of 0.9 which means that it is easy to implement in the practice of this mechanism. Table 75 shows the quotes from the interviews.

Table 75. Informal Meetings (Quotes from interviewees)

University	Quotes from interviews
3	Much things are **based on the informal meeting** that sometimes **does not have positive results** for the subjects in the long term.
6	The informal meeting is very productive for **IT internal issues**. We frequently have informal talks which are easy to implement.
8	I think informal meetings are **very interesting**. However, to make a more **relevant decision, it is not through this instrument of informal meetings**, but our day to day, we take tens, hundreds, thousands of decisions that are decisions that say that less impact, and that we need a matter of proximity to keep the team sharing knowledge, united, we did yes, quite informal contacts. We **go out sometimes**, we go out to a **bar on campus here to talk about work, have a coffee, which is to stimulate this conviviality**. I do all the work of interacting with the user, where IT works, where IT can help, this I do very often.

Table 76 provides information of this analysis about quotes from the interviews.

Table 76. Informal Meetings (Coding)

Category	Sub-Category	Codes
Relational mechanism	Informal Meetings	Solve only daily problems; not very effective in the long term; many things are informal; easy to implement; productive for insights and to integrate the team; not effective or useful for relevant and shocking decisions

As you can see in the table above, the findings reveal that informal meetings are effective only to discuss daily and immediate IT issues. Many issues in universities are based on information meetings that for the long term are not effective.

IT Leadership

Even though the IT leadership mechanisms were indicated in only one university to compose the ITG baseline, it is quite obvious that the interviewed recognised the importance of an IT leader at the institution. Table 77 shows the quotes from the interviews.

Table 77. IT leadership (Quotes from the interviewees)

University	Quotes from interviews
3	It is **important to have leadership in the IT department**. However, sometimes it depends on university management and who is in this position.
4	From my point of view, it is **essential to have a person as a leader that pushes and motivates your team.**

Table 78 provides information of this analysis about quotes from the interviews.

Table 78. Analysis from the Interviews - IT leadership

Category	Sub-Category	Codes
Relational mechanism	IT Leadership	It depends on the person that is in the position; a leader to motivate people is important;

All types of organisations need IT leadership in the IT department. From our point of view, IT leadership in the case of universities should be via the Chief Information Officer or the person with a higher position in IT in the university. The relational mechanism "IT leadership" scored an average of 1.3 for effectiveness and a high score of difficulty of implementation, 3.5. It means that, currently the accordance with these universities is not an effective mechanism for universities and also difficulty to implement. Despite of the IT leadership as indicated by only one university as the ten most important mechanisms to compose ITG, it is quite clear that leadership is important for ITG in universities. The choice may be based on the fact that leadership depends on personal and intrinsic skills as well as the position.

Office CIO /ITG

The relational mechanism office CIO/ ITG had a frequency of three in the universities in the exploratory study. Moreover, regarding the effectiveness, the average score is 4.1 out of 5. It means that it is an effective mechanism for universities. Table 79 shows the quotes from the interviews.

Table 79. Office CIO / ITG (Quotes from the interviewees)

University	Quotes from interviews
3	Yes. We have an office CIO. The CIO is (...) he/she reports directly to the rector.
4	I think it is **important to have an ITG function** at the university and a CIO.

Table 80 provides information of this analysis about quotes from the interviews.

Table 80. Office CIO / ITG (Coding)

Category	Sub-Category	Codes
Relational Mechanism	Office CIO /ITG	Important to have a formal ITG function; CIO function-

The findings reveal that in a university, it is important to have a formal function for the CIO or ITG. A formal function helps to identify the need and also to promote ITG in the university. Therefore, a recognised office for the CIO or the decision maker in IT is an important mechanism to compose the ITG baseline at the institution.

Engagement between IT and the academic area

An interesting mechanism that emerged from the qualitative analysis that we are proposing is named "Engagement between the IT and academic area". Such evidence shows that this mechanism is useful as well as effective and important for effective ITG as presented in quotes in Table 81.

Table 81. Engagement between IT and the Academic area (Quotes from the interviewees)

University	Quotes from interviews
2	(...) we have a **strong relationship with other departments** (...) s**earching knowledge and always helping when necessary**. For instance, in a new project, analysis of the adoption of new technology, **faculties assist the IT department in the process of selection**. It is essential because IT at the institution should be **not only be a support unit but a function that must interact with all areas of the organisation**. The **theoretical knowledge from the faculties** assist the IT department in better **decision making** in the processes.
8	We have some initiatives with schools and academic departments, for **application development and solutions.** But the timing of the academy is not the same as ours. **We gave the professors some projects**, and they were developed internally. Some example is an application like waze for students to **navigate within the university** and find a cash machine. I'm in building 11 and I want to go to the library, it maps the paths inside the campus, which is where Google does not enter, it maps the paths inside the campus and takes you to the library. Ah, I need to withdraw some money, where do I have an ATM from the Brazilian bank, ah you have an ATM from the bank of Brazil in the other building, and it takes you there**. This was a student research project that set up Engine,** we found it interesting and we hired the student to give the application another body of production application for the project he had done. This was a fluke, talking to a professor about IT's need for computer science, from that conversation came the opportunity. There I am narrowing more and more, I am going there, I am talking, I am helping (...) There **are research projects to count vehicles, and solutions for parking**. And we have helped in the infrastructure. And these are very punctual initiatives, there is no governance process behind them. Today we have an application, for students that are very stressed when they get very anxious on the day of a test until the grade is administered, and our application receives a push, it shows, so this follows us in social networks and it is quite interesting the positive manifestation, I received the SMS of the grades, the note push, then it enters the application and checks the note. We have an interesting action roadmap in the application. The application can look at the vacancies that are available in the parking lot. We have not yet been able to take the student to the vacancy, this project is still in progress with the college. On taking the student to the vacancy that is available, other information that is available is that there are 30 spaces free.

Table 82 provides information of this analysis about quotes from the interviews.

Table 82. Engagement between IT and the Academic Area (Coding)

Category	Sub-Category	Codes
Relational Mechanism	Engagement between IT and the Academia Area	Relationship with academia; engagement with computer science, engineering courses; purposing IT problems in reality to be solved by students; solutions from students for the IT department; integration among the researchers with faculties.

The results show that real problems are being brought from IT to be studied by the staff of courses and universities, examples including information systems, management, among others. It is important to have engagement between IT and business, in this case with academia. As noted by the IT department, it has a need to solve an internal problem in the university. An alternative was to contact the professor in the engineering school to propose this problem to be solved internally in the classroom or to be a topic in a dissertation or thesis. These interesting initiatives have been developing partnership with the schools. One interesting example is the software developed like "Waze" to help the academic community to navigate inside the campus and search around for places such as a cash machine, restaurants, and buildings, among others. Another example, is the solution developed to control the parking in the

university. Such examples show that the integration and engagement with academia is productive and has several benefits for IT as well as the university.

Moreover, another project mentioned that has been developed is about face recognition that is a need for the university and the CIO suggests to develop it in partnership with the researchers/professors from an engineering school. It shows the applicability and relevance of the theoretical knowledge from academia to solve a real IT problem inside the university. In addition, students have all the support for tests and experiments doing a case study to solve a real necessity.

As mentioned, the timing of academia is different than the time of requests of the university. However, this partnership with academia is a good starting point to develop wide projects and to create a culture of integration with the schools. Thus, this mechanism is crucial for ITG in the universities.

Knowledge Sharing Among Universities

Another suggested mechanism is the knowledge sharing among universities. This mechanism is essential in having good ITG in universities. This mechanism enables universities to share crucial information on several topics (i.e. management, courses, etc.). However, this mechanism has a limitation that was highlighted by the interviewees. Such a mechanism can only be implemented among universities managed by a common entity like most public universities. The application of these mechanisms among public and private universities do not seem to be a future reality since they are competitors. The interviewees argued that the sharing of information between public and private universities in practice is not common due to the market competition to recruit students. Therefore, an association where the universities share knowledge and resources regarding ITG can bring many benefits for cost reduction, for example, in software acquisition, sharing courses and training. The universities share similar facilities and solutions such as infrastructure, systems, and laboratories.

For instance, some scale economy could be applied in new software acquisition when purchased in quantity for all universities rather than individually. To summarise, the implementation of this mechanism would not be easy given the universities' context (i.e. financial autonomy), but the centralisation of some common aspects could be very effective and useful in practice. Another suggested mechanism is knowledge sharing among universities. Table 83 shows the quotes from the interviews in other universities.

Table 83. Knowledge sharing among universities (Quotes from the interviewees)

University	Quotes from the interviews
1	*(...) Netherlands has an organisation called "SURF" In this organisation we share a body of knowledge. SURF is a portal where all Dutch universities are members of this organisation.* ***We share operations, IT, special IT also security, real life practices, and we test all procedures.*** *SURF provides an exchange in universities. When I started here. I saw. (...) one interesting course in Enschede, another in Rotterdam.*
2	(...) relationship with other departments searching knowledge and always helping when necessary. For instance, in a new project, analysis of the adoption of a new technology, the faculty assists the IT department in the process of selection. It is essential because IT at the institution should be not only be a support unit but a function that must interact with all areas of the organisation. The theoretical knowledge from the faculty assists the IT department in better decision making in the process. (...) **shares information** with other **universities from the Netherlands,** the main method used is the e-mail. This **interaction with other universities is important because there are projects discussed and solutions to be adopted. It is an appropriate environment to share information with the CIO and managers**. This **exchange is considered the success factor** in IT. SURF is an example of a portal to share information between Dutch universities.
3	(...)The shared knowledge between universities is **really important** and we do not have this. There is no interaction between the universities to know what everyone is doing, developing or implementing. We could together bargain better prices for software at national level, for example Adobe, Microsoft. In doing this, we **can save money** and reduce costs. In fact, this interaction among universities is lacking in Brazil.
5	*"To share knowledge on courses, training is important in IT governance to be strong at university. Moreover, it improves the level of IT as well as the IT quality at university. Because the* ***private sector is our competitor*** *(...) Not specifically, but It's not usual to share information about IT with them (...) by* ***sharing information with other institutions we would be promoting training and*** *reducing costs and in the case of software development. We have an association with all public universities. You can access the website which is iucc.ac.il. It is a strong organisation where they negotiate with Microsoft and other industries"*
6	We have an entity called FCCN, Foundation for National Scientific Computing. www.ffcn.pt every year they create an event called FFCN da where the topics of network, security, best practices are addressed. We are together for these 3 days to discuss various topics from wireless to multimedia among all universities in Portugal. It is **fundamental.** It's the **same business case, everyone has students, teachers, non-docents and problems.** The VoIP system is exactly that and arises from FFCN, practices. etc. The last one was at the University of Algarve. That's basically it. There's an agenda. There are meetings and workshops about **campuses best practices.** It has a **great positive impact**, because all directors are together, we **exchange contacts**, we **know each other, problems are discussed and how to solved them. W**e have a list among all members and exchange information, about **problems and solutions.**
8	(...) We have here some **working groups with other universities**. Then I participate in two groups, one is only for university, the other is a group with several verticals, industry, commerce, services. (...) we **exchange a lot of information,** share and are always looking for what other institutions are adopting as novelty. We exchange information via email, WhatsApp, face-to-face meetings. The sharing of this information, knowledge **I would not do through a portal**. We respect others a lot, and don't want, **competitors,** and I did not want to use that word. So, we're always linear so I'm going to talk about a technology. I'm taking at university for the IT guy from the other university, to what extent that to me is strategic or not. So, we do this measure, sometimes we talk a little, we do not talk everything. So, it has to be a little, a lot this dosage has to be measured. So, putting on a portal is too honesty. Among universities, universities are. We have a group that is not just IT, universities are part of it, a group that is a community of universities and non-profit universities, and it's in this group that I participate in**. The issue of sharing becomes easier in federal public universities.** I have exchanged interesting experiences, we in IT help ourselves, we end up making friends and we help each other. **IT managers at these universities end up creating a close relationship,** but we understand that I am the IT manager, university x and university y, are two very competitive institutions and we have to respect that, and we respect each other. (...) Now I'll give you an interesting example, **Adobe, which is something interesting, which is a fairly expensive contract**, **we negotiated with Adobe, through this body that congregates community universities**. We **bought it for all the universities that are part of this group, which are 15 universities**, here in the (...). This was the acme of our group, so far, it was this unusual purchase of Adobe,

University	Quotes from the interviews
	until then it had been more only **exchange of experiences, best practices**, what to do in a certain situation
9	The people after a lot of fighting, got ... I do not know if you know it in the (...), then it is association of the **private institutions** right, and you still have the (...) together. This association was able to create the IT chamber, and we met again, meeting every 2 months, and the agent started now in December which is very recent, making this **sharing, cases of conference institutions, independent of the tool** , we will start doing this, then this will help a lot, so we created a document, a virtualised space was created for us, a repository of files, the agent created an inventory document, in an Excel spreadsheet to have this level of knowledge, if you do not have a WhatsApp group, I have a WhatsApp group of CIOS in Brazilian education. (...) And a CIOS of (...), the IT camera. This is **very effective,** I left, when I came back from TI, I was away four years ago ... to have a notion, I was so far from the area that I did not even know how to set up a computer to buy, which was on the market. Which is the best computer, which is the best configuration. (...) so I called a lot of people to find out. I picked up the phone... I made some phone calls, no one knew who I was, but there were a lot of people that answered me. So, I contacted people on the site. I sent the emails and I asked myself what was being used. From that moment I started attending most of the events. They are promoted by enterprise IT managers. So, I now have a lot of people to keep in touch with to **exchange information** about the solutions. What do you use here for this, what do you use it for? So, I value it a lot, I give it high importance. We suggested that it be done, some experience similar to (...) our first experience to buy a data analysis tool in the beginning but it was a first experience, but the idea is from 2018 to start implementing this. "
10	(...) To share knowledge with universities is **very important**. Regarding the infrastructure, there are some conferences in Spain. For public universities, it is called **REDIRIS** for network and infrastructure. For management, it is called CRUE. We are members of CRUE. We have a **group among** the universities. When a problem emerges, we **exchange e-mails to share the solution**. We **share a lot of information.** A problem can arise with any application, or system within a university, and all others will respond to this problem (...) both universities and technology centres also inside. In this sense, there is **optimisation of human resources solving problems**. There is an annual meeting. All the universities are there, public, yes. Here we can **describe the knowledge** about it every year from many universities.

Table 84 Summary of the codes after the quotes analysis from the interviews.

Table 84. Knowledge sharing among universities (Coding)

Category	Sub-Category	Codes
Relational Mechanism	Knowledge sharing among universities	Share knowledge among universities in Spain in organisations, CRUE and REDIRIS; Portugal, FCCN; The Netherlands, SURF; share operations; security; real life practices; courses; exchange; share knowledge among universities by email;

It was concluded that this mechanism is essential to have good ITG in universities. This mechanism enables universities to share crucial information on several topics (i.e. management, courses, etc.). However, this mechanism has a limitation that was highlighted by the interviewees. Such mechanisms can only be implemented among universities managed by a common entity like most public universities. The application of these mechanisms among public and private universities does not seem to be a future reality since they are competitors.

The interviewees argued that the sharing of information between public and private universities in practice is not common due to the market competition to recruit students. Therefore, an association where the

universities share knowledge and resources regarding ITG can bring many benefits for cost reduction, for example, in software acquisition, sharing courses and training. The universities share similar facilities and solutions such as infrastructure, systems, and laboratories. For instance, some scale economy could be applied in new software acquisition when purchased in quantity for all universities rather than individually. To summarise, we are convinced that the implementation of this mechanism would not be easy given the universities' context (i.e. financial autonomy), but the centralisation of some common aspects could be very effective and useful in practice.

Partnership between university and software industry

Another suggested mechanism was the "partnership between university and software industry". The content analysis was also identified using the NVIVO software evidence from other interviews. Table 85 shows quotes from the interviews in other universities.

Table 85. Partnership between university and the software industry (Quotes from the interviewees)

University	Quotes from the interviews
5	*(...) "A **partnership and agreements among the university** with the software industry to create a solution for education for software licensing (e.g. Microsoft program, IBM among others) could be applied to other industries to provide a range of technologies to students, academics and administrative staff to test and use. In an open environment that is in universities, it is important to provide a range of technologies"*
8	(...) Nowadays, we intend to solve the problem with the lowest cost. So, open source for us, is the first choice. But we have something in the cloud (...) we use Microsoft office 365, so we do not have that internal mail server anymore here at the university, it's all in the cloud (...) Now we migrated all mail servers from office 365 and now in 2017 release **OneDrive too, because a lot of researchers and teachers are ordering a lot of disk area, more area, and for file sharing and everything, this sees us using passive storage, backup, and so putting that on the cloud disgusts me enough. Microsoft** guarantees the availability of the data. There is an administrative interface in IT that has tools for OneDrive data recovery. However, there is always that concern that our emails and data are hosted outside of the university, outsourced. But, ok, it is free and it is working well (...) That is big news, and I think this is worldwide, which institution and teaching does not pay, is free. It is a **Microsoft program**, **Google** is also not too behind, and Apple shortly. This issue of **educational technologies is a strategy**. For strategic reasons, they offer these free education services (...)
9	We use **Google service**s for email, storage. It reduced so much of the costs with **IT infrastructure.**

Table 86 summarises the codes after the quotes analysis from the interviews.

Table 86. Partnership between university and software industry (Coding)

Category	Sub-Category	Codes
Relational Mechanism	Partnership between the university and software industry	Cost reduction with the adoption of Google Services; Adoption of One Drive Microsoft; Cost reduction; Alternative solutions; Other companies like Apple; Free solution for universities.

The 'Partnership' mechanism between the software industry and universities is essential for a complex and open-minded environment to develop new ideas, create knowledge and propose solutions to complex problems. Students and teachers need to test and know a variety of IT solutions. At universities, the IT department is responsible for providing the infrastructure with laboratories and software to meet the teaching-learning requirements.

However, many universities face severe financial restrictions in spending money with new software acquisition. To promote new software alternatives and provide a larger range of technologies to students and professors, a partnership with the software industry may be essential. In fact, several organisations have educational programs specific to universities such as Microsoft, IBM, Google and DELL aiming to deliver IT systems. Moreover, this partnership can bring many other advantages for universities such as cost reduction in software, material for training, support, and knowledge for students and professors. Thus, the partnership between university and the software industry is an essential mechanism to compose the ITG baseline in universities.

This chapter analysed the IT governance mechanisms in multiple case studies in ten universities from five countries. Chapter 4 presents the design and developing proposal of a baseline.

4. DESIGN AND DEVELOPMENT: PROPOSAL OF A BASELINE

This chapter presents the steps for developing a baseline of IT governance mechanisms for universities. As stated in the literature review, the actual model proposed for ITG in universities is developed in a specific context according to culture, size and roles, and the politics of a country. The aim of this artefact is to propose the most suitable and essential mechanisms for universities that can be useful for all types of university, regardless of culture, size and others contingency factors.

To achieve this endeavour, paying attention to the ITG mechanisms that universities have implemented using the contingency factors to identify and classify these mechanisms is necessary. Therefore, an extensive literature review was conducted analysing case studies. Moreover, the studies on ITG in universities are scarce and do not have a holistic approach covering the software and tools that universities have been using.

After an extensive literature review, a list of 46 IT governance mechanisms were identified. The ITG mechanisms can be different according to the organisation's expectations and benefits when implemented in a particular context (De Haes and Van Grembergen 2008b; Huang et al. 2010; Lunardi et al. 2014b; Pereira et al. 2014a; Peterson 2001; Sambamurthy and Zmud 1999). The endeavour is to identify the appropriate ITG mechanisms for universities. In order to do this, the next section presents the integration of ITG mechanisms from the literature review with the exploratory case study.

4.1 Integration of IT Governance Mechanisms

The ITG mechanisms baseline are developed with the integration of the effectiveness of ITG mechanisms identified in the literature review (Section 2.5) as well as the effectiveness of mechanisms in the single case study in ten different analysis units in five different countries. The objective of DSR is in the integration of different constructors. Therefore, ITG effectiveness mechanisms identified in 34 case studies in the literature review were integrated (Section 2.5) with the mechanisms in the exploratory case study with ten different analysis units in five different countries (Section 3.3).

As a result, a baseline with suitable ITG mechanisms for universities was proposed. The ITG mechanisms identified in the literature in 34 case studies were a good starting point based on the empirical results

from other universities. In addition, the exploratory case study complemented the ITG mechanisms in the literature adding new mechanisms to the specific context.

Table 87 shows the frequency of ITG structure mechanisms identified in these case studies and the frequency of their implementation in the literature review. The column "Frequency Case Studies" represents the frequency of choice of the ten most important mechanisms in these case studies chosen by the interviewees. Another column "Frequency Literature Review" represents the frequency of their implementation in the literature review. Table 87 show the frequency regarding the structure mechanisms (Literature Review vs. This Study).

Table 87. Structure Mechanisms Frequency (Literature Review vs. Case Studies)

Structure Mechanisms	**Frequency in Literature Review**	**Frequency in Case Studies**
IT strategy committee	14	8
IT organisation structure	18	5
ITG function / officer	5	4
Business/IT relationship managers	2	4
IT steering committees / councils	14	3
Roles & Responsibilities	11	2
Security / compliance / risk officer	2	1
Architecture steering committee	3	1
IT audit committee	1	-
IT project steering committee	2	-
CIO on executive committee	7	-
CIO reporting to CEO/COO	5	-
IT security steering committee	2	-
IT councils	3	-
IT leadership councils	1	-
IT investment committee	4	-
IT expertise at level of board	3	-
Business Process Management Office	-	Mechanism Suggested

During the selection process to develop the ITG baseline, some difficult decisions needed to be made. After reading the concept of some mechanisms several times, it was decided to join some mechanisms that in the literature review as well in the exploratory case study had an indication of similar meaning or function in practice. It is important to emphasise that such union of these mechanisms was not performed before the data collection due to the reason of maintaining the initial concept of the mechanisms to be possible to buy with studies of other industry. However, regarding the proposal of the artefact itself, as it is something particular for a given context, such a union of mechanisms was deemed necessary. In

addition, the purpose of the DSR is a simple artefact, so this union of mechanisms also had this purpose. Table 88 presents the mechanisms merged with a similar meaning to one with a global definition.

Table 88. Merging Structure Mechanisms

Structure Mechanisms	Frequency in Case Studies	Frequency in Literature Review	New Suggested / Merged Mechanism
IT steering committee	3	14	IT Steering Committees / Councils
Architecture steering committee	1	3	
IT audit committee	-	1	
IT security steering committee	-	2	
IT investment committee	-	4	
IT councils	-	3	
IT leadership councils	-	1	
Project governance / management methodologies	5	6	Project Management Office
IT project steering committee	-	2	

The structure mechanisms regarding the committees and councils were joined into a single mechanism encompassing such functions named "IT Steering Committees / Councils". The results of the exploratory case study show that a committee can have different functions or working groups, which in practice is more effective.

As presented in the previous sections, the objective is to triangulate the data coming from case studies in the literature review and in this study to have reliable data to compose the baseline. It is important to note that the mechanisms considered the meaning and interpretation of the quotes not just the frequency. The criterion for the mechanism to be considered for inclusion in the baseline is to have at least a higher frequency than two in these case studies and in the case studies from the literature review, as well as qualitative evidence that supports that these mechanisms are important. Therefore, it can be considered that the ITG baseline proposal took into account all these factors, in addition to the mechanisms suggested by the respondents identified in the case studies. Such mechanisms are presented in the last line.

Thus, after in-depth analysis of the results from the literature review and from multiple case studies, it was decided to consider the following mechanisms that exhibited a low frequency, however it was pointed out as essential. An example is the Security / compliance / risk officer framework mechanism that will be considered to compose the baseline. It is important to emphasise that the "Security / compliance / risk officer" and Cross-training structure mechanisms, although they did not have a high frequency in the

choice of the exploratory case study and the literature review, were decided to be included in the baseline. These were suggestions by the interviewees and suggestions from other studies where this was an important mechanism. The same process was performed with other mechanisms, for example, in the case of the mechanism "SLA" in which the results of the exploratory study show that SLA does not impact on ITG at universities. The effectiveness of SLA in universities is perceived as low. Moreover, the process mechanisms "SLA" is created to be achieved. If the defined time is not achieved in universities, it is not significant and does not impact on the institution. SLA is more so an internal instrument to control the employees and measure the quality of service provided.

Although, the CIO mechanism on executive committee was not chosen by the ten, the qualitative outcomes from interviews show that it is an important mechanism and should be part of a baseline. In addition, such a mechanism appeared in the analysis of the literature review that was implemented by seven universities. The IT expertise at board level exhibits a very similar concept, it is understood that having expertise at board level is essential. In addition, having the CIO who is the top representative on the executive committee is essential in selling IT in some way. Table 89 shows the frequency regarding the process mechanisms.

Table 89. Process Mechanisms' Frequency (Literature Review vs. Case Studies)

Process Mechanisms	Frequency in Literature Review	Frequency in Case Studies
Strategic information systems planning	12	8
Frameworks ITG	24	8
Project governance / management methodologies	6	5
IT budget control and reporting	11	4
Demand management	1	3
Portfolio management	7	3
IT performance measurement (BSC)	10	2
ITG assurance and self-assessment	1	2
Project Tracking	1	2
Service level agreements	-	1
Benefits management and reporting	3	1
Business/IT alignment model	6	-
Architectural Exception Process	1	-

Table 90 gives information regarding the relational mechanisms.

Table 90. Relational Mechanisms Frequency (Literature Review vs. Case Studies)

Relational Mechanisms	Frequency in Literature Review	Frequency in Case Studies
Knowledge Management (on ITG)	6	9
Office of CIO or ITG	4	3
Informal meeting	-	2
Corporate internal communication	4	2
Business/IT account management	-	2
Cross-training	5	1
IT governance awareness campaign	4	1
IT leadership	6	1
Co-location business/IT co-location	2	1
Shared understanding of business/IT objectives	11	1
Job-rotation	1	-
Senior management announcements	-	-
Partnership rewards and incentives	-	-

Furthermore, the name of some mechanisms were changed to a more appropriate definition to the context of universities

- "Roles & Responsibilities" will be adopted for the structure mechanism "Integration of governance/alignment tasks, the same designation adopted by Ko and Fink (2010) in the context of universities.

- "Training and Education" will be adopted for the relational mechanism Cross-training, as adopted by (Wilmore 2014) in the context of universities.

- "Corporate Communication" will be adopted for the relational mechanism "Corporate internal communication addressing IT on a regular basis".

Changing the designations of these mechanisms will allow for a clearer and easier understanding.

The suggested process mechanism "Dashboard" was merged with the process mechanism "Project tracking" which means to track individual projects with dashboards Dashboard is a more practical and common name to be used in practice.

Therefore, after this integration and merge, Figure 7 illustrates the IT Governance Mechanisms Baseline proposed for universities.

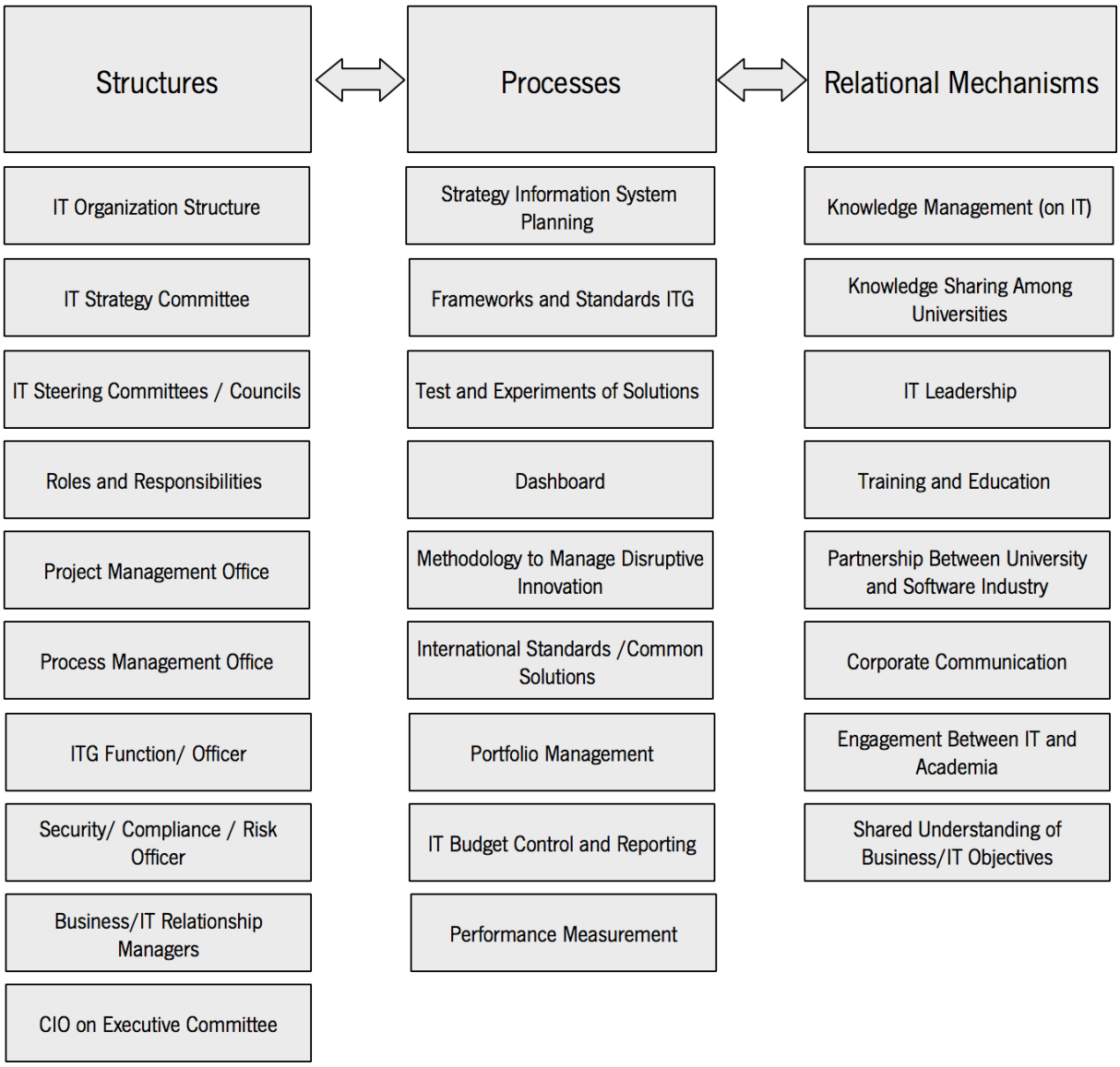

Figure 7. IT Governance Mechanisms Baseline

Our artefact is named "IT Governance Mechanisms Baseline" which is composed by ten mechanisms of Structures, nine of Processes and eight Relational Mechanisms illustrated at Figure 7. A holistic view of suitable IT governance mechanisms for universities can be seen in the Figure 7. Each of these mechanisms is presented and discussed according the literature review

4.2 IT Governance Mechanisms Baseline for Universities

This research demonstrated that the various models, frameworks and mechanisms for IT governance may not provide all that is necessary for IT governance at universities. Thus, a baseline model of ITG mechanisms was developed, in particular, in the context of universities as a solution to overcome these problems.

A list with 46 ITG identified mechanisms was started with in the literature review. These mechanisms may be considered generic to ITG across all types of industry. The study by Steven de Haes and Vam Grembergen (2008) proposed 33 IT governance mechanisms in the context of Belgian industries. The list of 46 mechanisms was used from the literature review and identified which of these have been implemented by the universities in 34 case studies as well as the importance and effectiveness and frequency of the implementation of each mechanism. In addition, new mechanisms suggested by practitioners were also identified to compose the baseline.

During the process of selecting ITG mechanisms to be included in the baseline, it was necessary to take in account the redundancy of mechanisms with the same meaning but different names.

This research aimed at identifying suitable ITG mechanisms for universities. Ten universities from five countries participated in this research. Interesting insights were collected from the interviews. It became clear that universities have specificities and challenges that shape the way management need to apply ITG to that context. Some new mechanisms were suggested by the interviewees to be added to the general ITG mechanisms' baseline (See Table 8) proposed by other studies. In addition, a definition for each new mechanism was also developed. New mechanisms suggested by the interviewees were checked against the literature. This process aimed to verify and see if other studies had not yet proposed a mechanism with a similar meaning. Figure 7 illustrated the IT Governance Baseline of mechanisms proposed for universities.

The "Baseline" is composed by ten mechanisms of Structures, nine of Processes and eight Relational Mechanisms. Each of these mechanisms is presented below as well as discussed with the literature review.

IT Organisation Structure

Some conclusions can be drawn from the ITG structure adopted by universities. The federal mode is the most adopted by large and extra-large universities. Due to the size of these universities with usually more than one campus, this structure becomes essential. On the other hand, the centralised structure is adopted by medium universities where the ITG infra-structure is central and do not have several campuses. An interesting finding is that any university adopts a totally decentralised structure. Moreover, the adoption of a centralised structure has some benefits such as economising on skills, economising on applications, cost reduction and standardisation.

The results in this study shows that universities with decentralised structures share the same problem with issues of high costs, a duplication of resources, a waste of resources, a difficulty in control and a difficulty in their relationship with the central IT. These findings are in consonance with the literature review identified by Hicks et al. (2012) in eight Australian universities. Furthermore, a decentralised model is not effective in practice due to the difficulty of standardisation and the relationship with other faculty areas.

It was confirmed that the centralised IT structure tends to be centralised rather than decentralised or federal. The federal structure is applicable mainly in universities with more than one campus where local IT is needed in the faculties to meet the demands. In practice, this model is not effective because the IT employees in the faculties do not report to the central IT. However, it is necessary to have IT support in faculties supporting all IT activities as well as a business relationship between IT and business. In the academic environment where there are several decentralised technologies, this structure is evident in laboratories where it is necessary for supporting even the geographical issues. It can be concluded that both worlds have a federal structure where the infrastructure, strategy, roles and procedures are centralised to avoid wasting resources and the execution and operations are decentralised. These findings confirm the literature provided by units Ko and Fink (2010) where the IT function has to control the decentralised functions in faculties. Therefore, the first mechanism proposed to compose the ITG baseline is the IT Organisation Structure.

Structure	Recommended Mechanism for Universities
IT Organisation Structure	The adoption of an IT organisation structure for better decision making in the institution. The adoption of a centralised structure if the university has one campus, and a federal structure with multi campuses, where the infrastructure, strategy, roles and procedures are centralised to avoid wasting resources and where the execution and operations are decentralised. To centralise all IT services and application in a unique central data centre (i.e. mail server, domain, hosting among others) to avoid the redundancy of the same service in faculties. In the case of universities with more than one campus or faculty, to have IT support in faculties supporting all IT activities as well as having interaction reporting to an IT member of staff like a CIO or IT director. Moreover, having an IT technician in faculties working to identify bottlenecks and improvement opportunities and reporting to the IT hub in the university.

IT Strategy Committee

The definition of an IT strategy at institutional level is mentioned as one the most important mechanisms for IT at universities (Albrecht and Pirani 2004). Hence, the strategy is also pointed out as the main concern in most case studies. Another important reason identified in the case studies is the importance of having an IT strategy committee to align IT with the business. Additionally, IT must have the organisation credibility operating at a high level of maturity in the long term not just the short term and in crisis. Therefore, it is necessary to clearly define the IT strategy (Albrecht and Pirani 2004; Fraser and Tweedale 2003).

Even though, some universities analysed do not have a formal strategy committee at institutional level and the strategy is defined by the IT department, there is a consensus upon the importance of strategy. The results show that an IT strategy committee is crucial to ensure that IT is on the agenda at the institution, to define the budget and investment in IT, to have a plan in the long term, and to define priorities in different areas of teaching, learning and administrative areas. Thus, to ensure that the IT strategy is on the agenda at the institution it is necessary to create an IT strategy committee composed of administrative staff, academics and students. Therefore, the second mechanism proposed to compose the ITG baseline is an IT strategy committee.

Structure	Recommended Mechanism for Universities
IT Strategy Committee	A committee at institutional level with the mission to ensure that IT is included in the agenda to assist the alignment with institution strategy. This committee should be composed of members of different backgrounds and expertise which are administrative staff; academic professors, students, researchers and IT staff. The aim is to understand the IT need and expectations to develop a strategy aligned with different levels of IT stakeholders.

IT Steering Committees / Councils

While the literature suggests several committees for ITG (an IT steering committee, an IT project steering committee, an IT audit committee, an IT security committee, among others) this exploratory study showed that to have a lot of committees is not effective in practice. Moreover, a factor stated by one interviewee is the difficulty in creating different formal committees due to the lack of people and engagement within areas of the institution.

Other committees and councils can be a part of the steering committee, for example an IT security committee or an IT project steering committee. Moreover, due to the lack of human resources and knowledge, it is difficult to have many committees at university. The councils are perceived as more effective in practice than committees.

The committees are important for the definition of procedures, roles, and IT internal politics such as the use of e-mail, wireless etc. However, it is necessary to have people from business and from IT to compose these committees. Indeed, in an academic environment like a university, there is a range of people with different knowledge (IT security, management, systems information, education) and a good deal is to interact these experts from different departments and schools to be members of the committee as well as council. In addition, there are political issues and conflicts of interest. Thus, members of the committee need to have decision makers based on the institute and not in the particular interest or even with an interest for a specific faculty.

Other committees such as the IT audit committee at board of directors' level and the IT security steering committee are not pointed out as essential and important in this exploratory study. The IT steering committee is not as common as other industries. While the IT strategy committee is at board level, the steering committee is at executive level and responsible for determining business priorities in IT investment focusing on IT service delivery and projects daily. Both committees are crucial for an effective ITG and to have a better understanding of the use of IT resources (Ali and Green 2006; Huang et al. 2010; Prasad et al. 2012).

At an IT level, this has more flexibility and autonomy to implement committees than at institutional level where it is necessary to integrate areas with people from different positions. Therefore, the third mechanism proposed to compose the ITG baseline is an IT strategy committee.

Structure	Recommended Mechanism for Universities
IT Steering Committees /Councils	A committee responsible to determine the priorities of IT at the institution and with the role of implementing an IT strategy. This committee can be divided into several sub committees or functions with the role of discussion activities of teaching, learning, IT security, and risks and projects. Each of these sub committees/councils can be always created when necessary depending on the context of the university and need.

Roles and Responsibilities

Definitions of the roles and the responsibilities to the stakeholders are essential and for an effective framework of IT governance (De Haes and Van Grembergen 2008a). The board and executive of IT should document all tasks and the responsible personnel to execute them.

This study showed that the universities have adopted formal roles and responsibilities with clear definitions of each IT area. One example pointed out is the use of the RACI matrix to define the roles and responsibilities. An interesting finding in this exploratory study is that most universities have formal functions like developing systems, hardware, network management, IT infrastructure, and support with IT experts in area aiming to support teaching, learning and administrative activities. Moreover, each one of these functions in the IT department has roles with experts in this area and are detailed in a document. These types of functions allow IT at universities to demonstrate better performance.

According to Ko and Fink (2010), it is important to define the roles and responsibilities clearly and unambiguously to ensure the effective execution of IT governance responsibilities. Other authors (Ajayi and Hussin 2016; Bhattacharjya and Chang 2006; Ismail 2008; Wilmore 2014) also identified the importance of having well-defined roles and responsibilities with the definition of clear functions which may impact positively on ITG. Therefore, the forth mechanism proposed to compose the ITG baseline is the role and responsibilities.

Structure	Recommended Mechanism for Universities
Definition of Roles and Responsibilities	A definition of roles and responsibilities with formal functions and clear definition. To provide documentation of all tasks and responsibilities with a formal division at IT level in the institution. Examples of formal functions, IT Support; System Development; IT Infrastructure; E-learning

Project Management Office

Universities are increasingly recognising the importance of project management at institutional and IT department level. Some decisions were made regarding two mechanisms related to management projects. The first, is the structure mechanism "IT project steering committee" that is composed of business and IT support focusing on prioritising and the management of IT projects. The second is the process mechanism "Project governance /management methodologies that include the methodologies and process to govern and manage IT projects.

In doing so, the understanding is that both mechanisms have the same goal that is related to project management. Therefore, to have a more ITG effective mechanism, these two mechanisms are merged in a unique mechanism with a global concept regarding to project management called "Project Management Office". Moreover, Wilmore (2014) suggests that universities should have a Project Management Office to guide and monitor projects as a support function for effective ITG.

According to the Project Management Institute (2013) "a Project Management office (PMO) is a management structure that standardises project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques. The responsibilities of a PMO can range from providing PM support functions to actually being responsible for the direct management of one or more projects". Rau (2004) states "The role of the project office is to develop and enforce standards and procedures for projects and programs pursued by IT. Because this unit monitors the use and adherence to standards by IT, it is also called upon to collect and report on progress and the performance of projects and programs that are underway." This way, the concept of this mechanism is more suitable for effective ITG in universities.

The Project Management Methodology mechanism was also refereed in five universities in the case study and considered as essential to compose the baseline. Indeed, it is quite clear that in the university context where most the activities are based on projects, this mechanism is pointed out as essential.

However, the findings in the exploratory study show some challenges for this particular context. Findings reveal that to have a formalised the project management with a structure at the institution is seen as more effective for ITG. Moreover, since that well established the culture of project management at the institution may be is easier to follow or chose a specific methodology or standard to implement.

Universities are following project management methodologies in accordance to their reality. Findings shows that Dutch universities are adopting PRINCE 2 as a standard for project management. On the other hand, Brazilian universities are following best practices in the PMBOK guide. In conclusion, it cannot be stated that there is a better methodology or framework for project management. However, it can be argued that following well known methodologies, projects are better managed.

An interesting example regarding project management is identified in the exploratory study in a private university in Brazil. The universities follow the PMI guide and they have a well-established Project Management Office with several employees certified in Project Management Professional (PMP). The importance of having a project management software is also noted here. This software should be easy to use for business and IT professionals without wasting much time in its implementation. A success example cited was the adoption of the software "Microsoft Project Enterprise" in which it is possible to be used at institutional level. Such software was adopted by the institution with no costs with the Microsoft agreement for Education. Moreover, the usefulness of this software is perceived by the users as a useful tool for project management.

Another piece of evidence from a Brazilian public university argues the importance of having software for project management that is easy to use and intuitive. The university chooses the open source software due to the difficulty sometimes endured in purchasing a commercial solution. In this case, the university can experience the advantages of creating a partnership with the software industry to have other solutions with different requirements for better project management.

Several authors recognise the importance of project management for universities (Fraser and Tweedale 2003). In addition, project management should not be just for ITG, but for IT in general. Therefore, in a project management office, it is possible to manage all IT projects. Furthermore, a project management office could be an interface with other areas and departments of the institution giving support.

Although the empirical findings identified in the literature in the mechanism of project management at universities are limited or scarce, the importance of this mechanism for IT is quite clear. Thai universities show the importance of project management for ITG and for higher education institutions in a study stressed by Jairak et al. (2015). Pereira and Silva (2012b) complement that project management is an important area in ITG. Thus, a Project Management Office is an important mechanism to compose the ITG baseline.

Structure	Recommended Mechanism for Universities
Project Management Office	A project management office to manage all kinds of IT Projects at the institution. To adopt the culture of management projects adopting methodologies such as PMBOK or PRINCE 2 to govern and manage projects. Adoption of a tool to control and monitor the projects.

Business Process Management Office

Business Process Management (BPM) is an emergent and recent approach discussed in organisations. Organisations are a collection of processes, even though for the most part, the processes are not well defined and documented. A formal BPO brings IT and business closer together to work as partners. It is an interesting mechanism to identify bottlenecks and process improvements. The goal of this BPO is to discover, analyse and propose areas to be optimised. Those proposed areas can be discussed by an IT strategy committee. The institutions all increasingly recognise the importance of processes management.

Structure	Recommended Mechanism for Universities
Process Management Office (PMO)	A process management office composed by IT professionals and academics to identify the areas to be improved in universities. A function defined at IT department level of the institution.

ITG Function/Officer

Universities are increasingly recognising the importance in a formal ITG function at the institution. This structure function is responsible to promote, drive, and manage ITG processes. The study carried out by Wilmore (2014) in four Australian universities show that is essential to have an ITG function catering for the promotion and discussion of topics related to ITG at university.

The findings in the exploratory study show that the universities are still in the initial phase in the implementation of ITG officer. However, is recognised the importance of an IT function in the university. Moreover, some large public universities in particular in Brazil have already implemented an ITG function which has fulfilled the governmental roles and laws regarding ITG in the public sector.

The exploratory study also reveals that universities with a smaller structure due to limitations of physical space and human resources have difficulty in an ITG office. However, it is recommended to ensure such ITG functions are linked to a particular employee. As a result, an improvement of the ITG processes in the institution can be expected.

Therefore, the ITG function in a university has to be clear. It has to have an office and a physical location of reference in which the personnel are allocated. This place should be known by everyone in the

university, students, teachers, and support. Thus, the ITG function is an important mechanism for university IT governance to compose the baseline.

Structure	Recommended Mechanism for Universities
ITG Function/Officer	A formal function in the institution responsible in promoting, driving and managing all ITG processes.

Security/ Compliance / Risk Officer

The mechanism security, compliance and risk officer were barely mentioned in the exploratory study in the universities. In addition, it is not pointed out by the interviewees of the ten universities as being an essential mechanism to compose the baseline. It is not a surprise since the results in the exploratory study are in line with the literature review.

The concern in adopting security and compliance is higher in the financial industry due to the IT impact on business, in particular in banks with money loss. The results in a study with 246 American institutions of higher education show 81% of institutions do not include IT risk in their institution's strategic plan (Bichsel and Patrick 2014). However, risk management is a big concern in accordance with the study.

This way, universities need to pay attention to these risks in the organisation. Risk management details how an institution determines its appetite for risk, as well as how risk controls and mitigation strategies for any given endeavour are developed and enforced throughout the enterprise (Bichsel and Patrick 2014). It is suggested to adopt the culture of compliance and standards following the known standards and best practices (Ali and Green 2005).

However, in the context of universities managing risk is crucial. Thus, based on the survey results in the study by Bichsel and Patrick (2014) in 246 American universities, it is highly recommended to take into account at least the following IT risks. The most important risks to be addressed in order of importance are:

- information security
- data privacy/confidentiality
- identity/access management
- compliance with laws and regulations,
- physical security of IT resources
- disaster planning and recovery systems

Thus, the Mechanism Security/Compliance and Risk Officer should compose of the ITG Baseline.

Structure	Recommended Mechanism for Universities
Security/ Compliance / Risk Officer	Function responsible for security, compliance and/or risk, which possibly impacts IT.

Business / IT Relationship Managers

The Business/IT Relationship Managers are prevalent in many organisations but with a variety of names such as account managers, business technology managers, and business information managers. They play an important role on a daily basis in understanding how the business operates and in interacting with their business peers. Moreover, the Business/IT relationship managers act as an intermediary between the business and IT, playing a critical daily role exchanging information with IT and business for helping the understanding of the operation of IT and business (Broadbent 2002; Weill and Ross 2004b).

Findings in the exploratory study at universities reveal the importance in having an IT professional being the bridge between the business, IT and administrative affairs, and faculties and departments interacting with professors and directors trying to identify the demands as well as suggesting how IT can assist the university.

This representative could be the CIO, IT director or another IT staff member who explains to the business how IT works and vice versa. In the case of universities, due to the size and complexity, this person plays a key role in explaining IT, and the functionality of many issues for the various departments. It helps IT to be proactive and work closely with the business assisting the units when necessary. Thus, the Business / IT Relationship Managers mechanism should compose of the ITG Baseline.

Structure	Recommended Mechanism for Universities
Business/IT Relationship Managers	Business/IT relationship managers working as an intermediary between IT and other areas in the institution such as teaching, learning, and administrative tasks. These managers working daily to understand the necessity of the faculties as well as the departments.

CIO on the Executive Committee

The CIO on the Executive Committee mechanism also known as the CIO on the Board in the organisation is pointed out as essential for many studies in the organisation (De Haes and Van Grembergen 2009). In the universities few studies identify clear and in-depth analysis of the impact of this mechanism for IT governance. However, Ajayi and Hussin (2016) argue that for effective IT governance at universities, it is fundamental to have a CIO on the executive committee.

The findings of this exploratory study reveal that it is essential on the board of the institution to have a person with IT expertise with an active voice. This person is responsible in showing other board members the importance of IT in the institution. According to the suggestions in the case study, the CIO is the most appropriate person for this task to sell IT in the board. Thus, the CIO is the highest representative in IT interacting with the IT team. Moreover, the CIO has the knowledge of all needs of IT as well. Thus, to have the CIO on the executive committee as an active voice on the board and interacting with other members is an essential mechanism for effective ITG.

Structure	Recommended Mechanism for Universities
CIO on Executive Committee	A CIO on the executive committee with the aim of representing IT showing the benefits and the impacts to the university and for all educational aspects.

Strategy Information System Planning

Strategy information system planning also known as IT Strategic PLAN is the most relevant IT document. Moreover, it is a document and tool to justify and plan all IT activities at institutional level. This document has a function to assure the priorities and investments of the IT area align with the mission, objectives and goals of the organisation. In other words, it is an enabler for IT and alignment with the institutional strategy (De Haes and Van Grembergen 2009). Moreover, the organisations should maintain a detailed IT strategic plan that incorporates business requirements. In the case of universities, there should be a plan which encompasses the activities of teaching, learning, and administrative tasks.

Authors such as Fraser and Tweedale (2003), Albrecht and Piran (2004), Bhattacharjya and Chang (2006) and Ajayi and Hussin (2016) stress the importance of an IT plan for IT governance and align it with business needs. Moreover, the SISP's function is to assure the priorities and investments of the IT

area alignment with the mission, objectives and goals of the organisation. In other words, it is an enabler for IT and in alignment with the institutional strategy (De Haes and Van Grembergen 2009).

These findings have identified that the IT strategic plan in the university should be a simple, objective and concise document to be discussed at the IT strategy committee and approved by the board of institution such as the rector, directors and administrative staff. IT strategy must cover all areas of the university. Ismail (2008) argues that the plan should provide an aggressive and bold, yet thoughtful and measured vision for how IT should be developed, used and applied to support the university's main activities such as research and academic, teaching and learning, and administrative support services. Additionally, Jairak et al.(2015) complement that the IT plan is an essential document in the institution related to the vision, mission and strategy. The IT strategic plan at the University of Oxford (2015), number one in the ranking of Times Higher Education has only fifteen pages. It is a summarised document displaying all areas (research, education, support administrative functions, infrastructure and IT staff and skills among others) that IT strategy needs to cover at the institution.

Process	Recommended Mechanism for Universities
Strategy Information System Planning	A strategic plan aligned with the objectives and goals of the institution ensuring all the priorities and investments. The plan should be a simple document with the length of two and four years. This plan should be discussed and approved at the IT strategy committee. The strategic plan aims to achieve the maximum benefit from information technology innovations, increasing research capability, enhancing teaching and learning, and delivering efficiencies in support of administrative functions.

Frameworks and ITG Standards

There are several frameworks and standards for the management of different issues of IT. The most known and popular are ITIL, COBIT and ISO/IEC 38500. The mechanism Frameworks and ITG Standards encompass all kinds of frameworks for ITG such as ITIL, COBIT, and IS0 27001 among others. However, the aim is to understand what the frameworks the universities have used are as well as the majority of processes implemented.

The mechanism frameworks and ITG standards ranked 5 in the ranking with a frequency of five from ten choices. It was not surprising, since the studies found in the literature show frameworks such as ITIL, COBIT or ISO/IEC 38500 as a starting point to implement IT governance. From the interviews, it is understood that ITIL is more practical and it is the most popular ITG framework implemented. Service

desk and incident management are the most common ITIL processes implemented in all universities. It is remarkable that IT at universities has a focus on operational services taking into account the number of IT users and quality of service of delivery to students, professors and administrative staff.

Findings in the exploratory case study are in line with the literature where it is argued that the level of maturity in ITG frameworks as well as in best practices is still low.

Moreover, the most implemented ITIL processes are service desk, incident management and managing problems. As mentioned, IT at university aims to deliver services with the best quality as possible to students, professors and administrative staff. Therefore, the way to reach it, is using known best practices in the industry. Among several frameworks, the framework ITIL seems to be the most practical, moreover, it is the most adopted by all universities. The ITIL framework provides 27 processes, however, to implement all these processes in the academic context is a huge endeavour, requiring a lot of people and human and knowledge resource.

As pointed out by a university delivery services to students, professors and administrative staff. The IT department at universities aims at delivering services with the best quality possible. Thus, this is a way to adopt known frameworks and standards for this. Among the ITG frameworks, ITIL seems to be more practical and easy to implement and is also the most adopted in the case studies in the literature review.

Therefore, a good essential starting point for universities is to implement at least these ITIL processes namely service desk, incident management, and problem management as well as knowledge management. The service catalogue is also another process essential for universities. All stakeholders need to know the IT services and products. Thus, the frameworks and ITG standards are an essential mechanism to compose the baseline.

Process	Recommended Mechanism for Universities
Frameworks and Standards ITG	Adoption of frameworks and standards to help IT governance at universities.

Test and Experiments for Solutions

Universities are one type of special organisation different than that of industry. While universities create and disseminate knowledge in society, industry is more focused in generating profit for the shareholder, reducing costs and creating economic value (Zhen and Xin-yu 2007).

Moreover, the findings show that due to plurality ideas in an academic environment, universities can do experiments and test a range of solutions. As a result, if they make an error it does not impact on the organisation. In contrast, in industry it is not possible due to the necessity of operational efficiency. Thus, it is quite obvious that universities are an environment of creating and developing solutions for real problems to disseminate knowledge to industry and society. Therefore, the IT department should provide an environment with different solutions for students and professors to test and homologate.

An interesting practical example is the use of a standard e-learning platform (e.g. Blackboard) which the university just provide the support for this software. However, professors, researchers and students would like to use and test other solutions for Learning Management Solution – LMS. Thus, the IT department should provide a server with alternative solutions such as Moodle, SAKAI, and Google Classroom among others. Another interesting example is to provide business intelligence software. Universities are increasingly using software to analyse data as well as helping the process of decision making. Therefore, to provide a variety of business tools can be of interest. Universities could start with open source solutions such as Kasandra, Pentaho, Spago BI, among others.

All stakeholders at university can take advantage of these types of software. In addition, it is important to emphasise that this software requires high processing power and appropriate IT infrastructure where normal desktops may have not exhibit sufficient performance. In this sense, the possibility of testing different solutions should be at institutional level, which IT departments must provide the necessary technological infrastructure for this type of solution to be tested and used. Therefore, the IT department provides virtual machines at institutional level for all users.

Furthermore, it is also suggested to publish all software available on the website and communicate with the academic community. Additionally, a list with the people that are using the tools as well as a form for feedback and suggestions is interesting. As a result, this process creates a software community inside the university to share knowledge and practical experiences. Consequently, everyone can help each other and enhance the results and knowledge. To summarise, from this point of view, to provide an environment to test different solutions plus the standard adopted by the university can spark seeking knowledge impacting IT and in areas of teaching, learning and administrative tasks.

Process	Recommended Mechanism for Universities
Possibility of tests and experiments	An environment with the possibility of tests and experiments for solutions in information technology. To provide a virtual machine and a range of software for all of the academic community to test and use (i.e. administrative staff, professors, students). To provide more than one e-learning application for students and professors than the standard adopted by the university. If the university adopts Blackboard as a standard and only provides support for this, it is stimulating to offer others such as Moodle.

Dashboard

The amount of data from the colleges and universities is not usually a problem. However, to provide the appropriate information to academics and decision makers is not an easy task due to the wide variety of information systems (Wolf 2016).

Therefore, to facilitate decision making and planning, many higher education institutions are creating dashboards to visualise data and make it readily available to deans, their support teams, and other users across campus (Wolf 2016). In this study, the importance of tools such as dashboards were identified to use by IT personnel and easy to use by academic staff to analyse data at an organisational level. Moreover, the administrators, and IT teams developing data visualisation dashboards to provide insight into their data thereby facilitate more effective planning and decision making.

There is an influx of data in these types of institutions. For example, universities collect and store datasets regarding student demographics, academic performance, housing status, meal plans, academic departments, class enrolment levels, and other important information. To help manage all these variables, and make the best use of available resources, many universities deploy business intelligence tools. By leveraging business intelligence tools, university staff and administrators can convert all their raw data into visually intuitive dashboards (InetSoft 2017).

Process	Recommended Mechanism for Universities
Dashboard	Tools to be used by IT professionals and easy to use by academic staff to analyse data at an organisational level.

Methodology to manage Disruptive Innovation

Universities provide a suitable environment to test different solutions to stimulate research, teaching, and innovation to be further applied to other industries. Moreover, it is necessary to identify opportunities on how to be innovative in a classroom environment and provide disruptive innovation in the teaching-learning process. Therefore, a methodology to assist in selecting and governing these technologies would

be important. As a summary, the methodology to manage disruptive innovation is an important IT area in the literature and should compose of the baseline of ITG mechanisms baseline.

Process	Recommended Mechanism for Universities
Methodology to Manage Disruptive Innovation	A methodology to manage disruptive innovation in universities.

International Standards/Common Solutions

Universities have characteristics which are different than those of the financial and healthcare industry. This mechanism requires making a benchmark with other universities to adopt the same international standards and solutions. Moreover, purchasing a new technology to interact with the CIOs from other universities to exchange ideas and discuss experiences can bring insights as well as benefits in terms of cost reduction before implementing a new software, for example, in the process of implementing new IT service management software (ITSM). Several open source and commercial tools are available. Nevertheless, few of these tools are known in the context of universities and the process of implementing and training may be too expensive. Therefore, adopting tools common to other universities can be advantageous to foster partnership among universities to promote courses, exchange information and reduce costs.

Process	Recommended Mechanism for Universities
International Standards / Common Solutions	The adoption of international standards. Adopting a common solution by several universities in the same country (ITSM software, Business Intelligence). It could be easier to share information, to promote training, and reduce costs in software development.

Portfolio Management

Portfolio management is the prioritisation process for IT investments and projects in which business and IT are involved (including business cases, information economics, ROI, payback) (De Haes and Van Grembergen 2009).

Universities increasingly need to know how to prioritise their processes and to define the appropriate IT investments that directly impact on teaching, research and extension activities. In the literature, different studies show that portfolio management is a mechanism with positive empirical results on ITG in universities(Fraser and Tweedale 2003; Wilmore 2014). The results of the study of Heindrickson and Santos (2014) in 57 Brazilian public organisations show the positive impact on the organisation performance with the adoption of portfolio management.

Findings in the exploratory case study reveal that the prioritisation of IT projects as well as spending and investment is essential and needs to be discussed in the committees. Such prioritisation and investment must be approved and have knowledge of the management of the university. On the other hand, the results of the exploratory case study show the difficulty of IT managers in prioritising projects and defining priorities that really impact the business. In addition, this is perceived due to political issues that are part of universities and how is they are managed, many times IT priorities are not well defined. As a result, this affects projects and activities that could more directly affect other activities in general.

Thus, it is necessary to align IT with business and the investments to be discussed in the strategy committee or in the steering committee. Another interesting question identified is the difficulty in measuring the Return on Investments in IT in universities. The financial industry used criteria such as profit as in the study carried out by Lunardi et al.(2014) and Wu et al. (2015). In the context of higher education, studies on how to measure return on investments in IT in research, teaching and learning were not found. Therefore, portfolio management is an important mechanism to compose the baseline.

Process	Recommended Mechanism for Universities
Portfolio Management	Prioritisation process for IT investments and projects in the institution.

IT Budget Control and Reporting

This process is responsible for controlling and reporting on the investments of IT projects in the organisations. It is a process of managing budgets in accordance with the definition of roles (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

The findings in this exploratory study revealed that, all universities have a concern and a need in having an IT budget. Most of them do not have a defined budget for IT that is a problem in accordance with the interviewed. The findings show that to have proactive and innovative IT focusing on the improvement of processes as well as developing new technologies is important in knowing the budget. Indeed, for IT departments to develop projects or even invest in new technologies, the board of universities need to ensure the financing.

Moreover, the process mechanism “IT budget control and reporting”” received an average score of effectiveness (2.8) and a score of difficulty of implementation (2.3). It means that in general in practice

universities with a defined IT budget is considered as important ITG. As mentioned earlier, the effectiveness of each mechanism is based on the mechanisms that universities have implemented. Thus, this average is significant according to this diversity of university. Therefore, to promote better IT at the university as well as developing strategic projects that affect teaching activities, learning is crucial to have as well as IT budget control and reporting. Thus, IT budget control and reporting is an important mechanism to compose the baseline.

Process	Recommended Mechanism for Universities
IT Budget Control and Reporting	Process to monitor and control the IT budget and investments in projects. Define an IT budget to ensure investment and prioritisation of IT projects.

IT Performance Measurement

Findings from the exploratory study show that universities are at the initial phase for the implementation of this mechanism. The main focus of the adoption of performance measurement is on operational measures, mainly to monitor users' satisfaction, especially, the students' satisfaction. The universities have measured user IT satisfaction through surveys. It can be argued that in a university environment where there are over thirty thousand users, measuring the user's IT satisfaction of services in an important indicator to evaluate IT in the university. Thus, IT Performance Measurement is an important mechanism to compose the baseline.

Process	Recommended Mechanism for Universities
IT Performance Measurement	The adoption of metrics and indicators in IT to assist managers to visualise and understand the strategic objectives of the institution. To measure the organisation's performance through the use of satisfaction surveys, analysis of service quality and all issues regarding operational excellence.

Benefits Management and Reporting

Benefits to the business are monitored and managed during and after the implementation of IT (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009). Indeed, it is important to assess the impact of IT projects and communicate their benefits to the organisation. This way, everyone understands better the contribution of the IT function and how IT investments particularly improve core processes and turn into net benefits for the organization. Thus, Benefits Management and Reporting is an important mechanism to compose the baseline.

Process	Recommended Mechanism for Universities
Benefits Management and Reporting	Processes to monitor the IT benefits on teaching and learning activities, during and after implementation. A way to show IT investments in projects and the real impact on the university.

Knowledge Management (on IT Governance)

The use of portals such as a system to share and transfer knowledge in IT governance frameworks, tasks, and responsibilities is essential for universities (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000). Lunardi et al. (2014a) also argue the importance of having an internal portal to share information on IT. Knowledge management is an important issue to be explored in IT governance. Moreover, the portals, and systems of e-learning such as Moodle and SharePoint disseminate information to employees and stakeholders. In this way, the use of the applications looking at the improvement of processes and documenting knowledge of the organisation is extremely recommended. Manuals, videos, and guidelines can be included in the practice of knowledge management.

Findings in the exploratory study reveal that the shared knowledge on ITG should be within the entire academic community and other courses. Universities have adopted different types of systems and solutions to store and share knowledge regarding the task, frameworks and responsibilities. Some examples are portals to publish the services for IT employees and the academic community. Other tools also used include google drive, wikis, Microsoft Share Point and other Microsoft Solutions.

As mentioned, to have many portals, wikis to share and to store information is not effective in practice due to the difficulty in finding out where the information is. As a recommendation, to share knowledge on IT at university is having one unique portal software to centralise the information. The results show that to centralise the information is better for management and to search for information. Thus, in accordance with the results, to share knowledge on ITG at university internally as well as with the academic community is an important mechanism to compose the ITG baseline.

Relational	Recommended Mechanism for Universities
Knowledge Management (on IT Governance)	Share knowledge on IT at university such as information about technology, frameworks, best practices, tasks, responsibilities and publish this information on the intranet, blogs or portal of the university. The purpose is to store and create an organisational memory of IT knowledge aiming at being always available when necessary to recover any information.

Knowledge Sharing Among Universities

This mechanism enables universities to share crucial information on several topics (i.e. management, courses, etc.). However, this mechanism has a limitation that was highlighted by the interviewees. Such a mechanism can only be implemented among universities managed by a common entity like most public universities. The application of these mechanisms among public and private universities does not seem to be a future reality since they are competitors.

The interviewees argued that the sharing of information between public and private universities in practice is not common due to the market competition to get students. Therefore, an association where the universities share knowledge and resources regarding ITG can bring many benefits for cost reduction, for example, in software acquisition, sharing courses and training.
According to Ko and Fink (2010) knowledge about IT governance should not only be created inside the research community but disseminated through dialogue and collaboration between the academic community and industry.

The universities share similar facilities and solutions such as infrastructure, systems, and laboratories. For instance, some scale economy could be applied in new software acquisition when purchased in quantity for all universities rather than individually. To summarise, it is convincing that the implementation of this mechanism would not be easy given the universities' context (i.e. financial autonomy), but the centralisation of some common aspects could be very effective and useful in practice.

Relational	Recommended Mechanism for Universities
Knowledge Sharing Among Universities	Share knowledge of IT among IT managers, IT directors, CIO in the universities by e-mail, forum, and discussion groups. Exchange experiences and best practices of software, infrastructure, training, solution of IT problems.

IT Leadership

IT leadership is crucial to all types of organisations and is defined as "*the ability of the CIO or a member of staff in a similar role to articulate a vision for IT's role in the company and ensure that this vision is clearly understood by managers throughout the organisation*" (De Haes and Van Grembergen 2009). Nfuka and Rusu (2011) also stress that IT leadership has critical success factors for effective IT governance.

The findings in the exploratory study reveal that IT leadership is an important relational mechanism to take into account to have effective ITG. In the universities analysed, the principal IT leadership is the IT leader that usually is the CIO, IT Director or IT coordinator. This position is responsible for making the bridge between IT and business as well as interacting with the board of the university. The empirical evidence also shows that most universities analysed IT leadership as a person with a strong background and technical skills rather than a background in management education. In this sense, the IT strategy and projects to articulate IT internally sometimes depend on the vison of the person that is in this position.

To summarise, findings in the exploratory study show that it is crucial to have IT leadership to promote IT leading projects and motivate employees. Otherwise, IT at the university tends to stay in inertia without any innovation. Indeed, IT leadership is crucial for IT governance at universities. Several authors such as Ko and Fink (2010) and Ajayi and Hussin (2016) state that IT leadership is in an important element for an effective IT governance model at universities.

Relational	Recommended Mechanism for Universities
IT Leadership	Leadership in IT to promote and lead IT projects. IT leadership at institutional level should be by the CIO or the IT member of staff with higher power in IT decision making. The CIO is the responsible member of staff for IT leadership and creating the interface between IT and business interacting with the board of the university. The CIO needs to have knowledge about all kinds of technology that could change the education at the university as well as the process that may impact teaching, learning and research activities.

Training and Education

The relational mechanism "Cross-training" was identified as important to compose the ITG baseline in only one case study. Surprisingly, this mechanism also wasn't implemented frequently in the case studies in the literature review. However, the training on IT in general for IT and business employees is necessary and essential.

The universities should have a formal model for training at institutional level. Wilmore (2014) recommend to implement effective ITG to consequently yield a formalised program of IT education and learning. Another study carried out by Ajayi and Hussin (2016) in one Malaysian university suggest the Training & Career Development as an important mechanism for ITG Effectiveness.

The results of this exploratory case study show that although training is not an essential mechanism for effective ITG in universities, it does not affect IT performance, staff training is important. In addition, it is important that training and education for IT employees focus on management and strategy process. This

type of training is useful for IT employees as a holistic perspective of the university since most of them have a strong technical background and expertise in IT.

With the advancement of distant education and technological resources, universities should start taking advantage by developing online courses on platforms such as Moodle, blackboard, etc. Once a course has been modelled, it is possible that the audience who performs this training is much larger. In addition, in public universities it is possible for IT business workers to enjoy it where the same resources are shared.

It is true that the need of IT departments is not in relation to the technical training of a particular technology to be launched or a new operating system. Training should not refer to the area of strategy and management and the processes of the organisation. Once you have a vision, but systemic about tools and solutions, it becomes easier to know how to optimise processes. It is noticeable in the case of Dutch universities, that many people carry out training in other universities and such training is made available on a portal.

Thus, it is perceived that it is interesting to create a portal to provide training, not only IT related but in other areas as well. In this way, the creation of a portal with e-learning courses is an alternative due to the reach that distance education has. In addition, universities in a specific country, such as public universities in Brazil, could share courses from different areas on this portal and with technicians. Private universities in a given network may also use a similar model to promote courses on topics that are common to all. Thus, training and education is a mechanism to compose the ITG Baseline.

Relational	Recommended Mechanism for Universities
Training and Education	A formalised program of training and education for those in the area of business and IT. A program to ensure the development of knowledge and promoting a culture of learning for all staff. Training in different courses and skills that are not just technical but regarding management, business processes, governance, tools for education among others. To provide a portal with e-learning courses to spread to the maximum amount of attendees in the areas of IT and business.

University and Software Industry Partnership

The 'Partnership' mechanism between the software industry and universities is essential to a complex and open-minded environment to develop new ideas, create knowledge and propose solutions to complex problems. Students and teachers need to test and know a variety of IT solutions. At universities, the IT department is responsible for providing the infrastructure with laboratories and software to meet the

teaching-learning requirements. However, many universities face severe financial restrictions in spending money with new software acquisitions.

To promote new software alternatives and provide a larger range of technologies to students and professors, a partnership with the software industry may be essential. In fact, several organisations have educational programs specific to universities such as Microsoft, IBM, Google and DELL aiming to deliver IT systems. Moreover, this partnership can bring many other advantages for universities such as cost reduction in software, material for training, support, and knowledge for students and professors.

Relational	Recommended Mechanism for Universities
University and Software Industry Partnership	Establishing a partnership between the university and software industry aiming to acquire solutions for education. A good starting point is to establish a partnership with Google or Microsoft where they provide a range of free or affordable tools for education.

Office CIO or ITG

The importance of the Chief Information Office in universities is increasingly acknowledged by the board of institutions. A formal position at university in the Chief Information Office yields the main IT leader. Moreover, the CIO is the responsible representative for IT leadership and creating the interface between IT and business interacting with the board of the university. The CIO needs to have knowledge on all kinds of technology that could change the education at the university as well as the process which may impact on teaching, learning, and research activities.

Relational	Recommended Mechanism for Universities
CIO or ITG Office	A formal CIO or ITG Office at the institution. The institution needs to have a formal CIO or ITG function.

Corporate Communication

The adoption of effective communication is essential in good IT performance (Weill 2004). The study carried out by Ko and Fink (2010) in four Australian Universities also reveals that communication is a key aspect to the success of ITG. Using formal channels is supplemented by informal channels such as a network approach or lateral coordination.

An appropriate means of IT communication in the institute is crucial for effective IT governance. Communication in the universities involves IT marketing and campaigns and how the IT issues are addressed.

Findings from this study show that the majority of universities use an informal channel for communication and networking to solve daily IT problems. The telephone and personal contact are two methods widely used for communication to address IT issues internally among users of IT. However, it is perceived that universities also have frequently used e-mail as a communication channel for IT subjects among the academic community.

Information is usually published for students, teachers and administrative staff, through e-mail and dissemination on the Website. In addition, some universities have recently started using social media to raise IT issues. In this sense, it is advisable that whenever the university adopts a new solution, or some IT project is in progress, it divulges, communicates, and explains this to all those involved in order that they understand the IT activities within the institution.

An interesting conclusion is that the university environment is based on networking among the people who are involved. This evidence is clear, with the results of the interviews in which the directors and technicians of different universities have a good relationship. Thus, the workforce is optimised and knowledge multiplied with this kind of exchange of experience. Therefore, a formal communication channel is an important mechanism to compose the ITG baseline.

Relational	Recommended Mechanism for Universities
Corporate	Formal institution communication to address general IT issues.
Commutation	To use formal and best practices of IT communicate to all stakeholders.

Engagement between IT and Academia

An interesting mechanism that emerged from data analysis is named engagement between IT and academia. In the exploratory case study, the findings lead us to perceive the integration in some universities with the faculties and mail with engineering and computer science courses. This mechanism had three pieces of evidence identified in the exploratory case study. It is quite clear that integration between IT in universities with schools, mainly the school of engineering, computer science and courses related to technology works well. An example is case three in which IT sought to solve a real university problem and took this to be the subject of undergraduate work to be developed in the school environment. The engineering school developed a solution for a parking control and student mapping

In this sense, this is bringing real IT problems to be studied by the staff of courses and universities, examples including information systems, management, among others. In addition, as identified, there is

often a shortage of human resources in the IT departments of universities, which inhibits the innovation of certain processes within the institution.

Therefore, one way to put this together and to partner with faculties and teachers, is via research centres. The university is a complex environment and can be an interesting environment of real studies and cases. In addition, given fact society of fact of the problem to have a practical application. However, this requires awareness and collaboration from the teachers' side to accept this challenge, as well as for IT staff to create the test environment, solutions, etc. often available.

This engagement between IT and business, academia with those associated with IT with knowledge about the organisation's business processes and people are working closely together with the same goal. This engagement is an important mechanism with the mission of changing and IT transformation in the institution. Therefore, the engagement mechanism between IT and academia is important to compose the ITG baseline.

Relational	Recommended Mechanism for Universities
Engagement between IT and Academia	Engagement and relationship with academia (e.g. school of engineering, system information, computer science among others) aiming to develop projects and solve real IT problems. The researchers and professors in the faculties working in partnership with the IT department. For instance, the IT department proposing the developing a mobile application in the computer science school by the students or even other IT problems in the institution to be a topic of a dissertation or thesis.

Shared understanding of business/IT objectives

A shared understanding of business/IT objectives is the ability of IT and business people, at a deeper level, to understand and be able to participate in other key processes and to respect each other's unique contribution and challenges (Luftman 2000; Reich and Benbasat 2000).

This study reveals that shared understanding is an important relationship mechanism. In the field of universities, it is necessary for stakeholders such as those in IT, business and academics to share common goals and IT purposes. In addition, the results in the exploratory study also show that top management executives often lack the sensitivity of understanding IT purpose at university and its impact on education. It is noticed that according to the interviewee, IT for some CIOs is seen as a strategy and with focus on ITG practices for aligning the business, however in other universities IT is still something very focused on technical issues.

Ko and Fink (2010) argue that to have an awareness and understanding of ITG at university it is essential for effective ITG. Moreover, ITG at universities has different perspectives to decision makers ranging from holistic to more technical. Other authors such as Bhattacharjya and Chang (2006) claim that in a complex environment such as universities, it is necessary to have clearly well-defined ITG objectives.

It is a quite clear in an environment like a university that it is necessary for stakeholders in all areas of the institution to share common IT objectives. Therefore, in accordance with the empirical findings identified in the literature review in addition to the exploratory study, the relational mechanisms share an understanding of business/IT objectives is an important mechanism to be included in the ITG baseline for universities.

Relational	Recommended Mechanism for Universities
Shared Understanding of Business/IT Objectives	A shared understanding of business/IT objectives among the main stakeholders in the institution. To clearly show IT activities and the importance of each one. To have the commitment of IT and business people associated with IT for education respecting the contribution and challenges.

As mentioned in previous sections in the ITG mechanisms list, these mechanisms are well known in the literature and in particular in the financial industry. However, the main objective was identifying and analysing these mechanisms of the universities in depth and verifying that they adopted well as a main priority. The proposed ITG mechanisms baseline will help the CIO, IT directors and IT managers from universities to choose the most important as well as implement more effectiveness IT governance. There is an awareness that the list may uncover all ITG mechanisms or some mechanism could be missing from this list. However, a rigorous process was performed to develop and validate the model with a holistic approach.

The proposed ITG mechanisms baseline for universities is useful mainly for developing countries. For example, in Brazil, there is constant expansion with over three hundred public universities and over two thousand private institutions of higher education, this list can assist the managers in these universities to choose the most suitable mechanisms. Table 91 shows the ITG governance baseline mechanisms for universities.

Table 91. IT governance Mechanisms Baseline for Universities

IT Governance Mechanisms Baseline for Universities		
	Mechanism	**Description**
S1	**IT Organisation Structure**	The adoption of an IT organisation structure for better decision making in the institution. The adoption of a centralised structure if the university has one campus, and a federal structure with multi-campuses, where the infrastructure, strategy, roles and procedures are centralised to avoid wasting resources and the execution and operations are decentralised. To centralise all IT services and applications in a unique central data centre (i.e. e-mail server, domain, academic system, among others) to avoid the redundancy of the same service in faculties. For universities with more than one campus or faculty, to have IT representatives in the faculties supporting all IT activities as well as having interaction reporting to an IT member of staff like a CIO or IT director. Moreover, an IT technician in faculties working to identify bottlenecks and opportunities of improvement and reporting to the IT hub at the university.
S2	**IT Strategy Committee**	A committee at institutional level with the mission to ensure that IT is included on the agenda to assist the alignment with institutional strategy. This committee should be composed of members of different backgrounds and expertise which are administrative staff; academic professors, students, researchers, IT employees. The aim is to understand the need of different levels of IT stakeholders.
S3	**IT Steering Committees / Councils**	A responsible committee to determine the priorities of IT at the institution and with the role of implementing IT strategy. This committee can be divided into several subcommittees or functions with the role of discussion activities in teaching, learning, IT security and risks, and projects. Each of these subcommittees/councils can be always created when necessary depending on the context of the university and need.
S4	**Roles and Responsibilities**	A definition of roles and responsibilities with formal functions and clear definition. Documentation to provide all tasks and responsibilities with a formal division at IT level of the institution. Examples of formal functions include IT support; system development; IT infrastructure; E-learning
S5	**Project Management Office**	A project management office to manage all kinds of IT projects at the institution. To adopt the culture of managing projects adopting methodologies such as PMBOK or PRINCE 2 to govern and manage projects. The adoption of a tool to control and monitor projects.
S6	**Process Management Office**	A process management office composed of IT staff and academics to identify areas to be improved at universities. A function defined in the IT department level of the institution.
S7	**ITG Function/ Officer**	A formal function within the institution responsible in promoting, driving and managing all ITG processes.
S8	**Security/ Compliance / Risk Officer**	Function responsible for security, compliance and/or risk, which possibly impacts IT
S9	**Business/IT Relationship Managers**	Business/IT relationship managers working as intermediaries between IT and other areas of the institution such as teaching, learning, and administrative tasks. These managers working daily to understand the necessity of faculties as well as departments.
S10	**CIO on Executive Committee**	The CIO on an executive committee with the aim of representing IT showing the benefits and the impacts to the university and in all education aspects.
P1	**Strategy Information System Planning**	A strategic plan aligned with the objectives and goals of the institution ensuring all priorities and investments. The plan should be a simple document with the length of two to four years. This plan should be discussed and approved by the IT strategy committee. The strategic plan aims to achieve the maximum benefit from information technology innovations, increasing research capability, enhancing teaching and learning, and delivering efficiencies in support of administrative functions.

IT Governance Mechanisms Baseline for Universities		
	Mechanism	**Description**
P2	**Frameworks and Standards ITG**	The adoption of frameworks and standards to help IT governance at universities.
P3	**Test and Experiments of Solutions**	An environment with the possibility of tests and experiments of solutions in information technology. In addition, an IT infrastructure to provide virtual machines with a range of software for all the academic community to test and use (i.e. administrative staff, professors, students). For instance, to provide more than one E-learning application for students and professors compared to the standard adopted by the university. If the university adopts Blackboard as a standard and only provides support for this, it is stimulating to offer others such as Moodle.
P4	**Dashboard**	Tools to be widely used by IT professionals and easy to utilise by academic staff to analyse data inside the organisational level.
P5	**Methodology to Manage Disruptive Innovation**	A methodology to manage disruptive innovation in universities.
P6	**International Standards /Common Solutions**	The adoption of international standards. A common solution adopted by several universities in the same country (i.e. same software as ITSM, Business Intelligence). It could be easier to share information, to promote training, and reduce costs in the software development.
P7	**Portfolio Management**	Prioritisation of processes for IT investments and projects in the institution.
P8	**IT Budget Control and Reporting**	Process to monitor and control the IT budget and investments in projects. Define an IT budget to ensure investments and priorities of IT projects.
P9	**IT Performance Measurement**	The adoption of metrics and indicators in IT to assist managers to visualise and understand the strategic objectives of the institution. To measure the organisation's performance through the use of satisfaction surveys, analysis of service quality and all issues regarding operational excellence.
P10	**Benefits Management and Reporting**	Processes to monitor the IT benefits on teaching and learning activities, during and after implementation. A way to show IT investments in projects and the real impact on the university.
R1	**Knowledge Management (on IT)**	Share knowledge on IT at the university such as information about technology, frameworks, best practices, tasks, responsibilities and publish the information in the intranet, blogs or a portal of the university. The purpose is to store and create an organisational memory of IT knowledge aiming to be always available when necessary to recover any information.
R2	**Knowledge Sharing Among Universities**	Share knowledge of IT among IT managers, IT directors, CIO in universities by e-mail, forum, and a discussion group. Exchange experiences and best practices of software, infrastructure, training, issues-related to IT problems and solutions.
R3	**IT Leadership**	To have an IT leader to promote and lead IT projects. This leader should be the CIO or the IT representative with higher IT decision making responsibilities. The CIO is the IT leader responsible for creating the interface between IT and business interacting with the board of the university. The CIO needs to have knowledge about all kinds of technology that could change the education at the university as well as the process which may impact the activities on teaching, learning and research.
R4	**Training and Education**	A formalised program of training and education for business and IT professionals. A program to ensure the development of knowledge and promoting a culture of learning for all staff. Training for different courses and skills not just technical but regarding management, business processes, governance, tools for education among others. To provide a portal with e-learning courses to extend to the maximum number of attendees in IT and business.

IT Governance Mechanisms Baseline for Universities		
	Mechanism	**Description**
R5	**University and Software Industry Partnership**	Partnership among the university and software industry aiming to acquire solutions for education. A good starting point is to establish a partnership with Google or Microsoft where they provide a range of free and affordable tools for education.
R6	**Corporate Communication**	Formal institution communication to address general IT issues. To use formal and best practices to communicate IT to all stakeholders.
R7	**Engagement Between IT and Academia**	Engagement and relationship with academia (e.g. school of engineering, systems information, computer science among others) aiming to develop projects and solve real IT problems. The researchers and professors In the faculties work in partnership with the IT professionals. For instance, the IT department proposes the development of a mobile application in the computer science school by students or even other IT problems at the institution could be a topic for a dissertation or thesis.
R8	**Shared Understanding of Business/IT Objectives**	To share an understanding of business/IT objectives among the main stakeholders in the institution. To show clearly the IT activities and the importance of each one. To have the commitment from IT and business personnel linked to IT for education respecting the contribution and challenges.

Based on the findings in the literature review and this experience in carrying out a case study with ten different universities from five countries, the following recommendations are proposed based on three dimensions namely Structure, Process and Relational Mechanisms. A guideline for the implementation of IT governance mechanisms at universities is suggested.

1. Obtain Executive Sponsorship/Sponsor at Senior Management level: The university needs to have a sponsor at board level with an awareness of the impact of IT on education. The sponsor should be the Rector or Head of some area with a higher power of decision making in the institution. Moreover, the sponsor must have the knowledge and awareness that IT can change education and the real benefits when implementing effective IT governance. This person also should be responsible for engagement with the CIO / IT leadership motivating all stakeholders for changing IT at the university. The creation of a formal structure and committees at an institutional level must be sponsored by this person.

2. Implement an IT Strategy Committee: to ensure that IT is included in the strategic plan of the institution and aligned with institution strategy. To encompass people from different backgrounds and expertise which are (i.e. administrative staff; academic professors, students, researchers, IT people) aiming to understand the need of the different level of IT stakeholders.

3. Create an IT Strategic Plan: with the objectives and goals of the institution ensuring all priorities and investments. The plan should be a simple document with a long-term duration (four years). This plan should be discussed and approved by the IT strategy committee. The strategic plan aims to achieve the

maximum benefit from information technology innovations, increasing research capability, enhancing teaching and learning, and delivering efficiencies in support of administrative functions.

4. Review the IT Organisation Structure: and the definition of roles and responsibilities. Review the IT organisational structure. Shift to a centralised IT organisation structure for better decision making in the institution. The adoption of a centralised structure is necessary whether the university has one campus, and a federal structure with multi-campuses, where the infrastructure, strategy, roles and procedures are centralised to avoid wasting resources and the execution and operations are decentralised.

To centralise all IT services and applications in a unique central data centre (i.e. e-mail server, domain, academic system, among others) to avoid the redundancy of the same service in the faculties. Additionally, having IT staff in faculties supporting all IT activities as well as having interaction reporting to an IT person like a CIO or IT director for universities with more than one campus or faculty should be implemented. Moreover, the IT technician in faculties working to identify bottlenecks and opportunities of improvement and reporting to the IT centre at the university is crucial. To define Roles and responsibilities clearly in different areas of support, management and executive decisions with the documentation of all of these roles is also a necessary component.

5. Implement an IT Governance Framework: A good starting point is implementing the ITIL framework, defining a service catalogue in the institution. In addition, to publish the service catalogue on the website to show to students, professors and administrative staff whole IT services provided. It is also important to implement the three main processes, help desk, incident and problem management. A suggestion is the adoption of a web information technology management tool. The recommendation is using an open source software "CITTSMART" which is ITIL compliance with thirteen processes certified by Pink Verify and the software "OTRS".

6. Implement a CIO office: and to define a formal function for the Chief Information Officer in the institution with the engagement and relationship with the board of the institution, working in partnership to promote IT.

7. Engage and Commit among Stakeholders: Share the IT objectives with all stakeholders, business and IT staff too show that IT is an enabler for changing education. To arouse the creativity and

entrepreneurial spirit among employees to enhance the processes in the institution using IT is important. To pay attention to disruptive technologies for changing IT and consequently to impact on education is also crucial. Promoting a culture of learning and growth for all the staff and providing e-learning courses for the maximum spread of people are too important points.

8. Share Knowledge on IT: internally such as information about technology, frameworks, best practices, tasks, responsibilities and publish the information on the intranet, blogs or the portal of the university. Also, sharing knowledge externally with CIOs and IT managers from other universities about IT best practices, type of software, issues-related to IT and solutions, governance models among others is important.

9. Adopt International Standards and Common Solutions: used by several universities in the same country (i.e. same software of ITSM, Business Intelligence). Before adopting a new technology to identify what the other universities have implemented and to share experiences with other IT managers is vital.

10. Establish a Partnership with the Software Industry: such as Google, Microsoft among others and take advantage of the education program provided by these industries. To use the hosting services as much as possible (i.e. e-mail, file storage) at least for students to reduce cost with infrastructure and people dedicated to maintaining thousands of email accounts can be useful.

11. Provide an Environment with the Possibility of Tests and Experiments: of solutions providing virtual machines with a range of software for all of the academic community to test and use it (i.e. administrative staff, professors, students). For instance, to provide more than one e-learning application for students and professors than the standard adopted by the university is a suggestion. If the university adopts a standard, e.g. Blackboard and only provides support for this, it is stimulating to offer others such as Moodle.

12. Engage IT with Academics: (e.g. school of engineering, systems information, computer science among others) aims to develop projects and solve real IT problems. The researchers and professors in the faculties working in partnership with the IT staff is important. For instance, the IT department could propose the development of a mobile application in the computer science school by the students or even other IT problems at the institution could be a topic of a dissertation or thesis.

13. Prioritise and Manage IT Projects: To define an IT budget clearly with the priorities of IT investments in projects and IT is important. To successfully deliver projects with the best benefits and impact to the institution is crucial as well as adopting methodologies for project management such as PMBOK and PRINCE 2. To ensure that the projects are well defined and effectively managed and monitored with the use of software for project management, it is suggested that the software "READMINE" and the software Microsoft Project Enterprise are utilised.

14. Manage Security and Risks: adopting a culture based on compliance in accordance with laws and legislation of the university/country is crucial. The following risks should be initially looked at: information security, data privacy/confidentiality, identity/access management, compliance with laws and regulations, physical security of IT resources, disaster planning and recovery systems to promote campaigns to staff and students for the responsible use of systems.

15. Implement Performance Measurement: to evaluate IT Services, and IT Projects with the application of surveys to measure the IT satisfaction of students, professors and administrative staff as well as the impact of the projects is an essential component. To provide a dashboard to be used by IT staff and easy to utilise by academic staff to analyse data inside an organisational level is an important point.

The next chapter presents the evaluation of IT governance mechanisms baseline.

5. EVALUATION

This chapter presents the evaluation and validation of the universities IT governance mechanisms baseline. It is divided in four subsections: subsection 5.1 presents the evaluation criteria; subsection 5.2 presents the interviews with the IT experts; subsection 5.3 presents the evaluation analysis; the validity is presented in subsection 5.4.

5.1 Criteria for Evaluation

In this section, the evaluation and validation of the artefact are presented. Evaluation of design artefacts and design theories is a major endeavour and a critical part in the DSR (Hevner et al. 2004; March and Smith 1995; Prat et al. 2015). In order to evaluate the proposed universities ITG mechanisms baseline a series of qualitative interviews were performed. The interviews are one of the most known methods to evaluate artefacts (Gerber et al. 2015; Peffers et al. 2007). Therefore, it was adopted to evaluate the proposed ITG mechanisms baseline for universities in this study.

In the previous section, several exploratory interviews to identify the suitable mechanisms for universities were performed. This section aimed to analyse if the proposed ITG mechanisms were suitable to a range of universities. In doing so, a variety of universities was chosen to evaluate these mechanisms. The aim was to find out if the ITG mechanism list fitted to all university types. A questionnaire was used to collect and evaluate the artefact. Hence, the result's robustness as well as their applicability were discussed and validated through different universities.

The literature fails in proposing a framework or a taxonomy for artefacts evaluation. Table 92 shows a DSR evaluation criteria list proposed by March and Smith (1995) to evaluate the generated artefact (i.e. Construct, Model, Method and Instantiation).

Table 92. Evaluation criteria for DSR artefacts
(March and Smith 1995)

	Construct	Model	Method	Instantiation
Completeness	X	X		
Ease of use	X		X	
Effectiveness				X
Efficiency			X	X
Elegance	X			
Fidelity with real world phenomena		X		
Generality			X	
Impact on the environment and on the artefact's users				X
Internal consistency		X		
Level of Detail		X		
Operationally			X	
Robustness		X		
Simplicity	X			
Understandability	X			

The criteria list to evaluate the DSR was adopted and followed by several authors (Aier and Fischer 2011; Prat et al. 2015; Sonnenberg and vom Brocke 2011). However, according to Aier and Fischer (2011), very little justification and explanation of each criterion proposed by March and Smith (1995) is provided. After an extensive literature review to identify a deep definition of each one these criteria, only two articles found (Aier and Fischer 2011; Prat et al. 2015), from where we adapted the definitions.

Regarding the evaluation criteria for the DSR artefacts proposed by March and Smith (1995), two criteria were removed, the elegance and the robustness. The first one, according to Aier and Fischer (2011) "Elegance is related to simplicity. In fact, simplicity is a special aspect of elegance". Thus, the authors did not take into account this criterion. Moreover, Prat et al. (2015) defined this criterion as "The elegance with which the artefact has been built" and argue that design science researchers have shown little interest in this criterion. Currently, evaluation artefact's impact is more important and critical than assessing its style.

The second criterion, some authors such as Aier and Fischer (2011) defined as "The robustness of an algorithm refers to its applicability over the whole spectrum of purpose and scope. It is therefore a notion of a broad purpose and scope". Another definition of robustness found in the literature was provided by Prat et al.(2015) as says that "The ability of the artefact to handle invalid inputs or stressful environmental conditions" and it is often evaluated with metrics doing simulation and analysing the performance. Other authors such as Décosse et al.(2013) agreed that robustness was mainly aimed at algorithmic artefact

evaluation and may not be an appropriate criterion to evaluate a construct or a model. The artefact in this study will be evaluated in terms of constructs and models. Constructs belong to the domain's conceptual vocabulary and are used to describe problem within the domain March and Smith (1995), and to specify their solutions with appropriate symbols and terminology (Gregor and Hevner 2013). Models are sets of propositions or statements expressing relationships between constructs (March and Smith 1995) and are designed representations of the problem and possible solutions (Gregor and Hevner 2013). A "model can be simply as a description that is, as a representation of how things are" (March and Smith 1995).

Therefore, in this thesis, the artefact will be evaluated in terms of construct and model with the following criteria: completeness, ease of use, fidelity with real world phenomena, internal consistency, level of detail, simplicity, Understandability, importance, accessibility, and Suitability. Table 93 shows the criteria by March and Smith (1995) with a description of a meaning of each criterion and regarding the artefact's relevance by Rosemann and Vessey (2008).

Table 93. Evaluation criteria for the artefact adapted

	Construct	Model	Description	Author
Completeness	x	x	The artefact contains all necessary elements and relationships between elements consistent and complete.	(Aier and Fischer 2011; Prat et al. 2015)
Ease of use	x		The artefact is easily usable with low effort.	(Aier and Fischer 2011; Prat et al. 2015)
Fidelity with real world phenomena		x	The artefact corresponds with the reality and some real problem phenomena.	(Prat et al. 2015)
Internal consistency		x	The artefact has the elements consistent with an adequate terminology and justified with the theory.	(Aier and Fischer 2011; Prat et al. 2015)
Level of Detail		x	The artefact has appropriate level of detail to the size of the problem addressed.	(Aier and Fischer 2011)
Simplicity	x		The artefact contains the minimal number of elements and relationships between elements and it is easily understandable and manageable.	(Aier and Fischer 2011; Prat et al. 2015)
Understandability	x		The artefact is easily comprehended, both at a global level and at the detailed level of the elements and relationships inside the artefact	(Prat et al. 2015)
Importance	x	x	The importance of artefact to practice perceived by practitioners.	(Rosemann and Vessey 2008)
Accessibility	x	x	The artefact is understandable by practitioners with an appropriate terminology with focus on the practice	(Rosemann and Vessey 2008)
Suitability	x	x	The applicability of artefact to the practice	(Rosemann and Vessey 2008)

Based on the criteria shown in Table 94, a questionnaire was created using a Likert scale for ten statements: 1. Strongly disagree; 2. Disagree;3. Slightly Disagree; 4. Slightly Agree; 5. Agree; 6. Strongly agree, to evaluate the artefact with experts.

Table 94. Questionnaire for Evaluation the IT Governance Mechanisms Baseline

	Criterion	**Statement**
1	Completeness	The Baseline contains all the necessary mechanisms to an effective IT governance at universities.
2	Ease of use	The Baseline of mechanisms is well described and ease of use and implement in the universities with little effort.
3	Fidelity with real world phenomena	The proposed baseline corresponds to a possible solution for the suitable choice of mechanisms for IT governance at universities.
4	Internal consistency	The Baseline uses an adequate terminology, is well written and justified with the theory.
5	Level of Detail	The Baseline contains a sufficient level of detail in each mechanism for IT governance at universities.
6	Simplicity	The Baseline contains the minimum number of mechanisms for IT governance at universities and they are easy to implement.
7	Understandability	The baseline is easily understood as a model for IT governance at universities as well as the meaning of each mechanism is easily understandable.
8	Importance	The Baseline is important for IT governance at the universities.
9	Accessibility	The Baseline has an understandable terminology with a practice perspective not only theoretical.
10	Suitability	The Baseline of mechanisms is applicable in the practice to assist the IT governance at universities.

As mentioned earlier, the evaluation is a crucial and important part in the DSR. To evaluate the artefact, universities were selected from other contexts and there were different than the ones selected to develop the artefact. This choice allows us to have more rigour in the evaluation ensuring that the artefact can really work in practice.

5.2 Interviews with IT Experts

Universities in four different countries, Brazil, Portugal, Spain, and Germany were contacted. The evaluation of the university in Portugal was *in loco* and the ones in Spain, Germany, and Brazil via Skype. All the interviews were recorded and began by introducing and explaining the research's context as well as the problem and the proposal. Then, all the steps of the artefact's development process were presented showing the importance of the artefact's evaluation for the IT managers, IT directors, CIO and business people as well as the people involved in IT at the university.

It was also explained that the artefact contained three main parts: the structure, process, and relational mechanisms, and that each one of these dimensions encompasses several mechanisms, which

definitions were also explained. In this phase, the Author adopted a realistic language showing the importance of these mechanisms, their relationship with practice, and the advantages of their implementation and possessing an effectiveness ITG in universities. Additionally, the experience and knowledge acquired from the interviews in other universities were shared as well as the obtained results. All doubts were elucidated in this phase.

Finally, after all of these phases, the evaluation process was started. Table 95 presents the position, education and work experience of the university IT experts in the field of teaching, research, and service to the community.

Table 95. Details about the interviews in the Evaluation

	Country	Public University	Position	Education and Work Experience
1	Portugal	Size: large Number of IT employees: 50-99	IT Services Director	Master in Computer Science Experience of over 20 years on IT. Currently, over five years in the director position.
2	Germany	Size: extra large Number of IT employees: 100-300	Chief Information Officer	PhD with over 30 years of experience on IT. Full professor and researcher at the university.
3	Portugal	Size: large Number of IT employees: 24-50	IT Technical coordinator	Master in Computer Science. Experience of over13 years on IT. Strong experience with IT governance and research in the universities
4	Brazil	Size: extra large Number of IT employees: 100-300	Chief Information Officer / Consultant	PhD in Information Technology and Business with over 40 years of experience on IT at universities. Over 20 years of experience on corporate and IT governance Consultant in several Brazilian universities
5	Spain	Size: extra large Number of IT employees: 100-300	IT Director	Master Over 22 years of Experience on IT Currently, over two years on IT Director position

Table 96 illustrates the findings of questionnaire applied with the IT experts to the evaluation of IT Governance Baseline. As mentioned earlier, the questionnaire was applied in accordance with criteria defined and developed in the Table 94.

Table 96. Findings of Evaluation IT Governance Mechanisms Baseline

	Statements	Interviews				
		1	2	3	4	5
1	The baseline contains all the necessary mechanisms to an effective IT governance at universities.	Strongly Agree	Agree	Agree	Strongly Agree	Agree
2	The baseline of mechanisms is well described and ease to use and implement in universities with little effort.	Slightly Agree	Slightly Agree	Slightly Agree	Slightly Agree	Agree
3	The proposed baseline corresponds to a possible solution for the suitable choice of mechanisms for IT governance at universities.	Strongly Agree	Agree	Agree	Agree	Agree
4	The baseline consists of adequate terminology, is well written and justified with the theory.	Strongly Agree	Agree	Slightly Agree	Strongly Agree	Agree
5	The baseline contains a sufficient level of details in each mechanism for IT governance at universities.	Strongly Agree	Slightly Agree	Agree	Slightly Agree	Agree
6	The baseline contains the minimum number of mechanisms for IT governance at universities and they are easy to implement.	Strongly Agree	Disagree	Agree	Agree	Agree
7	The baseline is easily understood as a model for IT governance at universities as well as the meaning of each mechanism is easily understandable.	Strongly Agree	Strongly Disagree	Strongly Agree	Agree	Slightly Agree
8	The baseline is important for IT governance at universities.	Strongly Agree	Agree	Strongly Agree	Strongly Agree	Agree
9	The baseline has an understandable terminology with a practice perspective and not only theoretical.	Strongly Agree	Slightly Agree	Agree	Agree	Agree
10	The baseline of mechanisms is applicable in practice to assist the IT governance at universities.	Strongly Agree	Agree	Strongly Agree	Agree	Slightly Agree

Table 97 provides quotations from the interviews relating to each criterion. This qualitative information is useful for a better understanding the evaluation process.

Table 97. Evaluation (feedback from IT responsible)

Criterion	**Quote from IT Expert**
Completeness	The proposed baseline has the essential mechanisms and it is a sufficiently comprehensive base focusing on the IT governance domain in higher education institutions. I suggest adding two mechanisms, which in practice could have a positive impact on successful implementation of an ITG model, namely: Service Level Agreements (SLA). The implementation of the ITSM in any institution should guarantee the service level agreements between different stakeholders' types. The absence of this mechanism makes it difficult for the latter to understand the value that IT brings to the institution, besides the bureaucracy, usually associated with these ITSM processes. The second proposed mechanism is the relational mechanism of Reward and Incentives in the context of human resources management, with the purpose of motivating the institution's employees to reinforce desired behaviours by the managers. (3). In general, it contemplates the spectrum for IT governance at universities. (4)

Criterion	Quote from IT Expert
Ease of use	Some mechanisms are easy to implement, others depend on several factors, among others, such as time and human resources (1). It is not in this presented specific ITG mechanisms proposal, but rather in my opinion, that whatever approach or ITG model will never be easy to implement in a university (or other institution type). The effort will always be significant, and it will be greater, the lower the institution's maturity degree in the ITSM issues and its availability for organisational changes that this approach type implies. In my opinion this will even be one of the key factors for the success and the implementation ease of this baseline but for this it is necessary a good capability of Organisational Change Management. "If we think it, in the public universities in Brazil, the proposed model is not easy to implement. There is still a lot of resistance and lack of vision in the IT management. The vision of IT in these university types is still highly technical" (3).
Fidelity with real world phenomena	The answer is based *only* on the realities that I know about some Portuguese universities. The universities are still in a very early stage of adopting these IT governance methodologies. I would even say that, except for mechanisms related to IT management (ITSM) namely the implementation of key processes as Incident Management, Service Requests, Problem Management, Asset Management and Service Desk functions, our universities are not yet sufficiently aware of the importance of implementing a significant set of proposed mechanisms. It particularly relates to the relational mechanisms, where the communication, leadership management, and knowledge sharing are still at a very early stage of maturity (3). I agree. However, the proposed model does not correspond to current reality of universities. The Brazilian public and private universities have still a long way to be explored in this topic. They need a better understanding of the objectives that should be followed, making documentation through plans, measuring achievement of goals through indicators, mainly, of alignment of IT to business and not of business to IT (4).
Internal consistency	I suggest to join the process mechanism dashboard together with the mechanism performance measurement to form one mechanism (i.e. performance management). The dashboard is an tracking the ITG performance instrument at the institution. The processes test and experiments of solutions and methodology to manage disruptive innovation, I suggest to merge in a unique mechanism named management innovation, where available all the activities and resources such as tests and adoption of new technologies to help the universities in the innovation process would be available. I would also propose renaming the relational mechanism of relational partnership between university and software industry to something more generic such as external IT relationship. Where the partnership would be with all industry types, not only with the software industry. This partnership would have flexibility and new audiences, not only cost reduction (3).
Level of Detail	*"This is not detailed enough from my point of view"* (2) I think the model should present more details, because the used word was implementation. In my viewpoint, governance is a good management practice. Thus, I visualize the model in terms of processes, but not in terms of activities and indicators in each activity. If this details level were to be added, it could be easier for universities´ managers and IT staff to more effectively understand what should be done to implement IT governance. (4) Overall, I agree with the detail presented in the descriptions of all the mechanisms. However, I would suggest not being so explicit in including specific examples of certain technologies or references to certain products (e.g. blackboard, Microsoft Power BI, Google) (3).
Simplicity	*"This may be the essential mechanisms – but this is not easy to implement! To create a working ITG framework, it takes a lot of effort and a long time. Many failed!"* (2) The issue of the simplicity / ease of understanding of the mechanisms always depends on the maturity level in each particular university, regarding their knowledge in this theme (3).

Criterion	Quote from IT Expert
Understandability	I consider that the three components: the structures, processes and relationships, are well detailed in terms of processes and / or practices. However, in my view, more details in each process and/or practices of the mechanisms could be interesting. Also, including the monitoring indicators of these processes/practices and the activities within the practices could provide a better understanding of the whole model (4). "I think that the baseline is very well-defined and, although it is easily understandable for someone who has worked as a manager. The problem emerges when you need to explain that structure to someone who works in a technical IT position. Both positions have to interact with each other and often an IT technician does not perceive the usefulness or functionality of certain management positions" (5).
Importance	"*The recommendations 1-15 are definitely important* "(2) "Yes. I am sure." (4).
Accessibility	Based on my experience, the proposed model's language is easy to understand for managers. However, the practical application of each process (or practice) in each mechanism is not clear to IT managers (4).
Suitability	"*The baseline can sure be of assistance*" (2) Certainly. However, it is recommended to perform activities and monitoring indicators by practice and by activity (4). "*Not always, because often a management position has to "fight" with the inertia that moves certain technical departments, which are not accustomed to management positions involved in the management and development of their projects* "(5). The practical applicability of the proposed mechanisms is possible (3).

The comments provided in Table 97 were analysed using content analysis Myers(2013) where the data collected in each criterion were analysed comparing the keywords and the meaning of the text aiming to improve the artefact. Subsection 5.3 provides the analysis and conclusions from the baseline evaluation.

5.3 Analysis

The ITG mechanisms baseline was evaluated with IT experts from universities of different contexts. As a result, it was concluded that the structure, process, and relational mechanisms were relevant for the practitioners to be implemented for an effective university IT governance. Although some mechanisms were difficult to implement due to the current reality in the universities, human resources issues, and time and organisation culture for changes, the ITG mechanisms baseline had a deep appreciation of the IT experts. Furthermore, the interviewees' feedback provided interesting points to be taken into account when implementing specific mechanisms.

In addition, the proposed guideline with the implementation order of each mechanism was helpful for ITG in the universities. This guideline can be applied to all universities. However, it is not a "silver bullet" for university IT governance. To the Author's best knowledge, the proposed model can be useful for

universities to implement ITG or even to choose suitable mechanisms for their actual IT governance model, however it is conceivable that the proposed model would not solve all problem of universities IT governance, but it could be a good starting point. Furthermore, the effective ITG implementation at universities always depends on the human resources, time, management's support, ITG maturity level, and a desire for changes.

One example, regarding the mechanism University and Software Industry Partnership, is the adoption of the Gmail and Microsoft Services that had a high relevance for most of universities. Nonetheless, the evaluation made in Spain revealed that it was an important mechanism to reduce infra-structure cost such as hosting and storage, but due to the county´s data host law, is not permitted to outsource this kind of service (i.e., host e-mails and store personal and institutional files).

Concerning the Completeness criterion**,** most of the interviewees agreed that the baseline contained all the necessary mechanisms to an effective ITG at universities. However, the respondent No.2 commented that a mechanism was missing, but he/she did not name it. On the other hand, the interviewee No.4 suggested two mechanisms to be included: the Service Level Agreements (SLA), and the Rewards and Incentives. However, after an analysis, it was decided not to include them. The literature review's findings and the multiple case studies revealed that these mechanisms did not have a significant impact on IT at university. According to the Service Level Agreements (SLA) mechanism, the aim was to answer the tickets on time. Therefore, in the case of universities if a problem is not solved on established time it does not impact the business.

The other suggested mechanism was the Rewards and Incentives motivating employees to do the desirable functions on IT. The results in the preformed case study also demonstrated the difficulty of implementing this mechanism in universities, especially in public universities due to the national rules and laws that forbid this kind of reward. |Unlike in the financial industry, where providing rewards and incentives for the best employees and motivate them with special packages is easier due to the management model.

In the second criterion, the Ease to Use, all the interviewees were in agreement. However, ease of use and implementation effort are quite dependent on university's reality. As discussed by an interviewee, the ease of use always depends on specific internal factors in each organisation such as time, human resources, management support. In addition, as pointed out, ITG model implementation in a university

or in other institution type will never be easy. The implementation ease depends on capability to manage organisational change, hence high organisational Change Management capability is required. Thus, these issues are interesting factors to be considered in future studies.

The third criterion, the Fidelity with Real World Phenomena, also reached consensus between all the interviewees about that the ITG baseline corresponded with a possible solution for assisting the right choice of ITG mechanisms at universities. However, it was stressed by two interviewed institutions (a Portuguese, and a Brazilian university) that the universities are not sufficiently aware of the implementation importance of a significant set of the proposed mechanisms. It means that in-depth awareness is necessary in people holding management positions at universities to resolve the ITG issues. The interviewee No.4, pointed out that in his/her experience, in the case of Brazilian universities, there is a lack of clear understanding of IT objectives for universities to align with business.

Thus, the universities need to create an understanding of the impacts that IT can bring to business. In this particular baseline, the first proposed mechanism of the guideline was creating an environment for the university's top management to realize the IT's importance for business and in the case of universities, the IT's impact on teaching, research and learning. To summarize, even though the proposed baseline had a fidelity with the real word on ITG, universities still need to work out awareness about the ITG issues in the top management position to implement the mechanisms.

The fourth criterion, the Internal Consistency**,** also had an agreement of all the interviewees on the fact that the ITG baseline used an adequate terminology, it was well written and justified with the theory. However, the interviewee No.4, suggested some interesting ideas to merge or even change the terminology and the name of specific mechanisms. The interviewee suggested to merge the process mechanism Dashboard and the mechanism Performance Measurement to a single mechanism (i.e., Performance Management). According to him/her, the Dashboard is an instrument to track the ITG performance at an institution. The Author agrees with the view point, however in practice, to his best knowledge, a particular mechanism named dashboard may be useful for ITG at the universities. Moreover, it was chosen to emphasize this mechanism and it was included as a unique process mechanism. The aim was to make the practitioners pay attention to a tool such as dashboard and realise that it is essential not only indicators for performance measurement.

Another suggestion was to merge the mechanism Test and Experiment of Solutions with the Methodology to Manage Disruptive Innovation into a mechanism called Management Innovation. In the Author's view point, the management innovation is a generic ITG area with more global innovation and purpose and these mechanisms are more specific and more practical for universities. Nonetheless, the suggestion was helpful to re-evaluate the mechanism and the model.

Lastly, the suggestion was to change the Partnership Between University and Software Industry name to something more generic, for example External IT Relationship. According to the interviewee, the relationship could be with any organisation not only with the software industry. However, in accordance with the findings, the relationship with the software industry was a mechanism with positive empirical outcomes. It showed that universities need to create a relationship with the software industry to reduce costs and get advantages. On the other hand, the interviewee pointed out interesting perspectives that the relationship should take into account such as flexibility and audiences, and not only the cost reduction. Thus, to the Author's best knowledge, proposing the External IT Relationship mechanism would be too generic for practitioners.

To summarize, even though the interviewee No.4 made some interesting suggestions, generally the criterion Internal Consistency also was fulfilled.

The fifth criterion, the Details Level was also agreed upon by all the interviewees. The ITG baseline contained a sufficient details level in each mechanism for IT governance. However, the interviewees No.2 and No.4 suggested that more details were necessary. In the case of the interviewee No.2, he/she commented that the model was not sufficiently detailed. But, he/she did not explain what kind of details were necessary or would be interesting. At the same line, the interviewee No.4 suggested that it would be interesting to include indicators and activities for each mechanism.

On the other hand, the interviewee No.3 voiced concerns that the proposal should not be so explicit in including specific examples of technologies or references to certain products (e.g., blackboard, Microsoft Power BI, Google). The objective was to show with the products the link between practice and actual reality in universities

Such feedback is interesting to improve the ITG baseline. Nevertheless, this baseline's objective was to create a simple and easy to use artefact. Moreover, to include indicators for each activity, a deep study

for each mechanism is necessary. Since the goal of this research was to propose a model and not to develop a method, the details level seems adequate. Thus, it is claimed that the criterion Details Level was fulfilled and the interviewees' suggestions are stimulating and deserve attention however in future works.

The sixth criterion, the Simplicity, had an agreement of all the interviewees which means that the baseline was in line with a minimum mechanisms number for IT governance at universities and implementation ease was sufficient. Only the interviewee No.2 disagreed, however he/she claimed that the ITG baseline had the essential mechanisms but they were not easy to implement due to the necessary effort inside the organisation. Indeed, any model or framework requires to implement changes in the organisation's management as well as the commitment and sponsorship from the top management.

On the other hand, the interviewee No.3 pointed out that the simplicity / ease of understanding issue of mechanisms always depends on the maturity level in each particular university, regarding their knowledge in this domain. It showed that any ITG model implementation takes a long term and effort. Regardless the knowledge and the maturity level about ITG in the organisation, any implementation is a long and tough process in which it is necessary to have commitment from all stakeholders. Thus, based on the evaluation by the interviewees, it was accepted that the ITG baseline fulfilled the simplicity criterion.

The seventh criterion, the Understandability**,** concerning how easily the baseline each mechanism's meaning are understood as a model for IT governance at universities achieved an agreement of the most of the interviewees. Only the interviewee No.2 strongly disagreed, however he/she did not present any explanation for such answer. On the other hand, the other interviewees agreed that the ITG mechanisms baseline was well detailed in terms of the structures, processes and relational. In the same way, the interviewee No.5 also agreed that the ITG baseline was well defined but stressed the difficulty in explanation of some management issues to people with a technical IT background. As mentioned, these are some challenges to be confronted the context of universities. To sum up, the proposed ITG baseline fulfilled the criterion Understandability in accordance with the evaluation analysis by the interviewees.

Regarding the eighth criterion, the Importance, the results showed an appreciation and agreement of all the respondents, with three responses being Strongly Agree and two Agree. In addition, the interviewee No.2 reiterated that the practical recommendations from 1-15 were definitely important. Such responses showed that the proposed baseline as well as the guideline had an acceptance by the practice community.

The ninth criterion, the Accessibility**,** which relates to the baseline's terminology and if it is understandable from a practical, and not only theoretical, perspective. This criterion had an agreement of all the interviewees. The interviewee No.4 stressed that the proposed model's language was easy to understand for managers. However, the practical application of each process (or practice) was not clear to IT managers. Such response was in line with the previous responses by this interviewee where it was indicated that in-depth details with indicators and metrics in each mechanism were necessary. From the Author's view point, in accordance with this particular university's reality implementation of some ITG mechanisms is necessary with well detailed tasks and indicators. Nonetheless, it is claimed that this criterion was also fulfilled, taking into account the diversity of the universities overall evaluation.

Finally, the last and the tenth criterion, the Suitability, used to evaluate the applicability of the mechanisms baseline in practice to assist IT governance at universities. All the interviewees agreed that the proposed ITG baseline was applicable and could be used in the universities context. Nonetheless, some interviewed emphasized some points. The interviewed No.5 argued that such mechanisms were not always to be implement due to the technical departments needing to have more awareness and focus on management. To summarize, although the ITG baseline was applicable to universities, it was perceived that each university has its own peculiarity and difficulty. In particular, in some universities it is necessary to increase the management's awareness in the technical departments, for another one an ITG model needs to be well detailed with indicators for monitoring. However, in a holistic view, it can be stated that the proposed mechanisms are possible to be implemented and can help ITG in the universities context. Therefore, according to the interviewees' answers, it is claimed that the proposed ITG baseline is applicable for universities and fulfils the criterion's requirements.

In conclusion, the proposed baseline's evaluation had a high university expert's acceptance level. Moreover, based on their answers, the criteria defined to evaluate the artefact in Design Science Research were reached. Concerning the suggestions and feedback received in order to improve the artefact, several suggestions were included. However, in-depth details about the indicators and activities were not included. In the Author's view point, more studies on each mechanism are needed to identify what kind of details level should be reached. Such suggestions are interesting and should to be better explored in future work and move from a model to a method deeper detail.

Despite the importance recognition of the impact in the practice of such mechanisms, the findings revealed that universities are still in an initial maturity level concerning ITG focused on the technical part of infrastructures rather than management. Therefore, it is a quite notorious that there is a long way to implement ITG mechanism at universities. In addition, managers need to have awareness that IT can bring several benefits for education and work and can be a driving force for transforming the education.

5.4 Validity

The criteria proposed by Carvalho (2012) were used for validation of the knowledge-for-a-purpose created in this research. The criteria were as follows: success of artefact, generality, novelty, and capability for explanation.

Success

The artefact's success can be determined in terms of usefulness, efficacy, and efficiency. The proposed ITG mechanisms baseline achieved the objective of this study. The ITG mechanisms baseline can be used in a small university with few IT employees and students as well as in large institutions with a variety of characteristics with multi-campus.

Generality

The validity criteria for generality are supported by the case studies from the literature review where universities were analysed for different characteristics. Therefore, we used the contingency factors such as culture, size, type, control regional differences, and IT organisation structure. The aim was to generalize the mechanisms baseline to universities with different configurations.

Moreover, multiple case studies were performed a with ten different universities from Brazil, Portugal, the Netherlands, Spain, and Israel and helped to refine and improve the initial mechanisms baseline from the literature review. Additionally, the interviews were useful to confirm and add information to this particular context. Therefore, the ITG mechanisms baseline can be used to implement ITG or improve the current ITG system in any university knowing the mechanism and tools.

Thus, to support the artefact generalization, extensive literature review was carried out analysing the ITG mechanisms implemented in thirty-four case studies in universities. In contrast with the models and frameworks proposed in the literature review for universities, our model aimed to have a holistic approach

with suitable mechanism for all countries. We did not take in account specificities such as the countries or universities rules and laws. Of course, some particular mechanisms would have to be attuned to the university's reality.

The interviews were useful to analyse each mechanism's effectiveness and to state whether it should be adopted or not. Additionally, seven new mechanisms were identified to compose the baseline according to CIO´s recommendations and the data analysis.

The exploratory studies of ten universities helped to discuss and refine the ITG mechanisms list for universities as well as to comprehend if the mechanisms that should be adopted or not. Therefore, it can be stated that the ITG mechanisms baseline will not solve the ITG problems in all universities around the world. However, the built ITG mechanisms baseline are a good starting point for ITG implementation in any university, helping to decide which mechanism to implement first.

To summarize, the artefact generality can be observed by the rigor in the artefact's developing process covering the studies on literature review, an in-depth exploratory case study and the evaluation with other universities.

Novelty

The research outcome is a new knowledge. The literature showed ITG mechanisms in general. However, the challenge is to comprehend and to identify the suitable mechanisms to a particular context. Additionally, the implementation importance order was described. Therefore, the effectiveness and implementation ease of these mechanisms were analysed in an exploratory study in ten universities in five different countries. Furthermore, the ITG baseline was increased adding new mechanisms oriented to universities context. The new knowledge created is useful to any ITG implementation project that may contribute to increase the strategic alignment.

Regarding the DSR knowledge contribution, the framework proposed by Gregor and Hevner (2013) to classify this knowledge was adopted. According to Gregor and Hevner (2013) the DSR knowledge contribution in this thesis is classified as Exaptation: Known Solutions Extended to New Problems. In the "exaptation research, the researcher needs to demonstrate that the extension of known design knowledge into a new field is nontrivial and interesting. The new field must present some particular challenges that were not present in the field in which the techniques have already been applied".

As mentioned earlier, the universities are organisations with characteristics different from industry. To give an example the mechanisms identified in particular to the universities context such as the Test and Experiments of Solutions, Knowledge Sharing Among Universities, and Engagement Between IT and Academia. These are some mechanisms examples identified in our exploratory study that are particularly suitable to the context of this kind of organisation. Such mechanisms were not identified in studies in other industries on IT governance, according to the Author's best knowledge.

Explanation Capability

The capability of explaining why the proposed solution is useful or more efficient than alternative solutions (Carvalho, 2012). Additionally, Piirainen et al.(2010) also state that a solution needs a clear justification, robustness, and clarifications, plus the artefact's reliability to solve a problem.

The first explanation of the IT governance mechanisms baseline reliability is related to the fact that the proposed mechanisms fulfil the requirements defined for the problem's solution in the five specific objectives. Moreover, the solution provides suitable mechanisms to IT governance in a particular industry type. In contrast with alternative solutions that were developed for a specific country or organisation, the solution proposed in this research presents more holistic approach. Additionally, the IT governance mechanisms baseline is simple to be adopted and implemented by universities from different contexts. The ITG baseline was validated with IT directors, Chief Information Officers and IT coordinators. These people had a strong IT and business background on IT governance at universities. It showed that the solution adopts a common vocabulary from all the organisation areas and meets the knowledge of people with different expertise.

Another robustness's aspect of the ITG mechanisms baseline is related to the fact that it was developed with a variety of case studies from a literature review using Web of Science, Scopus and AIS Electronic Library (AISeL). These databases provided the scientific community with coverage of most important journal, conferences papers in the information system area. Moreover, the ITG mechanisms baseline also took into account the suitable mechanisms identified in the literature review as well as identified new mechanisms in an exploratory study from the practitioners' perspective. Therefore, the requirements to build an artefact reached the robustness criterion. The next chapter presents the discussion and conclusions of this thesis

6. DISCUSSION AND CONCLUSION

This chapter presents the conclusions as well as the practical and theoretical contributions. The limitations of this thesis and suggestions for further research are also shown. Finally, the research publications and the final remarks are presented.

6.1 Revisiting the Research Question and the Objectives

The objective of this research project was to develop a baseline model of IT governance mechanisms for universities. In order to do this, the research question of this thesis was defined as **"What is the baseline of mechanisms to govern IT in universities?"** To answer this research question, four objectives have been developed that are explained below as well as how they were accomplished.

The first research objective was to **"Identify the IT governance mechanisms from the literature review".** This objective was reached in Section 2.5 where an extensive literature review was performed and 46 IT governance mechanisms, 17 structure mechanisms, 15 process mechanisms, and 14 relational mechanisms were identified. These mechanisms may be considered as generic to IT governance and adopted to all industry types. Additionally, the IT governance mechanisms can differ, according to the organisation's expectations and benefits, when implemented in a particular context (De Haes and Van Grembergen 2008b; Huang et al. 2010; Lunardi et al. 2014b; Pereira et al. 2014a; Peterson 2001; Sambamurthy and Zmud 1999). These mechanisms were adapted from the study carried out by Almeida et al. (2013b). However, the endeavour of the review was to identify which of these mechanisms have been adopted by the universities as well as which were the most appropriate ones.

The second research objective was defined as "**Analyse the IT governance mechanisms that were implemented in different universities"**. A list of the 46 IT governance mechanisms identified in the first objective was used for this purpose. Hence, an extensive literature review in databases such as Web of Science, SCOPUS, and AIS eLibrary (Association for Information Systems) was performed. Furthermore, the most important academic portals regarding IT in higher education, two information systems associations in universities, EDUCAUSE in the United States of America and UCISA in the United Kingdom, were also examined (See Section 2).

In the literature review process, 26 articles representing 34 case studies in universities were identified. The list was updated in November 2017. It was not surprising that the number of studies on IT governance in universities, was lower than in other industries. Moreover, as stated previously, studies on this type of organisations are limited and scarce. To identify the mechanisms, the articles were closely and meticulously examined to understand the effectiveness of each mechanism as well as its implementation. The mechanisms identification process was a huge endeavour, because most of the studies did not adopt the same mechanisms' definitions in accordance with the literature review. Therefore, each mechanism's definition from the literature review was compared with the definition implemented in the case studies. In addition, NVIVO software was used for assistance during this process.

The review process was useful and crucial to understand the mechanisms implemented by other universities as well as the mechanisms' practical implications. Moreover, if the mechanism was adopted by other case study, it was an indication that it might have a positive empirical result and thus it was a candidate for the baseline. The Table 12 to Table 17, in the Section 2.5 present a list of these mechanisms as well as a quantitative and qualitative evaluation of each of them regarding their implementation, effectiveness, and ease of implementation.

As a result, a list of effective IT governance mechanisms found in the literature was created and considered as the baseline. The purpose of it was to create a reference point for an effective IT governance at universities thus it was ascertained that the identified mechanisms were appropriate and enough to be the starting point minimum for an effective IT governance at universities.

Most of these mechanisms did not provide enough empirical information in the case studies analysed in the literature review. In some examples such as the “Service Level Agreement – SLA” and the “Partnership rewards and incentives” no detailed evidences were identified about effectiveness. mechanisms'

Hence, the initial list of the 46 IT governance mechanisms identified in the research objective 1 was used to analyse the effectiveness and ease of implementation of each mechanism.

The second part of the baseline developing was to identify the structure, process, and relational mechanisms in different universities.

To ensure the studies' validity and reliability the cases were carefully selected. Multiple case studies were conducted on the IT department units of ten universities across five countries: Brazil, Portugal, The Netherlands, Spain, and Israel. Convenience sampling was adopted to select a variety of universities from different contexts with a variation in institutional size, culture, control type, and IT organisation structure to reduce contextual bias (Creswell 2013; Dubé and Paré 2003).

Pre and a pilot tests were performed. Before moving to interviews, an instrument with the same set of questions to be used in the interviews to collect data online using Lime Survey was developed. The pre-test was carried out with two experts that have been working on IT governance and also have been teaching this topic in public universities in Portugal, and with a CIO of a large university in Brazil. The received feedback indicated that the instrument was extensive to respond. Moreover, a comprehensive explication of each mechanism's definition was necessary before application of the questionnaire. According to the experts, the researcher's face-to-face involvement was crucial for the data collection. Therefore, these suggestions were followed during the research.

Additionally, it was also perceived that the researcher could not interact with the interviewee, discuss, explain nor confront the data with other source from university. Furthermore, it was found out that a questionnaire just with closed question was not appropriate because the interviewee could not suggest and include new mechanisms. Besides, with this approach, it was not possible to value the practitioners' experience. That is why interview was adopted to collect data as the most suitable method to answer the research question.

The multiple case studies carried out in this research allowed to draw conclusions from ten case studies to complement the case studies analysed in the literature review as well as to develop a baseline. In doing so, it was intended to uncover other mechanisms, from the practitioner’s experience, that have not been adequately covered in the literature, particularly for universities. The interviews were conducted with the universities’ IT decision-makers at the top and medium management levels (CIO, IT coordinator, and IT director) usually responsible for all that concerns the IT sector (ITGI 2003).

Thus, an incremental identification process of new mechanisms, in particular in higher education context, was followed moving from one case to another. Regarding the cases number and necessary interviews, the recommendation of (Creswell 2013; Myers 2013) were followed where the data collection saturation

is reached when no new insight or news are revealed by the participants. In this case, no more new mechanisms were proposed after the fifth interview, that suggested eight new mechanisms.

An interesting point during the proposing process of universities IT governance mechanisms baseline was that the literature was reviewed for the mechanisms that were found in our case studies to check if they had not already been proposed by other authors. In addition, also to maintain the rigour and the same meaning for each identified mechanism in other articles. This study was useful for understanding different perspectives on IT governance at universities as it has acquired valuable information regarding each mechanism. Thereafter, with the mechanisms analysis in the literature review, and the mechanisms identified in the exploratory case study the research moved on to the third stage.

The third research objective aimed to **"Propose an IT governance mechanisms baseline for universities."** To develop the baseline, we integrated the findings from different sources: the literature review and the cases studied in our research.

In this phase, the quantitative data and the new mechanisms suggested by the interviewees in the several case studies were analysed. To analyse the results, a triangulation of the effective mechanisms identified in the literature review (Chapter 2) with the mechanisms identified in the conducted case studies was performed. This triangulation allowed to obtain more reliable outcomes for each mechanism.

This is the minimum set of mechanisms found suitable to assure for effective IT governance at universities. In this thesis, the ITG baseline proposed is considering ITG mechanisms for universities.

The research on IT governance governance mechanisms in particular in universities are scarce. However, there is a huge concern and interest in research in this area in this complex type of organisation. This thesis contributes to an increase in the knowledge of IT governance in universities.

The fourth and last research objective was to **"Evaluate the proposed baseline".** The evaluation process was carried out with experts from universities other than those used for the data collection. The IT governance mechanisms baseline was validated with IT experts from five international renowned universities in four countries: Brazil, Portugal, Germany, and Spain. The universities and the experts, having deep knowledge of the IT technical area and are working as researchers in academia, were carefully chosen for the evaluation process to keep the rigour and the expertise level in this phase.

As a result of the universities IT governance mechanisms baseline evaluation, it was concluded that the structures, processes, and relational mechanisms were relevant, in the eyes of the practitioners, to be implemented in order to increase the IT governance's effectiveness. Nevertheless, some of the mechanisms may be difficult to implement due to the current reality of the universities and issues related to human resources, and time and organisation culture. All the experts shared a deep appreciation of the IT governance mechanisms baseline.

Moreover, the proposed guideline of the implementation order for each mechanism was helpful for IT at the universities. A highlight of this guideline may be applicable to any university, however it cannot be considered as a “silver bullet” for IT governance in all universities. Nonetheless, the proposed model may be useful for universities to implement or re-evaluate their actual IT governance model. In spite of the fact that the proposed model could not necessarily solve universities' IT governance problems, the proposed mechanisms could be a good starting point for that purpose. For example, the “Partnership Between university and software industry” mechanism having Google or Microsoft as partners, had a high relevance for most of the universities.

The expert interviewees highlighted the baseline's importance and usefulness for this particular context. Moreover, as pointed out in one of the cases, the maintenance of infrastructure with over thirty thousand email accounts, plus a file repository for each student is expensive in terms of investments in hardware, software, and human resources to manage it. Therefore, universities increasingly need to look for alternative solutions. Entering into agreements and partnerships with the software industry may be an advantageous way to solve some of the problems. Companies such as Microsoft or Google, among others, are interested in making their solutions available for the society in order to spread knowledge and promote new applications. It was shown that the return on universities' investments on these services was possible due to agreements and special offers for the educational context. Some universities encourage their students to use the Google IT Services for educational purposed.

Another mechanism having a significant impact on Business-IT alignment is the Engagement Between IT and Academia. One example pointed out, in the first validation, that the IT department needed a solution for a problem and appealed for help to a computer science school. The school accepted the request what resulted in a Master's thesis focused on developing a software for monitoring and registering of a network

equipment. This solution, being useful, showed the importance of creating partnership and engagement with faculties.

University is a learning place and the IT internal support and administrative unit need IT solutions to certain IT problems. IT departments usually do not have enough human resources to develop particular solutions to enhance processes in the academic environment. Thus, it is strongly recommended to have an interaction and partnership with the faculties in the university to share real IT problems to be debated and studied internally within the classroom.

This type of problem, once time modelled with the software requirements using formal languages, makes the task easier to be transferred and developed in the computer science school by students. Moreover, this kind of project impacts positively both IT process innovation in university as well as in teaching models and practices in the classroom. Students can see they are developing solutions for a real environment and understanding the benefits for the university. However, IT and academia need to be aware about this challenge in working together and the real benefits for the university overall.

To conclude, the IT governance baseline was evaluated according to the Design Science Research recommendations (March and Smith 1995; Rosemann and Vessey 2008) and the results were validated basing on the recommendations of Carvalho (2012). The success criteria of the artefact, generality, novelty and capability for explanation were reached and explained in Section 5.4. Therefore, from the Author's point of view the artefact developing process using the Design Science Research, followed rigorously and accomplished all the steps.

First, the problem was identify based on the Author's background education and experience, and on an extensive literature review process. Second, the findings used to develop the IT governance baseline model were identified in the literature review of 34 case studies in the universities context (Section 2.5) and a lack of qualitative information was perceived in each mechanism. Third, the multiple case studies allowed to better understand and support the mechanisms already identified and to identify new mechanisms for a particular context of universities. Thus, the integration of these two components allowed the proposal of the ITG baseline. To summarise, the proposed IT governance baseline may be a starting point for all types of universities in a different context.

This thesis considered implemented of suitable IT governance mechanisms to develop an IT governance mechanisms baseline specifically applied to universities. Moreover, the developed model had a holistic approach and did not take into account some specific policies or laws in each country or university. Therefore, this study also contributes to cover the literature gap about the ease of implementation and effectiveness of IT governance mechanisms. Thus, the use of a qualitative approach with a case study method, using interviews to collect data, was the most appropriate approach for the addressed problem.

The main conclusions from this research are:

Universities increasingly need to be innovative to address the market's requirements and promote better processes and services for teaching, research and service activities. In this sense, is crucial that they to manage innovation inside their IT departments by testing and implementing new solutions to provide the same services, products, and courses with low and affordable prices. Moreover, internal integration among the IT, schools and faculties of the university is necessary to have an overview about the needs of the IT. All of these elements, the IT and academia people, must be engaged with a unique purpose of promoting better IT governance. Formation of an innovative and enterprising environment expected as a result of this co-operation and integration. Therefore, it is necessary for the universities in order to have an effective IT governance, to focus on the innovation managing by providing an environment for testing and experimenting new solutions, sharing their knowledge with other universities, going into partnerships with industry, and engaging in relationships with internal schools and faculties. Sharing of the models, practices, and problems' solutions with others universities, particularly in the public sector, must be permanent to help to choose and manage a model which is easy to implement and operate model.

We can argue that while the IT governance in the literature is related mostly to accountability, decision making, monitoring and control, however the findings of this research revealed that it is mandatory for universities to take into account some other issues for an effective IT governance. Firstly, the partnership with industry, in particular with the software industry from which it is possible to obtain many benefits. Secondly, to share knowledge about a model, practices, problems, and solutions with other universities. Thirdly, to provide an environment for testing and experimenting of new solutions to create an innovative IT close to and aligned with business. As a result, IT can be a relevant factor to transform education.

To summarise this research in three questions “what?” “how?” and “why?” below is explained:

What - Developing suitable mechanisms for IT governance baseline for universities.

How- Analysing and identifying effective IT governance mechanisms in the literature review and in multiple case studies.

Why - The academic environment poses some particular challenges to the information technology governance. A few studies in the literature showed an effective IT governance mechanisms for this particular context. The literature on IT governance at universities is scarce, sparse and somehow coming from too specific realities. It is needed to create more generalised concept.

The next section presents IT governance Mechanisms across Industries

6.2 IT Governance Mechanisms across Industries

A comparative IT governance mechanisms analysis across industries is presented in this section. Table 98 provides a comparison across industries according to the most relevant mechanisms, effectiveness and the ease of implementation. The effectiveness of the mechanisms that were not implemented in the universities at the interviews time was not taken into consideration to determine the average. For this reason, the average effectiveness can be lower than in similar studies.

The column "Most Relevant Mechanisms" represents the perceptual of the 10 most important mechanisms selected in each of the 10 interviews (Table 27). The effectiveness and difficulty were calculated by summing each mechanism's score in these dimensions structure, process and relational, and by calculating the mean (Table 27 and Table 28). The green cells represent the highest value in each industry type; the white cells represent the intermediary value in each type of industry, while the orange cells present the lowest value in each industry type.

Table 98. IT governance mechanisms across industries

	Most Relevant Mechanisms			Effectiveness			Difficulty		
	Structure	Process	Relational	Structure	Process	Relational	Structure	Process	Relational
Financial Industry	46.7%	40.0%	13.3%	23.6	24.6	22.0	17.7	23.1	20.4
Healthcare Industry	41.7%	28.3%	30%	22.9	26.1	26.4	20.5	20.6	17.8
Higher Education	30.0%	44.0%	26.0%	20.1	27.0	28.1	27.4	24.9	20.2

The results in Table 98 show that the process mechanisms were the most recommended for all the industries. On the other hand, the relational mechanisms were the most implemented (22) in practice but less suggested as the most relevant (Table 27). These are interesting conclusions that should be explored in further research. The results also indicated differences among the investigated industries: relational mechanisms were the less relevant for the higher education industry and the financial industry, while the processes mechanisms were the less relevant for the healthcare industry. The structure mechanisms were the less effective for the higher education industry and the healthcare industry, while for the financial industry it was the relational mechanisms. The relational mechanisms were the most effective and the easiest to implement in the healthcare industry and in the higher education industry, while for the financial industry the processes and structures were found to be the most effective and the easiest to implement.

From the pool of the 46 possible mechanisms (the 10 most important selected in each interview in 10 interviews), 30.0% were the structure mechanisms, while 44.0 % were the processes and 26.0 % were the relational mechanisms (Table 27). Some information regarding the comparison between the Portuguese financial industry by Pereira et al. (2014b) and the healthcare industry by Pereira et al. (2014c) is presented in Table 98. The study on the Belgian financial industry by De Haes and Van Grembergen (2009) was not included as it did not provide enough information for a comparison.

The next section presents the theoretical and practical contributions as well as the limitations and further research.

6.3 Contributions

This thesis contributes and enriches the research on IT governance in the context of universities, by developing a model with suitable configuration on IT governance in the perspective of the structures, processes and relational mechanisms in universities.

6.3.1 Theoretical Contribution

The theoretical contribution to this thesis is a conceptual IT governance mechanism model, that includes the structures, processes and relational mechanisms, to guide the universities' managers on choosing and implementing an effective and efficient IT governance mechanism. Moreover, this study assists to identify the impact of the mechanisms in a specific context from the perspective of universities CIOs. The proposed model allows universities to govern information technology efficiently and effectively. This study also contributed to the identification of IT governance mechanisms' effectiveness in the context of universities. This thesis added eight new mechanisms to the literature on IT governance. Furthermore, the effectiveness and ease of implementation of IT governance mechanisms is also analysed in a context that is still little explored. The new proposed mechanisms were built on a rigorous research methodology in a single exploratory case study with ten different analysis units. In addition, the suggested mechanisms were presented and discussed in renowned conferences on information systems. Thus, without any doubts the findings had an influence on the scientific community.

From the eight IT governance baseline increasing mechanisms suggested in this thesis, according to De Haes and Van Grembergen (2008), one can be classified as the structural mechanism - The Process Management Office (PMO); four as the process mechanisms: Test and Experiments of Solutions, Methodology to Manage Disruptive Innovation, International Standards /common Solutions, and Dashboard; three as the relational mechanisms: Knowledge Sharing Among Universities, Partnership Between University and Software Industry, and Engagement Between IT and Academia. The aim is to have an IT governance mechanisms list not only from a literature review's perspective but from a practitioner’s point of view.

The baseline list of the proposed mechanisms is a good starting point for universities to implement IT governance as well as to have a better IT performance. The mechanisms were identified in a confluence literature review that provided empirical evidence from 34 case studies and multiple case studies of ten

universities in several countries. Such results help to get the most applicable and generalised baseline as possible. Additionally, the collected data had a variety of contingent context, such as size, focus, regional differences, it was also controlled and validated with different universities than those from which the data were collected, what allows to apply more generalised meaning to this thesis' findings.

In addition, the DSR knowledge contribution of this thesis, in accordance with Gregor and Hevner (2013), is classified as Exaptation: Known Solutions Extended to New Problems. In this thesis, it was shown that it was possible to transpose a solution from one type of organisation to another. De Haes and Van Grembergen (2009) have identified a baseline of IT governance mechanisms for the Belgian financial industry. Pereira et al. (2014b) provided IT governance mechanisms for the Portuguese financial industry and the healthcare industry Pereira et al. (2014c). These outcomes showed that the mechanisms baseline differ across industry's sectors. The need to address the implementation of IT governance mechanisms in different contexts encourages further studies. In this thesis, an IT governance mechanisms baseline for universities was proposed with particular mechanisms.

As mentioned earlier, universities are organisations with characteristics different from industry. An example can be the mechanisms identified in the context of universities such as the Test and Experiments of Solutions, Knowledge Sharing Among Universities and Engagement Between IT and Academia. Such mechanisms were not identified in the studies on IT governance in other industries.

The IT governance baseline proposed in this study is also a scientific contribution particularly for the field of IT governance where research on this topic is still scarce and deserves more studies. Universities are complex organisations and their management model differs from one institution to another. This research focuses especially on universities and draws special attention to what is new when compared to other sectors.

6.3.2 Practical Contribution

Besides its meaningful theoretical contribution to the scientific knowledge, the thesis provides a major practical input to the practitioners from industry. In this research, a guide to assist managers with IT governance implementation as well as with evaluation their own implemented IT governance model or assessment of the current situation in the IT in their institution. The model incorporates the structures, processes and relational mechanisms and will help managers to adopt adequate mechanisms to

accomplish their mission. Moreover, the model describes solutions (e.g., IT governance structure type, committees, etc.) that universities have efficiently used in their environments to IT governance.

In this way, this research's outcomes will allow benchmarking the solutions of many universities. One of the major ITG objectives is the operational and strategic efficiency. All organisations types aim to reduce the costs and to improve the operational performance, profit, to deliver better products and services to the customer and internal user. In the context of higher education institutions, regardless if public or private, there is a need to optimise the resources the best possible way. Therefore, the IT governance mechanisms proposed in this thesis have practical implications for universities as they allow them to re-evaluate their actual IT governance models and their adopted practices.

In developing countries such as Brazil, there are 59 extra-large public universities controlled by the government. Currently, facing an economic crisis, the universities are seeking to reduce costs and enhance their internal governance and management models. Hence, implementation of mechanisms such as the Sharing Knowledge Among Universities or the Partnership may increase the IT services' quality.

Due to the administrative and financial autonomy, the universities usually do not share the IT information nor do they make IT benchmarking of what they are doing. In doing so, the universities choose to develop their own models. As a result, in practice this it is not efficient due to the fact the universities' work is isolated and the knowledge is not shared.

To adopt the same international standard or even a solution is a huge challenge to universities. However, it is interesting that increasing number of universities adopt identical solutions to easier develop training together, to create software solutions, what consequently leads to reducing the procurement costs.

6.4 Limitations and Further Research

This research has some limitations as well. Firstly, the collected data was limited to ten universities from five countries. Despite inviting fifteen other universities to participate in the research, it was not possible to include them as the answers did not come on time. It is conceivable that CIOs' agendas must be always full, however all effort was made in persisting and contacting the CIOs from different universities to encourage them to participate in this study. Secondly, only one executive was interviewed in each

university. Thirdly, the implementation level, effectiveness and implementation ease assessment of each mechanism was based on a short time-frame. Therefore, a longitudinal case study would be interesting to analyse the IT governance mechanisms in each university over longer time period.

It was not possible to collect in-depth qualitative information in all the universities for each particular mechanism. Many universities did not have enough details concerning the IT governance mechanisms, probably due to different IT governance implementation level in each case. Therefore, some mechanisms had more qualitative information than others. Further, in-depth studies are necessary to strengthen the outcomes in each mechanism.

Considering the results evaluation, which is a crucial part in the DSR, there are also some limitations. The results were evaluated by CIO, IT directors from five universities in four different countries Brazil, Portugal, Spain and Germany. It is a small number but the know-how and expertise of these people were expected to be sufficient for the evaluation.

The Author did not spare any efforts to conduct the best possible evaluation by initially accessing the web sites of universities in several countries (England, Scotland, Portugal, Spain, Germany, the Netherlands) to acquire information, such as names and e-mail addresses, about the CIOs, and IT directors. Then, an email was sent to each person explaining the research's purpose and inviting them to participate and to collaborate in the evaluation step. Over forty emails were sent to universities in different contexts. Additionally, more than 30 calls were made to the IT departments asking for additional information about the IT managers. The process lasted for three months, and a lot of persistence was put into it and many questions regarding recommendations of other related people were asked. At the end, five other universities that had been contacted via three interactions by email agreed to participate in the evaluation process.

After more than one month without receiving a positive answer and after reaching a significant number of universities from different contexts with interesting and useful feedbacks, the evaluation process was terminated.

Therefore, to the best author's knowledge, the evaluation phase satisfied all the criteria and rigour of the DSR. However, it is known that the DSR is an interactive process and the model can be constantly evaluated and improved and the Author acknowledges that more evaluation is always required.

Additionally, since the method used is the DSR, it is always vital to take into account this phase to improve the results. Another limitation of this thesis is the fact that the interviewee's suggestion to include indicators and activities in each mechanism were not taken into account. The suggestions were interesting and could be useful, in future work but they were out of the study's scope - a baseline just with enough detail for a parsimonious model.

Last but not least, the results were obtained based on the Author's understanding of the IT governance mechanism and its definition found in the literature on this topic such as De Haes and Van Grembergen (2008a). Nonetheless, the literature may have other IT governance mechanisms that were likely not identified or covered in this thesis. The baseline is grounded in the ITG mechanisms encountered in the literature review and in the multiple case studies with an interpretative analysis of specific universities sample. Accordingly, studies in different universities are necessary to include or remove mechanisms in accordance with the university context.

Since, there are few studies on the IT governance in the higher education institutions context, in accordance with this research's results, some interesting issues may be suggested to be addressed in future research:

- carrying out further research to compare the universities IT governance maturity level, conclusions could be drawn regarding the organisations type (private vs public), and questions like: What is the IT governance maturity level when considering the higher education institutions' rankings? How universities, with a better position in the ranking, tend to adopt more formal mechanisms than others?
- including indicators to monitoring and activities in each mechanism.
- repeating the questionnaires in a larger universities sample to analyse the effectiveness and implementation ease of each structure, processes and relational mechanism. A quantitative study with statistical correlation research.
- application the questionnaire to more respondents in each university, and to interview also business people such as rectors or other university board's members.
- doing more interviews in different universities to check the proposed mechanisms or detect other different mechanisms.
- investigating each individual mechanism in private and public universities and the impact on business of mechanisms such as the SLA, Cross-Training, Partnership Rewards and Incentives.

- adopting the new identified mechanisms proposed in this study to verify the impact on the teaching, learning, and research activities.
- performing quantitative studies, for example, making use of the structural equation modelling and second-generation data analysis techniques, to assess the new mechanisms' impact on universities' performance, to adopt a similar approach in study in this topic but in other type of organisation such as in Tonelli et al. (2015).
- Using the proposed IT governance mechanisms list to create critical success factors (CSFs) in specific countries, such as the study carried by in the public sector in Tanzania (Nfuka and Rusu 2011).
- analysing the return on investment (ROI) on IT at universities and investigate how to measure the ROI on IT at universities.

The tasks proposed above should encourage researchers to carry out more studies on this organisation type as the studies in this field are still scarce and limited. However, it is a huge concern for researcher to investigate the topic, especially in public universities with their mission for society. As it can be seen in the latest article in the AIS eLibrary (Association for Information Systems) about a study on information security management in 505 U.S. higher education institutions (Liu et al. 2017). The next section where preliminary results from this research has already been discussed and disseminated.

6.5 Research Publications

The preliminarily results of the research were presented in the following conferences and journals to discuss and receive feedback from experts (Table 99).

Table 99. Scientific communications performed during the research

Publication	Type	Indexing	Ranking Core
15º Portuguese Conference on Information System, Lisbon, Portugal, 2015	Doctoral Consortium	SCOPUS	-
Twenty-Fourth European Conference on Information Systems (ECIS) Istanbul, Turkey, 2016	Doctoral Consortium	-	A
Bianchi, I. S. (2015). Frameworks e práticas de Governança de TI para Universidades: Oportunidades de pesquisa baseadas em uma revisão sistemática da literatura. Paper presented at the 12th CONTECSI International Conference on Information Systems and Technology Management, São Paulo, Brazil	Conference	-	-
Bianchi, I. S., & Sousa, R. D. (2015). IT Governance for public universities: Developing a model. Paper presented at the Proceedings of the 26th International Business Information Management Association Conference - Innovation Management and Sustainable Economic Competitive Advantage: From Regional Development to Global Growth, IBIMA 2015.	Conference	SCOPUS/ISI	B
Bianchi, I. S., & Sousa, R. D. (2016). IT Governance Mechanisms in Higher Education. Procedia Computer Science, 100, 941-946. doi: 10.1016/j.procs.2016.09.253	Conference	SCOPUS	-
Bianchi, I., Sousa, R., & Pereira, R. (2017). IT governance Mechanisms at Universities: An Exploratory Study. Paper presented at the Twenty-third Americas Conference on Information Systems(AMCIS), Boston, USA, August 10-12, 2017.	Conference	SCOPUS	A
Bianchi, I., Sousa, R., Pereira, R., & Hillegersberg, J. (2017). Baseline Mechanisms for IT Governance at universities Paper presented at the 25th European Conference on Information Systems (ECIS), Guimarães, Portugal, June 5-10, 2017.	Conference	-	A
Bianchi, I. S., Sousa, R. D., Pereira, R., & Luciano, E. (2017). IT Governance Structures in Brazilian, Dutch and Portuguese Universities. Procedia Computer Science, 121, 927-933. doi: 10.1016/j.procs.2017.11.120	Conference	SCOPUS	-
Bianchi, I., & Sousa, R. D. (2015). IT governance for public universities: Proposal for a framework using Design Science Research. Espacios, 36(21).	Journal	SCOPUS/Q4	-

6.6 Final Remarks

I would like to conclude the thesis with some final remarks regarding the my exciting PhD journey. During that time, I was involved in several academic activities regarding the PhD as well as extra courses that will contribute to my future academic career. Moreover, I had a chance to visit the Head of European Research Centre on Information System (ERCIS) with which the University of Minho in Portugal is a partner. Additionally, I also underwent a three months internship at the University of Twente in The Netherlands, where I made part of an IT governance research group. The period spent abroad resulted in networking and better understanding of the research in different contexts.

Although with some limitation (e.g., technical; languages), I have always had a passion and curiosity to acquire knowledge in the research's area. Therefore, I have exchanged e-mails, participated in discussion lists and conferences relevant for my personal development and the thesis. Moreover, I also attended some extra courses (i.e., Winter Symposium in Business Process Management – University of Liechtenstein; Summer School in BPM – Utrecht University - The Netherlands, FCCN Conferences – University of Tras dos Montes – Portugal; PLS Course in Granada - Spain). Furthermore, I visited infrastructure, such as laboratories and libraries, of over fifteen universities around the world and exchanged ideas with experts from different universities. Unfortunately, it was not possible to collect data in all of these universities. However, it was an invaluable experience.

I also was nominated as a representative of the PhD students at the ISTTOS research group to the international committee when the Centre ALGORTIMI was evaluated by international evaluators and OCDE committee.

Another interesting experience in the data collection process was the interaction that I had with the interviewees. The research about the IT at universities awoke the CIOs' interest and they wanted to know more about the IT governance in universities in foreign countries. I, informally, continued exchanging experiences with the universities IT directors, what suggests an interest of the practical community working in this topic. To summarise, I intend to continue carrying out research in this topic and investigating the IT at universities to improve my proposed model.

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APPENDIX A – INVITATION LETTER (IN PORTUGUESE)

Prezado (a) (Nome, Sobrenome),

O meu nome é Isaias Scalabrin Bianchi. Eu sou estudante de doutoramento em Tecnologias e Sistemas e Informação da Universidade do Minho. Além disso, também sou Técnico em Tecnologia da Informação na Universidade Federal de Santa Catarina.

No âmbito do desenvolvimento de uma investigação com a temática de governança de TI em universidades, gostaria de convida-lo a participar da minha pesquisa por meio de um questionário e entrevista. O tempo da entrevista é de aproximadamente uma hora e poderá ser realizada via Skype.

Ressalta-se que, você foi selecionado devido ao cargo e experiência que ocupa de gestor na área de TI da sua instituição e irá vir a contribuir com o campo de conhecimento sobre governança de TI em universidades.

O objetivo da investigação é para fins acadêmicos e os seus dados pessoais serão mantidos sobre anonimato e guardados confidencialmente.

Vossa colaboração é de extrema importância, e agradecemos o seu interesse e disponibilidade para a entrevista.

Ao final da pesquisa, iremos encaminhar os resultados obtidos e as práticas utilizadas de governança de TI das universidades entrevistadas. Estão participando desta pesquisa, universidades de países como Portugal, Brasil e Holanda.

Atenciosamente,

Isaias Scalabrin Bianchi
Doutorando em Tecnologia e Sistemas de Informação da Universidade do Minho.
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APPENDIX B – INTERVIEW GUIDE (IN PORTUGUESE)

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Rui Dinis Sousa (rds@dsi.uminho.pt)

Guia da Entrevista

Este estudo é parte de uma pesquisa intitulada "Governança de TI para as Instituições de Educação Superior" do programa em Tecnologia e Sistemas de Informação da Universidade do Minho, a qual está sendo conduzido pelo estudante Isaias Scalabrin Bianchi, sob a supervisão do professor Rui Dinis Sousa.

O objetivo desta entrevista é identificar os mecanismos de governança de TI que a sua universidade tem implementado, bem como a eficácia e importância de software e outras soluções que adotadas na governança de TI.

O questionário está dividido em quatro seções.

1. Questões gerais sobre a instituição
2. Questões relacionadas a sua formação e experiência na função.
3. Questões relacionadas aos mecanismos de governança de estrutura, processo e relacionamentos
4. Questões sobre software e métodos.

Termos Gerais

- Este estudo está sendo conduzido com profissionais de TI de Universidades de diferentes países.
- O propósito desta entrevista é somente acadêmico, as suas informações pessoais e da sua instituição serão protegidas sobre confidencialidade.
- O tempo da entrevista é de aproximadamente uma hora. Sinta-se à vontade para interromper a qualquer momento. Eu gostaria de gravar a entrevista com o seu consentimento e autorização.
- Os resultados deste estudo poderão ser submetidos a conferências e revistas acadêmicas. Todas as informações do entrevistado e da instituição serão confidenciais.

Nós iremos compartilhar os resultados com todas as pessoas envolvidas nas entrevistas.

APPENDIX C - STATEMENT FOR COLLABORATION (IN PORTUGUESE)

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Declaração de Colaboração

Eu declaro que estou ciente sobre o objetivo e termos de colaboração deste estudo intitulado "Governança de TI para as Instituições de Educação Superior". Além disso, eu autorizo a gravação da entrevista, bem como o uso das informações coletados somente para propósitos acadêmicos, deste que mantido o anonimato e confidencialidade do respondente e instituição.

_____, _____ de 201 .

_____

APPENDIX D – INVITATION LETTER (IN ENGLISH)

Dear Mr./Ms. (Name, Last Name),

My name is Isaias Scalabrin Bianchi. I am a Ph.D. Student in Technology and System Information at University of Minho. Moreover, I am an employee in IT at Federal University of Santa Catarina. I have been working for six years on IT governance in universities.
The topic of my thesis is upon IT Governance in Higher Education Institutions. I am investigating the IT governance mechanism that Higher education institution have implemented, under the supervision of Ph.D. Rui Dinis Sousa. This research also is supported by CAPES Foundation, Ministry of Education of Brazil.

Due to your position in the institution and experiences, I would like to invite to collaborate with the research with an interview. The purpose of the interview is only academic, and the data of the interview and institution will be protected confidentially. The time of the interview is approximately one hour.

It will be a pleasure if you participate. The outcomes of this interview will be provided and sending to your email.

Thank you for accepting to participate.
Best Regards,

Isaias Scalabrin Bianchi
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APPENDIX E – INTERVIEW GUIDE (IN ENGLISH)

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Rui Dinis Sousa (rds@dsi.uminho.pt)

Interview Guide

This study is part of the research project entitled " IT governance for Higher Education" in the Doctoral Program in Technology and Information Systems, at University of Minho, which is being carried out by Isaias Scalabrin Bianchi and Rui Dinis Sousa.

The aim of this interview is to identify the IT governance mechanisms that your institution has implemented as well as the effectiveness and importance of the software and others IT governance solutions.

The questionnaire used in this interview is divided in for sections.

1. General questions upon the institution.
2. Personal Information
3. IT governance Mechanisms
4. General questions upon the tools, software that the institution has implemented or would like to adopt.

General Terms

- The study will be conducted by interviewing the employees of Higher Education Institutions from different countries.
- The purpose of the interview is only academic, and the confidentiality is protected of the interviewer and institution and will be protected confidentiality.
- The time of the interview is approximately one hour. Feel free to stop anytime. I would like to record the audio for practical purposes, with your consent, of course.
- The outcomes of this study might be submitted to academic conferences and journals, with the aim of increasing the knowledge of IT governance in higher education institutions. The identification of institutions as well the interviews will be safeguarding and again is protected your confidentiality.
- We will share the outcomes of this study with all the people who were interviewed.

APPENDIX F – STATEMENT FOR COLLABORATION (IN ENGLISH)

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Researchers:
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Rui Dinis Sousa (rds@dsi.uminho.pt)

Collaboration Statement

I declare that I am aware of the aims and terms of collaboration of this study "IT governance for Higher Education". Moreover, I authorize the record of the interview as well the use of the information acquired only for academic purposes.

_____, _____ of 201.

_____

APPENDIX G – IT GOVERNANCE MECHANISMS QUESTIONNAIRE

1. Institution Information

Total Number of Students:

Total Number of Administrative Staffs:

Total Number of Professors:

Total Number of employees:

Number of employees in IT (+ Outsourcers):

Institutional Budget:

IT Budget:

2. Contingency Factors

In the following questions check with **X** the right option:

2.1) Type of Institution:

a) Public ☐ b) Private ☐

2.2) What is the type of IT Governance Structure used in the institution?

a) Decentralised ☐

b) Centralised ☐

c) Federal ☐

3. Personal Information

3.1) Position in the IT function:

a) CIO b) IT Director c) IT Manager d) IT Coordinator e) IT Analyst □ f) Other

3.2) Education

a) Bachelor ☐ b) Master □ c) PhD □

3.3) Experience in IT (in years):

3.4) Experience in the position (in years):

4. IT Governance Mechanisms

The tables below show the list of IT governance mechanisms of structures, processes and relational mechanisms. Rate each mechanism in according to these criteria.

4.1) What is the level of implementation of the IT Governance Mechanisms in your institution?

Rate a score from **0 (zero**) if the IT Governance Mechanism **is not implemented** to **5 (five)** if the mechanism is **totally implemented**

4.2) What is the perceived effectiveness of the IT Governance Mechanisms in your institution?

Rate with **0 (zero)** if the IT Governance Mechanism is **not effective**.
Rate with **5 (five)** if the IT Governance Mechanism is **very effective**.

4.3) What is the perceived ease of implementation of the IT Governance Mechanisms in your institution?

Rate with **0 (zero)** if the IT Governance Mechanism is **very easy to implement**
Rate with **5 (five)** if the IT Governance Mechanism is **very difficult to implement**

Structure Mechanisms			
	Implemented	**Effectiveness**	**Ease of implementation**
IT strategy committee			
IT project steering committee			
IT security steering committee			
Architecture steering committee			
IT audit committee at level of board of directors			
IT investment committee			
CIO on executive committee			
CIO reporting to CEO and/or COO			
IT steering committee			
IT governance function / officer			
Security / compliance / risk officer			
Integration of governance/alignment tasks in roles& responsibilities			
IT councils			
IT leadership councils			
Business/IT relationship managers			
IT expertise at level of board			
IT governance Structure			

Process Mechanisms			
	Implemented	**Effectiveness**	**Ease of implementation**
Strategic information systems planning			
IT performance measurement (BSC)			
Portfolio management			
Charge back			
Service level agreements			
IT governance Frameworks /Standards			
IT governance assurance and self-assessment			
Project governance / management methodologies			
IT budget control and reporting			
Benefits management and reporting			
Business/IT alignment model			
ITG Maturity Models CMM			
Project Tracking			
Demand management			
Architectural Exception Process			

Relational Mechanisms			
	Implemented	**Effectiveness**	**Ease of implementation**
Job-rotation			
Co-location Business/IT collocation			
Cross-training			
Knowledge management (On IT governance)			
Business/IT account management			
Executive / senior management giving the good example			
Informal meetings between business and IT executive/ senior management			
IT leadership			
Corporate internal communication Addressing IT on a regular basis			
IT governance awareness campaign			
Partnership rewards and incentives			
Shared understanding of business/IT objectives			
Senior management announcements			
Office of CIO or ITG			

4.4) If you use other mechanisms that are not list above and thinking that is relevant to IT governance. Add here talking about the definition and how are used in your institution?

Mechanisms	Definition

4.5) What is a minimum set or minimum baseline of required IT Governance Mechanisms? (Note: Please select 10 (ten) IT Governance Mechanisms). Number 1 (one) is the most important mechanism and number 10 (ten) is the tenth most important mechanism.

	Mechanisms
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

APPENDIX H – CONSTRUCTS OF ITG MECHANISMS

Constructs	Relevant Literature
IT strategy committee	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009); (ITGI 2003); (Ali and Green 2006); (Yanosky and Caruso 2008); (Brown 2006)
IT audit committee	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
CIO on executive committee	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
CIO reporting to CEO/COO	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; ITGI2003; Weill and Ross 2004b)
IT steering committee	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009); (ITGI 2003); (Yanosky and Caruso 2008)
IT governance function / officer	(De Haes and Van Grembergen 2008a)
Security / compliance / risk officer	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
IT project steering committee	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
IT security steering committee	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Architecture steering committee	(De Haes and Van Grembergen 2008a; Van Grembergen and De Haes 2009; Weill and Ross 2004b).
Roles& responsibilities	(De Haes and Van Grembergen 2008a)
IT councils	(Broadbent 2002; Weill and Ross 2004b)
IT leadership councils	(Broadbent 2002; Brow and Grant2005; Weill and Ross 2004b)
Business/IT relationship managers	(Broadbent 2002; Weill and Ross 2004b)
IT investment committee	(Weill and Ros 2004b)
IT expertise at level of board	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
IT organisation structure	(De Haes and Van Grembergen 2004; Luftman 2003; Sambamurthy and Zmud 1999; Weill and Ross 2005)
Strategic information systems planning	(De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Earl 1993)
IT performance measurement	(De Haes and Van Grembergen 2006; Van Grembergen et al. 2004)
Portfolio management	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2009)
Charge back	(Weill and Ross 2004b) (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2009) (De Haes and Van Grembergen 2009)
Service level agreements	(Weill and Ross 2004b) (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2009)
ITG Frameworks /Standards	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
IT governance assurance and self-assessment	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Project governance / management methodologies	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
IT budget control and reporting	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Benefits management and reporting	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Business/IT alignment model	(Van Grembergen et al. 2004)
ITG Maturity Models CMM	(Peterson and Fairchild 2003) (De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Project Tracking	(Weill and Ross 2004b)
Demand management	(Heier et al. 2007; Symons 2005)
Architectural Exception Process	(Weill and Ross 2004b)
Job-rotation	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000)
Co-location	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000)
Cross-training	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000)
Knowledge management (On IT governance)	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman2000; Lunardi et al. 2014b)
Business/IT account management	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009; Luftman 2000)
Executive / senior management giving the good example	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Informal meetings	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
IT leadership	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Corporate internal communication Addressing IT	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
IT governance awareness campaigns	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Partnership rewards and incentives	(De Haes and Van Grembergen 2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009)
Shared understanding of business/IT objectives	(Luftman 2000; Reich and Benbasat 2000)
Senior management announcements	(ITGI 2003; Weill and Ross 2004b)
Office of CIO or ITG	(De Haes and Van Grembergen2006; De Haes and Van Grembergen 2008a; De Haes and Van Grembergen 2009).

APPENDIX I – ACKNOWLEDGMENT EMAIL

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Information Systems Department
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Fax: 253 510 300
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Researchers:
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Rui Dinis Sousa (rds@dsi.uminho.pt)

Dear Mr./Ms. (Name, Last Name),

I would like to thank you very much for meeting with me and participation in the research on IT governance in Higher Education Institutions. I appreciated the time you took from your hectic schedule to spend time with me. Moreover, this study could not have advanced without your collaboration and the sharing of your experiences and knowledge. We intend to share the outcomes of this study with all the people who were interviewed. The aim is to share the information acquired upon IT governance in universities from different countries. We expected with this research to contribute to the field of IT governance in particular Higher education institutions where the research is scarce yet. The information that I gained with the interview will help progress with my thesis, also increasing the knowledge of IT governance in the context of Higher Education Institutions.

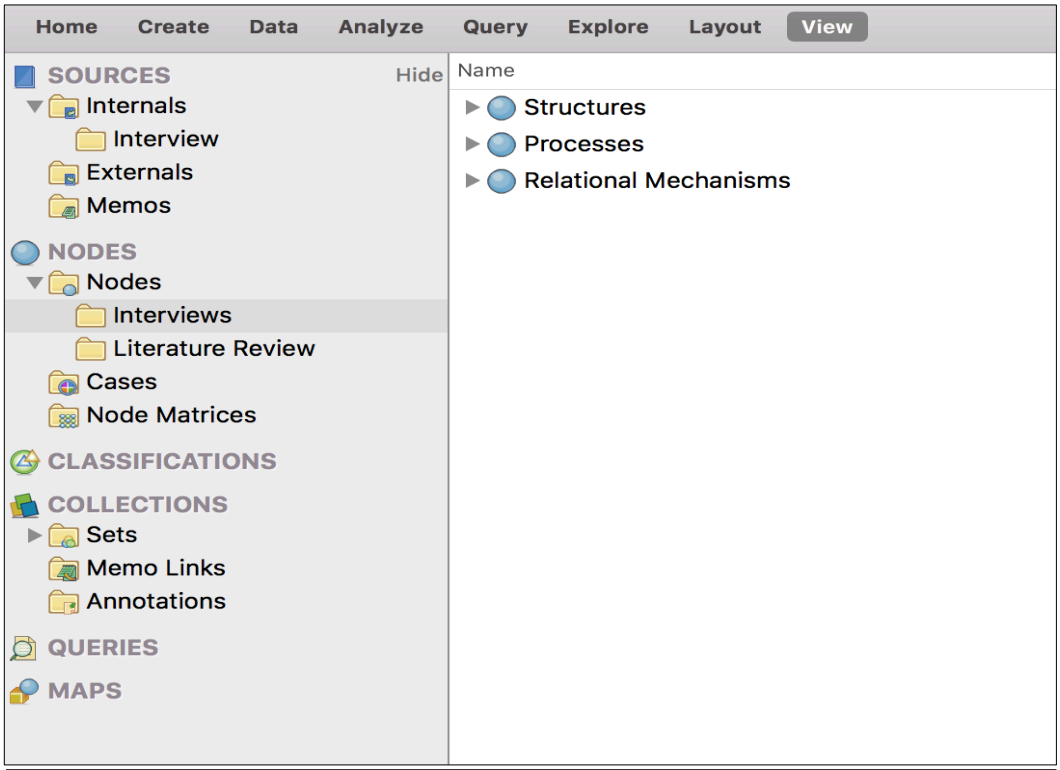
Furthermore, as researcher we intend to continue making research in the field of IT governance. Therefore, we are looking forward for exchanging further information. If I have some doubt about the information collect on interview, after the transcription, I will contact you. Also, feel free to contact me.

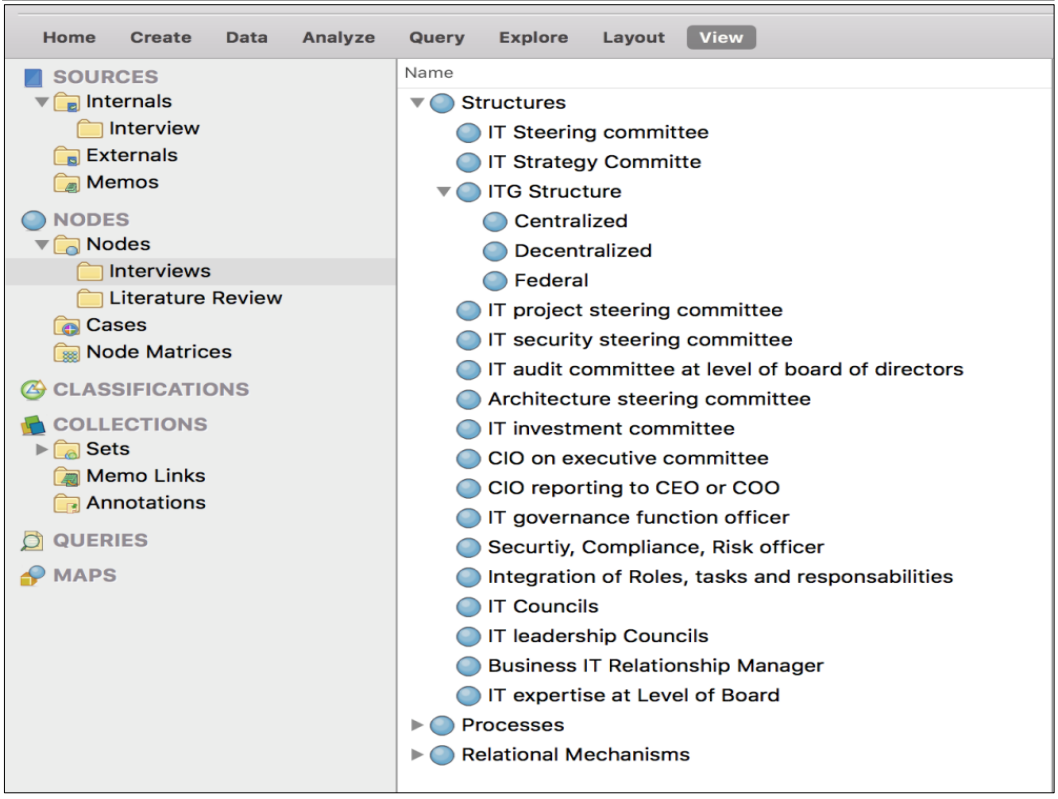
Thank you very much once again for your collaboration and time.

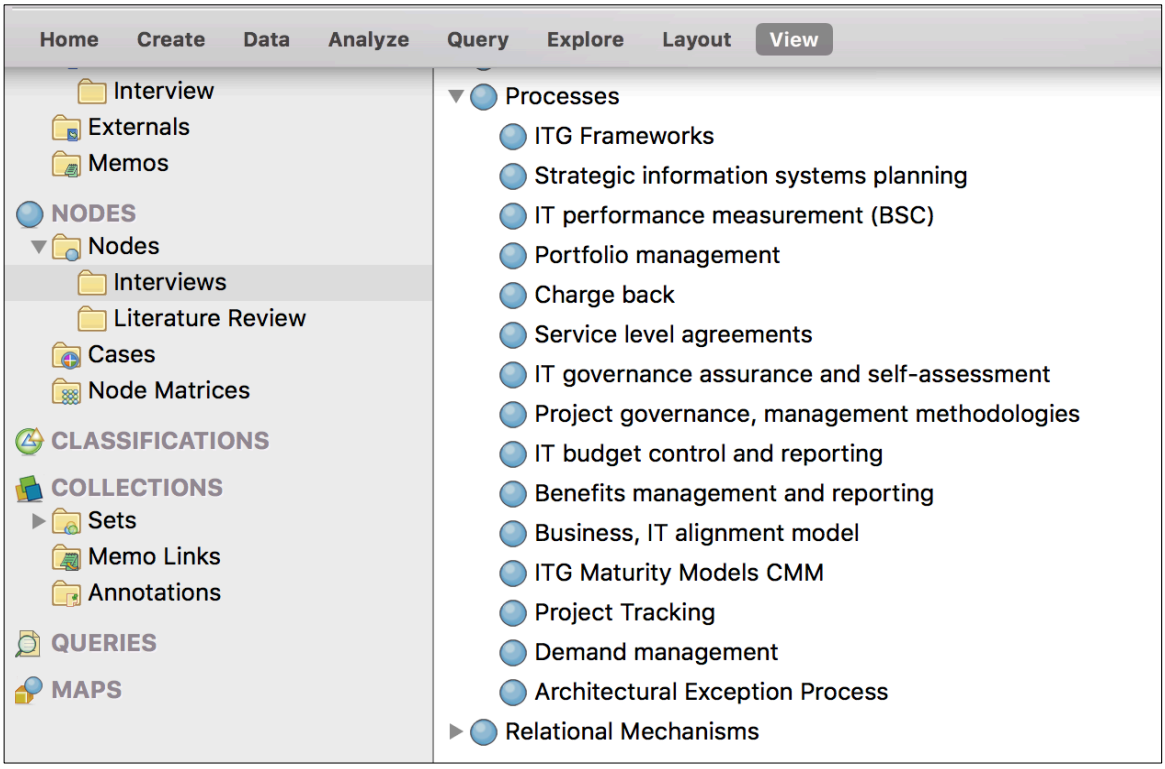
Sincerely,

Isaias Scalabrin Bianchi
PhD Student in Technology and System Information
University of Minho
Site: http://pdtsi.dsi.uminho.pt

APPENDIX J – NVIVO



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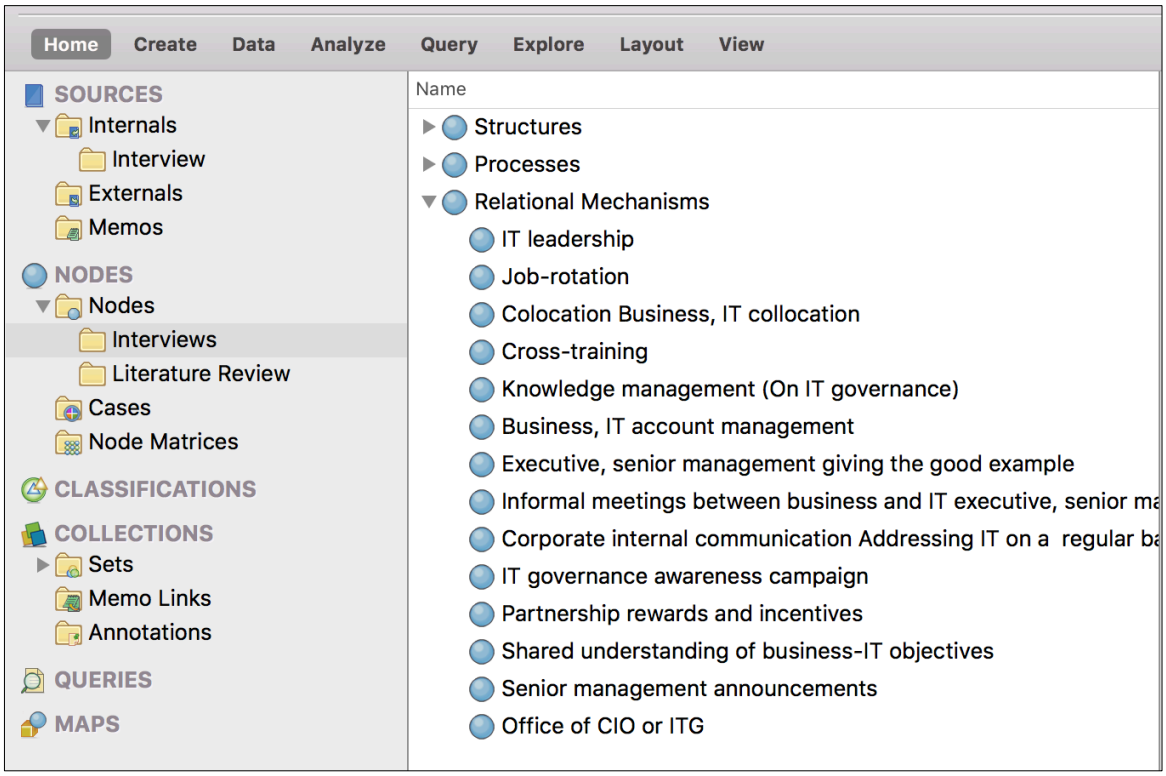
IT performance measurement (BSC)
Portfolio management
Charge back
Service level agreements
IT governance assurance and self-assessment
Project governance, management methodologies
IT budget control and reporting
Benefits management and reporting
Business, IT alignment model
ITG Maturity Models CMM
Project Tracking
Demand management
Architectural Exception Process
Relational Mechanisms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Job-rotation
Colocation Business, IT collocation
Cross-training
Knowledge management (On IT governance)
Business, IT account management
Executive, senior management giving the good example
Informal meetings between business and IT executive, senior ma
Corporate internal communication Addressing IT on a regular ba
IT governance awareness campaign
Partnership rewards and incentives
Shared understanding of business-IT objectives
Senior management announcements
Office of CIO or ITG

APPENDIX L – INVITATION LETTER FOR THE EVALUATION OF ARTEFACT

Dear Mr./Ms. (Name, Last Name),

I hope that this email finds you well.

First of all, it is a pleasure to meet you. My name is Isaias Scalabrin Bianchi. I am a Ph.D. Candidate in Technology and System Information at the University of Minho. Moreover, I'm also an IT employee at Federal University of Santa Catarina, Brazil.

I am at the end of my PhD thesis on the topic of IT governance for universities.

I developed and proposed a Baseline (with a list of IT governance mechanisms) in particular, for universities. The list of practices is for helping all kinds of universities to have an effective IT governance.

However, this list of IT governance mechanisms is important to validate, having an appreciation and feedback by experts in the practice.

I am sure that your expertise and know now in IT are valuable for this validation of IT governance mechanisms (a list with 27 practices). **Moreover, the "(UniversityName)"is a good case study as well as the reason of my contact.**

I would like to invite you to collaborate in this study by accepting to be interviewed on Skype or answering a **questionnaire (10 multi choices questions).**

Please let me know if you have any interest in participating in this study. If so, please tell me your availability, or I can send the questionnaire to be answered.

I understand you are a very busy person. However, it will be a pleasure if you participate sharing your comments about this list of practices, in particular, for universities. It takes the **maximum 20 minutes** of your hectic time.

The purpose is only academic, and the confidentiality is protected of the interviewer and institution.

I very much appreciate your collaboration.

Best regards,

Isaias Scalabrin Bianchi
PhD Candidate in Technology and System Information
University of Minho
Site: http://pdtsi.dsi.uminho.pt
Computer Engineer - www.ufsc.br
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APPENDIX M – ORIGINAL INTERVIEW´S TRANSCRIPTS (QUOTES IN PORTUGUESE)

Structure Mechanisms

IT Organisation Structure

"O ideal é você ter um ambiente descentralizado onde a ponte central defina modos e procedimentos e a execução seja descentralizada. Isso pra mim é um modelo ideal. Você tem centralizada a estrutura core para evitar recurso desnecessário e assim por diante e execução você distribui para escalar melhor. Mas estamos mundo longe disso. O federal o importante é 5. É ruim um modelo totalmente descentralizado 1. E centralizado 3. O ideal que a parte estratégica e definições seja centraliza e a parte operacional seja descentralizada". (3)

(...) "a gente tem algumas áreas descentralizada, como eu falei para você. Hoje é um problema sério. Mas de fato assim, a gente tem uma TI central. Que quando os órgãos de controle vem cobrar, é sempre desta TI que eles cobram (...) Algumas unidades tem uma TI própria e independente e não tem relação nenhuma direta conosco. Eu acredito para a universidade para o que ela tem estado ter, o modelo descentralizado é o melhor ao meu ver. Eu estou considerando os conceitos de ITIL tá, onde as decisões fossem centralizadas. Se fosse tivesse assim, a parte de operação fosse descentralizada ou no mínimo uma relação entre essas TI, uma relação que poderia ser de relação. A TI com a infraestrutura e as decisões centralizadas e as operações descentralizadas. Esse seria o modelo ideal que eu considero para a universidade hoje. As TI descentralizadas nos centros de ensino tem sua própria autonomia e sua própria gestão e que acaba acontecendo, é a TI centralizada é ter objetivo desenvolver e atender as necessidades da universidade como um todo, ela raramente atende as necessidades pontuais, olhando para atender as necessidades que é mais geral da universidade. Aquelas unidades lá, elas acabando desenvolvendo por meios próprios localmente a unidade a qual está subordinado. Então, o que acontece acaba tendo sombreamento de produtos, muitas vezes você acaba tendo o mesmo produto em diferentes locais. No caso da TI centralizado, a gente não tem acesso a esses dados. A gente tem uma unidade no (...) que é totalmente independente, eles desenvolvem softwares para atender as necessidades deles. Então isso causa vários problemas, o custo é um deles com certeza. Essas pessoas, poderiam desenvolver um produto para que a universidade precisa e não só para eles. Eles vão desenvolver produtos para atender as necessidades específicas deles, vão ter os dados localmente, a gente não vai ter acesso, a universidade não vai ter acesso é esses dados. Não existe nenhum controle, essas unidades não respondem a TI da universidade (...) E você ainda tem problema de cunho político, por que essas unidades acabam por construir um império, eles são donos, eles acabam concorrendo com a gente. Eles desenvolvem um produto que a gente não tem, e ai as outras unidades ficam sabendo e querem esse produto, só que dai no final as contas, como eles tem uma estrutura menor, quando eles param de manter esse produto, isso vem pra gente. Então naturalmente acaba estourando na TI central, os problemas que foram criados nessas unidades. A gente não tem comunicação com elas infelizmente. Alguns campus tem apenas um técnico, por estar a quase (...) km de distancia. Ok. A gente precisa descentralizar a TI nesses casos, mas a gente precisa ter um vinculo com suporte com esse cara. A gente tem ferramental que pode ajudar esses técnicos dos campus, a gente tem soluções e conhecimento que eles não tem que poderia a vida dele para otimizar os processos, que ele não tem acesso. Assim, existe uma resistência, já é um troço tão natural, que é você lá e eu aqui e tudo certo, assim, não olham corporativamente. E não tentam resolver esses problemas. Eles respondem aos diretores dos campus, que não é uma pessoa da TI geralmente" (4)

(...)"Centralizada. É uma grande vantagem em termos de redução de custos. É mais difícil gerir uma equipe quando tem pessoas a trabalhar em locais distintos, mesmo quando for para criar equipes, métodos de trabalho, é mais difícil de implementar." (6)

(...)"Essa distribuição não é muito bom dos servidores, nos departamentos, o ideal é se você tudo centralizado, eu não vejo isso como bom essa descentralização, a centralização é bom para gestão, poupança de recursos. O problema é que cada faculdade tem seus próprios data centers, a universidade não tem data center para a universidade. Assim é muito mais caro. No contexto das faculdades, não aqui, de faculdade para faculdade, fazem todo o mesmo. Todos tem um web server, todos tem um mail server, um servidor de autenticação, todos tem os mesmos tipos de servidores, repetidos, pra fazer exatamente a mesma coisa, e cada um faz por si, é preciso ter uma equipe em cada unidade. É um desperdício de recurso, e como os recursos são poucos, quer humanos quer técnicos, ah. Coisa começa ficar por mal feita." (7)

"É centralizada aham, temos um setor chamado (...) e toda a TI é organizada por nós. Hoje a gente só tem um campus, e hoje isso facilita bastante a questão da TI ser centralizada por que é um único local" (8)

"Sim. Centralizada. Nós temos a are de infraestrutura no CPD, a área de TIcs que esta dedicada a gestão interna." (10)

IT Strategy Committee

"(...) "Não existe um comitê de estratégia na (...).. O que é feito de estratégia é feito internamente na TI (...)". (3)

(...)"Hoje para mim o comitê estratégico, a estratégica estarei na cabeça, é o mecanismo mais importante" (4).

"(...)"A estratégia é definida é definida internamente. Existe um serviço único que é de informática e comunicações com (...)

Compete ao diretor de ti definir um plano de atividades em função das estratégicas do próprio (...) O plano é proposto.(...) Mas é uma coisa internamente definido pelo serviço em função dos objetivos globais do (...) E é dentro dessas (...) pessoas que é definido a estratégia e depois levado a reitoria." (6)

"(...)"Nós não temos implementado o IT comité de estratégia. Sim, mas. eu acho importante implementar sobre tudo para delinear uma estratégia e essa é umas das dificuldades por que infelizmente, por questões orçamentarias, é de difícil delinear uma estratégia, por que nós não sabemos, quando nós não temos orçamentos. È importante mas não é fácil de implementar, as dificuldades algumas são orçamentarias outras mesmos a nível de recursos humanos, pq é necessário que eles existem para fazer parte desse comité, e depois a sempre conflitos de interesse. Pelos menos para a definição de estratégia, normalização de procedimentos, definição de políticas, os comités são importantes. Essa questão que esta acima de nós o IT, se estamos a implementar é preciso, isso não depende apenas de nós, a direção tem autonomia."(7)

(...)"Agora sistemas, sim. A área de sistemas nós sofremos bastante de não haver um comitê de priorização, comitê de avaliar a estratégia, então cada qual tem suas prioridades e é uma coisa que a gente estava trabalhando com administração anterior de tentar montar esse comitê. Não tem comitê. Hoje a nossa TI aqui infelizmente ela está muito operacional, a nossa TI praticamente para resolver problemas de infraestrutura básica e necessidades operacionais de sistemas. Hoje eu quero, tenho intenção esta conversando isso com meu diretor anterior, e vou levar isso para o meu novo diretor, essa visão mais estratégia para a TI, eu estou há (...) anos aqui na TI, esses (...) primeiros anos foi aqui de arrumar a casa e agora nossa ideia é elevar ai o patamar da TI. (...)TI na cultura da organização ela é comodotiy, ela é que nem energia elétrica eu tenho que entrar na Salam ligar o interruptor e ela tem que estar ali. Eu percebo que o meu próprio usuário ele não entende a TI como estratégica, como parte da estratégia para desenvolver o negócio. Então eu tenho uma certa dificuldade de engajamento do usuário nas questões de TI. A TI eu tenho que me virar, responsabilidade minha que esteja tudo ok. Então eu acredito que um comitê, sim para definir projetos mais estratégicos é importante e é factível. "(8)

IT Steering Committees / Councils

"O comitê a gente tem o (...). Mas o (...) não é tão estratégica é mais na gestão organizacional. O (...) é mais consultivo. Exemplo. Temos que estudar uma política para o uso do e-mail eles vão estudar, validar, sugerir. Não existe um comitê de estratégia na (...). O (...) é consultivo não executivo. O que é feito de estratégia é feito no (...). Não foi fácil de implementar o IT Council, foi possível somente por que a vice reitora era da área de TI. (...) o que tem é a (...) Mas não tem um comitê dedicado a isso. Não é algo institucionalizado".(3)

(...) "Não existes comités específicos somente para TI. Compete ao diretor de TI definir um plano de atividades em função das estratégicas do próprio (...) O plano é proposto. As atividades tiveram mais relacionadas com parte da segurança informática. Mas é uma coisa internamente definido pelo serviço em função dos objetivos globais do (...) A dificuldade dos comitês é conseguir áreas tão distintas e que elas interliguem. Por que a dificuldade é exatamente conseguir áreas tão distintas, conseguir definir um plano que abrange a todas que elas se interliguem. Pq no fundo é interligar as parte de infra estrutura, com visual com o black board que vai buscar as aulas diretas com a primeira e a segunda linha, do usuário com o apoio (...) Eu sou mais objetivo há alturas em que devemos falar. Mas os comités servem apenas para troca de ideias mas não para execução. Ou seja, servem apenas inputs, mas depois esses inputs devem ser adaptadas e filtrados. Esses inputs dos comitês para nós os percebermos que em condições normais não conseguimos ter acesso a elas. Esses são necessários para nós situações que em situações normais não conseguimos ter acesso a á elas, obviamente que os problemas vão cá a

ter. Pra mim esses comités são conselheiros ou formadores, não de missão estratégica por que não tem o conhecimento. Uma coisa é falar o protocolo, RCA, outro é como implementar. Se vai ser Linux, Microsoft e isso um comité não tem a menor ideia do que existe na realidade. Apesar dos conselhos teóricos (...) Eu não considero importante ter conselhos. Há problemas, e o que precisam ter é ter articulação entre áreas e não é preciso ter algo formal para discutir. Existem problemas, vamos identificar esses problemas e vamos resolve-los. Articulação entre serviços e departamentos. A criação de uma equipe de trabalho sim, a criação de um comitê não. Não sei se estou a ser claro. A criação de uma equipe de trabalho com vista para resolver determinada questão sim. Uma comissão consultiva não."(6)

"Seria bom ter esses comitês para consensuar determinadas práticas e decisões. Para a web há um comitê para identificar por onde ir e onde não ir, que informação ter, o que informação necessita. Não temos comitês, temos certas pessoas que nos dão conselhos o que como ir, um pouco de conselhos."(10)

CIO on Executive Committee

"Eu não estou no board. Eu reporto á um administrador e um vice-reitor. Sinceramente, ahh (...) Pra mim não considero estar no board. Pra mim o importante é os objetivos sejam claros, e eu saber direcionar, qual é o foco do meu trabalho. Mas estar presente em uma reunião de reitoria, ah.. assuntos que não me." (6)

CIO Reporting to CEO and/or COO

(...) reporta diretamente ao reitor. Mas isso não é formalizado. (...) O CIO reporta ao reitor mais isso não impacta em conseguir recursos ou algo do tipo. (...)Como são cargos de confiança a escolha é quem conhece quem."(3)

(...)"Eu reporto á um administrador e um vice-reitor."(6)

IT Expertise at Level of Board

(...)"Tem especialista de ti no board. Docentes de carreira. Vice-reitor. É importante, Fundamental, ter alguém que fala a mesma linguagem de nós. A informática tem uma linguagem muito própria como em qualquer outra profissão, há medicina, qualquer profissão de uma linguagem própria, a informática não é diferente. Alguém que conheça a mesma linguagem, que conheça as mesmas dificuldades, é fundamental, alguém seja sensível a nos, quando estamos a pedir dinheiro para um determinado projeto, perceba o alcance do investimento deste projeto. "(6)

"Eu acho que é importante, pode não ser eu, mas tem que ter há uma voz no board da informática, mas o que se passa é que as vezes as decisões são tomadas sem haver as consequências da mesma, portanto é importante que existe alguém com um know how mais técnico." (7)

Business/IT Relationship Managers

"O papel do diretor da informática é também um evangelizador, que trazer os outros serviços par junto a IT e explicar o que a IT faz, dou um exemplo, nós no wireless, temos um acesso um acesso autenticados e no outro uma rede, a password muda toda a semana, as o papel do evangelizar é explicar para as pessoas. A password muda toda semana, para que as pessoas autenticam na rede autenticada. Esse é o papel do evangelizador é explicar as pessoas a informática, os serviços. Esse é o papel do diretor de informática. O papel do diretor de informática é montar a maquina o serviço para responder ao negócio. o que tempo que é difícil de encontrar. toda as pessoas gostam que expliquem o por que das coisas, desde que haja tempo, a dificuldade é (...)" (6)

"TI sozinha não faz nada, então a gente precisa saber das demandas do negocio. So que a gente as vezes não consegue ter nas áreas uma pessoa que faça essa ponta para gente. O que eu sentia, que faltava isso. Por que a demanda não chegava para nós. Faltava essa comunicação, as vezes não conseguia extrair a demanda. Eu senti as vezes que as pessoas se resguardam. Para não mostrar as vezes determinadas fragilidades. Proteger seu trabalho, não sei. Mas a agente não conseguia extrair a necessidade. Ou até a mesmo a pessoa não sabia. E ai levando essa pessoa. Para fora do setor. TI, indo atuar no planejamento estratégico a gente conseguiu ampliar mais esse relacionamento e essa pessoa é ela agora que traz as demandas para nos. Por que ela esta mais próximo do usuário e das suas necessidades. Mas não é fácil. Você lida nesses nível com pessoas, e vai além das competências técnicas eu tenho competências pessoais envolvidas. Então tem que ter

bom relacionamento e as vezes vc não consegue isso, a gente uma pessoa de ti com boa competências técnica, mas não tem competências pessoas tao forte assim. Então também é complicado." (9)

Security / Compliance / Risk Officer

"(...) Em termos de segurança, não temos nada institucionalizado. Seguimos um pouco da ISO 27001, mas é algo que está muito incipiente." (3)

"(...)quando chega ao staff maior de gestão é mais complicado mesmo criar comité. por que eles não conseguem ver a visão da segurança de uma forma de investimento. eu normalmente vou pelas beiradas. rsrsr. eu uso outras formas. a gente teve uma situação aqui muito engraçada com o nosso antigo direto (...) é... nos vinhamos já solicitando licenciamento antivírus mais potentes. Por que a gente usava o antivírus da Microsoft. não protegia nada. firewall. Também não conseguia pegar certas coisas para web. e a gente já tinha feito o projeto de licenciamento antivírus desktop e nada de aprovar. até o dia em que ele foi infectado. rsr é triste né mas.. mas o dia que ele teve problema com um boleto que ele abriu e infectou o pc dele ai não tive mais nenhum problema para provar a aquisição. de licenças . de antivírus mais. e tem uma outra situação também que aconteceu . é (...)o pro reitor la no caso o vice reitor não autorizava a implementação do AD naquela campus, servidor então. quando eu cheguei também. nada de servidor de AD uma estrutura de nos ter que replicar. os cadastros de usuários. replicar os usuários com a senha para ela.. então o que eu fiz (...) a gente tinha toda a estrutura de AD em todos os campis só (...) que não tinha. ai a gente tinha que ficar fazendo a replicação de usuários e senha só para (...) eu disse ai. professor. esse caso é um problema de segurança. que agente tem na rede (...) vocês são o único (...) que esta com problema. quando eu usei essas expressões vocês são o único (...) que ainda esta com problema. e isso é um problema grave de segurança. pronto ele autorizou a fazer. então. o caso deles tem que ter m pouco desta abordagem. mas com esse nível de staff é a abordagem." (9)

Business Process Management Office (BPO)

(...)"O escritório de processos pra mim, a gente tem uma dependência muito grande de gerenciamento de processos nas instituições. Por que a TI acaba lidando com processos no final das contas, acaba automatizando processos. Como a universidade não trabalha com esse foco em processos, a gente tem muita dificuldade para fazer as implementações. E um escritório de processos não somente para TI, mas para qualquer processo da instituição ele facilitaria muito a TI, mas nesse sentido. A gente gosta muito de BPMN, mas a universidade de uma maneira geral não consegue se organizar por processos, é uma outra estrutura que a gente está forçando a barra". (4)

Process Mechanisms

Strategic Information Systems Planning

"É o (...) Ele é um embaçador para conseguir recursos, planejamento estratégico e hoje ele não sai nada. Ele é um documento para constar no site, infelizmente. Ninguém fala nada na nova gestão do plano. Infelizmente. Aquela é uma ferramenta para justificar as coisas, mas infelizmente o que acaba sendo hoje é um documento que consta, apesar de todo o esforço feito não tem o reconhecimento da administração nele, no sentido de dar a devida importância no que é ali solicitado, então esse é um ponto crítico. A efetividade está baixa por que não é dada a devida importância no que está ali escrito. Ele é muito importante 5, é o mínimo. "(3)

(...)"Temos o plano de atividades já definidos para 2017. E temos um relatório de atividades que vai ser feito quanto chegarmos ao final de 2016 em função do plano de atividades que estava definido para 2016, ou seja no final de cada ano vai ser entregue o relatório de atividades, ou seja o rel atv é as atividades que foram propostas e executadas. O plano é muito simples, a partir do momento que nos definimos os objetivos é executar aquele projeto, e chegarmos ao final do ano e não implementarmos é mal, temos nota negativa. Vamos fazer aquele objetivo, temos que o cumprir se não somos penalizados. o plano é obrigatório e é publico. É fácil de implementar por que é obrigatório." (6)

"Nesse momento não temos um plano. No período anterior, nós tínhamos um plano para quatro anos. Um plano desses é orientador. Não é propriamente fácil, mas depois de realizado, é esclarecedor e é muito útil." (7)

(...) "A gente tem trabalhado com o, criamos o PDTIC plano diretor de TI. A gente tem procurado acompanhando com o planejamento estratégico. A cada ciclo de planejamento estratégico a gente organiza o nosso PDTIC então a gente, dentro disso agente se estrutura quais são as nossas ações acordo com o projeto estratégico. O nosso ultimo encerou 2016. Agora estamos trabalhando na organização de 2017. Alinhado com o planejamento estratégico institucional. Hoje esta organizado. Olha eu tenho procurado trabalhar com o um documento mais simples, e fui seguindo ele. Algumas coisas eu não conseguir fazer. eu Até comentei com o pessoal muitas ações e não conseguiu cumprir, eu digo tornou um plano muito abrangente, mas a gente tem procurado em cima do plano. O plano vai ser com poucas ações, mas a gente vai trabalhar em cima, temos conseguido seguir o plano"(9)

(...) "temos um plano para cada ano. O documento é bom, por que ao final do ano conseguimos saber o que conseguimos ou não. Não é fácil, depende de muitos fatores, financeiro, humano. Isso é sobre tudo falta de recursos, de pessoas." (10)

IT Performance Measurement

(...)"Nós não medimos a satisfação dos usuários. È importante mas nós não medimos. Infelizmente, nós não temos comprometimentos das áreas e das pessoas em preencher um questionário corretamente."(3)

(...)"A única que nos fazemos é avaliar a nível de disponibilidade dos serviços, é a única coisa que fazemos neste momento, e avaliamos sempre o nível de satisfação do utilizador final e realização dos pedidos no sistema ticket e a nível dos serviços, esse são os mecanismos que temos."(7)

Charge Back

(...) Isso é uma coisa que tinha começado na gestão anterior. O custo de impressão está sendo repassado e agora que a parte de rede tb. Infraestrutura. (...) é só repassar o curso para as unidades o pessoal começa a ser mais consciente. Na área publica é difícil repassar os custos. (3)

(...)" Eu acho muito importante ter essa divisão de custos para também haver essa responsabilização. Dividir custos de ponto de rede exemplo. Um departamento pede 20 ou 30 pontos de redes, o outro pede 100 e depois isso vai tudo para o bolo central. Não parece que seja difícil, a dificuldade não é técnica, a dificuldade é política. Tecnicamente isso seria fácil implementar, aqui esse serviço, aquele, custo hora, isso seria tecnicamente simples. Só são observadas as normas no ponto de vista geral, mas no particular." (7)

"(...)Não temos charge back. Isso também é uma questão a ser discutida por que hoje no custo da TI é apropriado muito custo e na verdade não é nosso. È inclusive compra de software especifico para um laboratório de ensino X, cai nesse centro de custo da TI. Então isso é uma questão a ser revista apropriação correta destes custos. Apropriação e rateio destes custos. As compras são todas centralizadas aqui, nós compramos. Tem algumas coisas mais especificas, que assim ai a unidade que tem mais dinheiro leva, por exemplo: ah computadores para o laboratório, determinada faculdade tem mais dinheiro, ela tem um orçamento dela, o nosso orçamento é base zero. Então, não quer dizer que o novo passado ela gastou e esse ano ela vai gastar também. Então é base de acordo com a necessidade da unidade, claro se é uma unidade mais rentável ela sendo privilegiada em um compra de computadores por exemplo para a remodelar um laboratório. Então a compra é feita por nós, mas quem digamos banca é a unidade."(8)

(...)"sim.. compartilhamento de custo, tudo é baseado no serviço, e é institucional. Então entra no roteio, agora na restruturação do datacenter, e agora acho que da quase 100 serviços. Mais ou menos, agora a grande dificuldade é especificar o que é de um e o que é de outro. Por que eu vou ter por exemplo. Servidores visualizados, servidores do campus e institucionais, mas é muito difícil na pratica, implementar esses rateio." (9)

Project Governance / Management Methodologies

(...) "O que a gente tem, quando tem é no readmine. Mas nada de gestão de projetos. Não é gestão projetos, só acompanhamento. (...) A partir que uma ferramenta de gestão de projetos torna trabalhoso manter o status do projeto atualizado ela não é uma boa ferramenta. Um Project Microsoft , é simples manter atualizado, é uma boa ferramenta." (3).

(...)"Nos estamos agora no processos de PMI".(6)

(...)"Temos o cargo gerente de projetos dentro da TI. Usamos ai as melhores práticas de gestão de projetos. Mas como comitê que participa a parte de usuário, ai eu acho que formalmente não está definido. Essa questão dos Framework, é complicado a gente dizer que segue algum em específico, por que sempre é um misto de melhores práticas. Nós temos profissionais certificados PMBOK, fizemos gestão das 10 áreas do PMBOK. Usamos na medida do possível as melhores práticas. Sim. Existem alguns Gaps, eu não posso dizer que sou 100% orientado a gestão de projetos. Ah vamos lá, métodos ágeis, usamos algumas melhores práticas de Scrum. Mas também não podemos dizer que nós somos 100% aderentes ao Scrum por que tem coisa que a gente não faz aqui, e assim com outros. (...) Em gestão de projetos é uma das áreas que a gente está mais organizado, é uma área que eu consegui trabalhar, a gente já vem ai há 5 anos AI desenvolvendo e essa eu acho que a gente está com bastante organizando, com recursos também humanos bem estruturado. Nós adotamos o Microsoft EPM. Enterprise Project Management. É o project Enterprise. O project é usado localmente na máquina e sobe para um repositório. E ali a gente faz a gestão dos recursos, o project é muito interessante. O project é muito interessante, mas ele começa ter muita limitação quando você começa a ter muitos projetos com recursos compartilhados que é o nosso caso. A gente toca aqui uma dezena de projetos em paralelo, uma equipe de 40 pessoas. Então assim, eu tenho um recurso está trabalhando em três projetos a mesmo tempo. Ah sim é bom, não é. Mas a cultura da empresa nos obriga a trabalhar assim, e o project começa a deixar a desejar quando você um portfólio de projetos que compartilha muitos recursos. E o EPM por ser Enterprise do project nos da essa facilidade. E ali também fizemos gestão de comunicação, tem relatórios de acompanhamento, de uma forma geral, de 15 em 15 dias nós lançamentos o relatório dos projetos, que tem indicadores uma breve descrição do projeto, linhas de base, informações bem visual. È uma folha bem visual, para o sponsor saber como é que está a situação... Hoje a gente esta em uma etapa um pouco mais avançada que só o project não ajuda. Mas não é fácil não usar a ferramenta, ela requer muita parametrização. Mas acho que gestão de projetos não é uma coisa simples né. Eu acho que não se resume, ah, fazer um cronograma, assim, a gente teve que passar por uma boa fase de setup da ferramenta, parametrizar, a própria geração dos relatórios, agora eu aperto em um botão e sai o relatório, mas até a gente formatar como a gente queria reportar como está o andamento do projeto, o que reportar, como reportar, para quem reportar , isso exigiu bastante trabalho... Controle de aquisições, orçamento, todas as áreas da preconizadas pelo PmBok a gente faz a gestão por ali"(8)

"(...)" Eu particularmente gosto de trabalhar com metodologias de GP, são boas praticas, são metodologias já incorporadas por outras organizações. Então são norteadores. A metodologia por ela em si, ela precisa ser incorporada, mas primeiro tem que a maturidade a organização eu tenho que ter uma base, para a metodologia se aderir. De uma maneira saudável. então. a metodologia se não pra mim, fica uma coisa bonita." (9)

IT Budget Control and Reporting

(...) "é assim precisamos de x para comprar x se não vai parar isso. OK que pegar o dinheiro então. A gente não tem orçamento. É solicitação de uma previsão." (3)

"Nos não temos orçamento. Mas o que acontece por vezes, que existem determinados custos, exemplo, licenciamento de software, quando fazemos, fazemos e enviamos o pedido junto a direção é indicado conforme aquilo esta distribuído entre os departamentos, é a única coisa que é feita.(...)"Como não temos orçamento, não tem grande aplicação os relatórios de controle de orçamento. Eu gostava de fazer, ter orçamento para um ano. depende da atividade fizemos, relatórios de aprendizagem, lições aprendidas. (...)Era fundamental se pudesse trabalhar com orçamento. " (7)

(...)"Essa questão do orçamento é difícil de trabalhar na universidade. Mas acho que assim, eu tenho que ter a cifra. Eu tenho que saber quais são os nossos limites para investimento de TI. Por que a gente se mata fazendo o projeto, e depois nos vamos aprovar tantos mil. é que a universidade trabalhou muito tempo com muita sobra de recurso, porque tinha dinheiro, quanto se tem muito dinheiro fica fácil, mas agora, esta mais difícil. Felizmente a universidade está acordando para isso no tempo certo."(9)

SLA – Service Level Agreements

(...) "é só no serviço terceirizado e hoje na pratica no serviço de impressão. Eu comecei um trabalho para definir as SLA, mas eu tenho que saber o tempo que as pessoas gastam, e é difícil medir o tempo, pois o pessoal não registra corretamente no sistema. Se o pessoal utilizasse certinho, mas o pessoal só fecha chamado. Só que é aquele principio, ou eu vou brigar para implementar isso e deixar o pessoal irritado, ou deixo assim que pelo menos estão trabalhando e respondendo os chamados. Mas aquele principio, como aqui quebrar um SLA não representa prejuízo. Não impacta. O pessoal não tem essa visão professional". (3)

"Nos não temos SLA definidos. É importante, mas desde que temos mais prazos para poder cumprir. Os SLA tipicamente existem para serem cumpridos e para serem pouco agressivos. E nós o que acontece que não temos meios para prestar isso com essa eficácia, era um bocadinho ridículo estar a fazer SLA para sistematicamente nós não cumprir e seria um problema. Mas ok. Exemplo vem um pedido de conta de mail em duas horas tem que se resolvido, mas as vezes nem sempre é possível". (7)

"Na parte de sistemas de suporte de sistemas. sim. Na parte de Infra. Ainda não. Ali ainda não consegui criar. Nos conseguimos no ano passado estruturar SLA. Estamos trabalhando com os níveis de prioridades e os tempos. SLA acho que a universidade a gente tem dois lados né. A universidade eu vejo que nos temos uma complexidade interna muita grande, uma pluralidade. Existem staffs que tem poder grande dentro da instituição, a área de ensino, a área de ensino normalmente sobrepõe a área administrativa, né então difícil é muito mais difícil para gente impor regras e determinares sobre a área de ensino".(9)

IT Governance Frameworks and Standards

(...)" E estou batalhando a mais de 2 anos para implantar gestão de configuração do ITIL, e eu não consigo, por que não tem apoio das áreas, ninguém tem o apoio das áreas de querer documentar as coisas. Hoje no ITIL o que tem implantado é a gestão de incidentes. O help desk está bem implementado. Nós temos um CMDB rodando 100%. Não temos muito registro formal documentado como sugere, ITIL, servidores, rede, etc. Não temos nada de COBIT. Infelizmente estamos bem fracos nesta parte de formalização de processos, internamente."(3)

(...)"Nós tentamos seguir ITIL V3, somos ISO 29001 certificados, gostava chegar a ISO 27001 em segurança e 2700 a nível da informação, se a memória não me falha. Existem alguns processos que seguem as boas praticas ITIL, existe formação de ITIL para todos os colaboradores do departamento, sim. 80% tiverem 3 módulos de ITIL. O ITIL é aplicado a processos. Temos uma plataforma (...). Que faz essa gestão, onde são colocamos todos os tickets. O ISO 9001 é uma forma dos processos estarem organizados. É difícil implementar tem um modelo único e especifico, que toda a gente ta a usar um modelo. Não usamos COBIT. No atendimento, pedi que todos os atendimentos fossem registrados, para fazer uma mapa de horários, para saber onde que há mais pedidos, configuração da rede wireless, etc, mais ao longo de um mês os atendimentos vai descer e voltar a subir, e voltar a subir no mês de janeiro antes das frequências. "(6)

(...)"Com o ITIL, seguimos algumas melhores práticas de ITIL, gestão de incidentes né, mas vamos lá, hoje eu não tenho lá 10% do ITIL implementado. As práticas são pinçadas, pego um pouquinho ali, um experiência e implementa. Ah sim, ah espaço para melhorar, mas em função do dia, o dia a dia nos consome muito. Por exemplo não temos definidos um catálogo de serviço, então eu não posso dizer que ah nós seguimos, o ITIL. Começa por um catálogo de serviços, não temos, mas a gente tem outras boas práticas do ITIL. Na gestão de incidentes, nós temos gestão de conhecimento e a partir dali a gente tem já registrada em um ferramenta... Nós estamos criando uma espécie de setor de serviços compartilhados na universidade e acabaram por usar essa mesma ferramenta de service desk para gestão de demandas."(8)

Methodology to Manage Disruptive Innovation

"A gente está olhando oportunidades. Isso é importante que é uma coisa nossa que a gente nunca fica acomodado. A gente está sempre buscando alternativas, hoje eu uso um Storage de uma marca, amanha eu uso outro, olhando ao mercado. Pq a TI nossa é muito dinâmica, o que é bom hoje amanha já não é mais.." (8)

Possibility of Tests and experiments

"(...)sempre possível montar laboratórios em que as pessoas instalam protótipos antes de entrar em produção, antes de entrar em produção instalam protótipos que é a prova de conceito, para os próprios colaboradores poderem testar."(6)

Dashboard

"(...)Ferramentas no sentido de dashboard. Um mecanismo neste sentido. No que a administração pode extrair os dados que ela quer consultar. Uma ferramenta que não somente o pessoal da TI pudesse utilizar mas todas as áreas a nível estratégico. Acho importante um mecanismo deste para a governança de TI da universidade (...)" (3)

"(...)Uma ferramenta para dashboard é muito importante. Ter uma ferramenta é uma questão de disciplina, quando aquilo começa a fazer parte do dia dia, aquilo fica fácil."(7)

Management Demand

(...)"toda solicitação vem via o sistema (...) É melhor e mais formal. Ou vem via chamado, a gente esta trabalhando para não aceitar nada pedido informalmente. Esse é um ponto que na gestão nova está tendo algumas mudanças ruins, espero que não piore tanto, ahhh é muito daquela resolve ali para ele rapidinho, resolve".(3).

(...)"As pessoas querem telefone, vir pessoalmente, faz-me um favor, preciso um favor, nos não estamos aqui fazer favor, estamos aqui para prestar serviços, eu não gosto de fazer exceções, quanto existem determinadas exceções, é bom que elas sejam identificados no nível do serviços que nos prestamos, e essa é uma das dificuldade que nos atravessamos a tentar perceber as expectativas de acordo com os meios disponíveis e as necessidades disponíveis. Ainda por cima, quando as coisas não tem custo, e é muito fácil pedir. Não há nada que nos façamos que seja custeado, então toda gente pede tudo."(7)

(...)"Por exemplo quando eu recebo uma demanda da área de ensino, aquela demanda é sempre urgente né eles pressionam, isso de uma maneira muito forte. A gente tem conseguido trabalhar um pouco, isso é bem complexo."(9)

Relational Mechanisms

Cross-functional business/IT job rotation and Co-location Business/IT collocation

"É mais difícil gerir uma equipe quando tem pessoas a trabalhar em locais distintos, mesmo quando for para criar equipes, métodos de trabalho, é mais difícil de implementar. Os funcionários de TI são funcionários de TI, são recursos de TI e não estão alocados em outros departamentos. A eficácia do Job rotation seria muito mais reduzida, e é muito simples perceber, tem a ver com energia de equipes se eu tiver uma pessoa num sitio sozinha a dar suporte o que vai, a experiência que vai ter, vai ser menor, do que estiver em 3 pessoas, um ao lado do outro, houve um problema, com um colega e vai ser mais fácil perceber. Não é muito importante. As pessoas de TI estão exclusivamente na TI. não acho isso importante."(6)

"Eu acho importante partilhar experiências com outros centros para conhecer outras formas de trabalho, eu não sei como que essas experiências pode ser feita, pode ser um e-mail, mas é muito importante a partilha de experiências. Por eles a trabalhar em outros centros, no nosso caso não acontece, o profissional acaba por quase por não ser da área nossa. Acabam por não ser funcionário nosso. Eles respondem ao centros e muitas vezes o centro não é uma pessoa técnica e não é nada eficaz ter essas pessoas a trabalhar isoladas, depois não há passagem de conhecimento, nós andamos a bater sempre nas mesmas coisas há funcionários novos e mesmo quando muda os próprios coordenadores deles, muda os coordenador e a forma de trabalho deles muda."(7)

(...) TI nas outras áreas, as áreas se sentem invadidas. Existe um pouquinho de protecionismo entre os setores, não é tão simples." (9)

IT Leadership

(...)" No caso do (...) tinha-se um leardership, na gestão atual não vi nada". (3)

(...)"Se você não tiver uma pessoa que puxe que motive a sua equipe, isso é o fim". (4)

Informal meetings between business and IT executive/ senior management

"Muita coisa é baseado no informal meeting o que muitas das vezes não dá um bom retorno para assuntos de longo prazo." (3)

"As reuniões informais são muito produtivas para questões internas da TI. Essas conversas informais toda a semana, são é fácil de implementar. (6)

"As reuniões informais eu acho muito interessante. Quando a gente parte para tomar uma decisão mais relevante, né, ai não é através desse instrumento de reuniões informais, mas nosso dia a dia, a gente toma, dezenas, centenas, milhares de decisões que são decisões digamos que menor impacto, e que a gente precisa por uma questão de proximidade de manter a equipe compartilhando conhecimento, unida, nós fizemos sim, bastante contatos informais. A gente sai as vezes, a gente sai vai até um bar em um campus aqui para falar de trabalho tomando um cafezinho, que é para estimular esse convívio. Eu faço todo o trabalho de interação com o usuário, onde a TI funciona, onde a TI pode ajudar, isso eu faço muito frequentemente."(8)

Knowledge Management (on ITG)

(...)Nós temos o nossos portal de serviços no (...) lá tem tudo sobre os serviços da TI desde informação das (...) tutoriais, manuais, tanto para alunos quanto para docentes." (3)

"Um portal é importante, para as pessoas conhecer os serviços prestados pela universidade." (7)

(...)"Hoje nós temos portal, temos em excesso, e de uma forma desestruturada. E quem tem dois relógios não sabe que horas, são, a gente tem uma brincadeira aqui. A gente tem wikis, das equipes internas, cada equipe achou por bem, montar seu site wiki, com problemas do dia a dia, gestão do conhecimento. O meu pessoal do N1 ja utiliza uma outra ferramenta, que é o one note para registrar lá, também la seu dia dia, seu diário de bordo. E temos também o nosso site de intranet no share Point, a gente coloca ali uma série de documentos, só que isso a gente tem que revisar e pegar o que não serve mais e botar fora, tem que fazer a faxina. Tudo o que a equipe passa coloca no one note, é uma ferramenta de compartilhamento, então o que um fez, os outros enxergam. Acabamos de criar um documento de desastre recovery. Precisamos há um tempo atrás fazer uma manutenção elétrica no datacenter e tivemos que pensar no plano B, caso viesse alguma coisa a falhar. E ai tivemos que construir um manual de desastre e recovery, esse manual, ok. Está bem escrito, mas está lá num conto na intranet da (...), que dai há 6 meses se eu perguntar que ele existe, ou pior daqui 6 meses eu vou encontrar ele lá e vou saber que não foi atualizado, as coisas mudaram e lá está desatualizado. As informações tem que estar centralizadas e com acesso, e atualização."(8)

"(...)Todos os documentos ficam no Google drive. um portal, é mais para comunidade. Políticas de acesso, direitos de uso, no portal acadêmico." (9)

Corporate internal communication Addressing IT on a regular basis

"E-mail e portais como Canais de distribuição. Lista de distribuição. Plataforma, Hangouts a nível do google. Para comunicar."(6)

"(...)Normalmente. e-mail. O que mais se utiliza é e-mail. Mas é o que se utiliza é email. Mas acho que tinha que ter outra forma. Eu gostaria de trabalhar muito na solução parecida com redes sociais, por grupos. Que pudesse ter comentários, tirar duvidas imediatas, a partir das mensagem, acho que o email, pelo o volume de email que circulam, acho que não é 100% eficaz o email. Como a universidade se comunica muito por email, os alunos estão atentos, eu até fiz um case de um turma que eu dei aula de engenharia e eu achava que não tinha muita eficácia na nossa comunicação né, empiricamente, mas fiquei surpreendida que com a aquela turma, da para dizer assim, uma técnica de grupo, que não, a gente esta sempre bem

informado com as coisas da universidade. Aqui, usamos muito facebook, Twitter e Instagram, e usam bastante essas redes sociais e estavam o ano passado, potencializando o youtube também."(9)

Partnership rewards and incentives

"Não temos incentivos ou qualquer tipo de recompensa. É proibido por lei. Se eu até quisesse tirar um dia de folga e compensar em outro ou algo parecido, mas nem isso é possível." (3)

"As questões de incentivos são mais limitados, a gente gosta de considerar e tal, mas muitas vezes pelo o nosso tipo de instituição e ser pública, isso não é possível. A questão de recompensa pelo menos na área de TI da universidade não existe." (4)

"As remunerações estamos proibidos por lei. Por motivos legais não podemos fazer. Como todas profissões, as pessoas querem ter uma recompensa seja ela qual for, agora nós não fazemos o que queremos, fazemos o que esta na lei. Não existe oportunidades de promoções, todas as carreiras estão congeladas a nível nacional, não é um problema nas universidades, é nacional. Ta congelado há 5 ou 6 anos, não é um problema da universidade, é a nível nacional." (6)

(...)"O incentivo é um tapinha nas costas, e seu emprego continua por mais um tempo. Aqui a gente sofre alguma restrição, por que nós somos uma entidade filantrópica, e também tem alguma legislação que nos impede de participação de resultados, recolhimento de impostos, isenções, a gente não tem algumas isenções, então para premiar funcionário é bem complicado. A pouco tempo nós mandamos uma DBA nossa fazer certificação, alguns colegas nós pagamos a certificação cisco, mas é muito desestruturado, mas não é algo que é seguido assim."(8)

Cross-training

"Hoje a gente tem uma necessidade de treinamento, pois a gente essa realidade com as unidades descentralizadas com técnico sem qualquer suporte, a gente precisa melhorar a visão operacional dessas pessoas, da uma visão mais táctica, conhecimento de gestão para esse cara. E também conhecimento técnico também para operacionalizar. Para hoje nós, o treinamento ganha um destaque extremamente grande. (4) "

"É fácil de ter treinamento, tem a ver com o budget que tiver disponível, se tiver budget ok. Aqui é feito identificação das necessidades e é feita a formação e medida. É feito um plano de formação anual para perceber qual é o caminho de formação que cada pessoa quer percorrer e esse é o plano de formação" (6).

"Hoje o treinamento é muito por demanda, chega uma pessoa nova na equipe, ela a gente identifica que ela precisa de algum ou outro treinamento ou quando surge uma tecnologia, a gente identifica que pode ser útil, a gente capacita uma ou duas pessoas, não existe um plano de capacitação definido. Eu acho ter um plano de capacitação, é necessário, pq quando a gente adota uma nova tecnologia é necessário já fazer um plano de capacitação para a equipe. Entendendo a dinâmica do nosso trabalho, é uma coisa que quero trabalhar agora esse ano, é ter uma plano de capacitação, inclusive para para os técnicos, que já são antigos aqui, mas tem uma deficiência, e eu preciso saber quais são as capitações que eu preciso frequentemente fazer a minha equipe passar, então isso sim é interessante a gente ter um plano de capacitação."(8)

(...)" Nós fizemos capacitação de sistemas, tanto para professores, coordenador, etc. administrativo. A equipe da ti por si só já busca capacitarem-se, eles tem buscado muita capacitação virtual né. (...) ela vai buscar qualificação que é necessidade deles. Participam de evento sistematicamente, então o desenvolvimento está super legal. A universidade, paga curso. Até hoje eu nunca tive recusa desse tipo de auxílio, a área de suporte de sistemas, é uma área que está acordando agora, mas agora que entenderam o que é ITIL como eles se posicionam né, e como eles atuam como gestão de serviços, agora nos vamos começar com a área de suporte para se qualificar. A área de infraestrutura, é uma área mais difícil, é aonde tem mais gente autodidata, e fazem testes, pesquisam, aprendem por eles mesmos, eles são mais autodidatas, mas é.. a gente trouxe o curso de IPV6 para eles, por que a gente participou em um evento e trouxe o IPV6 então trouxemos o curso para eles participarem, para provocar a implementação. E.. eu tenho provocado eles para participar de eventos. Mas dai então perceber as necessidades, a área de infraestrutura hoje, é a área que menos tem atuando neste nível, pq se agente deixar. Qual é a minha percepção se a gente deixa a área. Ficar só em de acordo com os cursos de seu interesse, ou fazendo a capacitação só o que é aquilo de seu interesse. Então a gente corre risco ficar na mesmice. E não evoluir. Então eu vejo que tem que ter

mescla. É o que a equipe de desenvolvimento tem, feito. Participa de evento, abre a cabeça, né.. ve outras possibilidades e ai faz o curso especifico a capacitação de aquilo que entende como necessidade de implementar."(9)

"(...)"Muitos poucos cursos e treinamentos. São importantes cursos e treinamentos são muito importantes (...) Dar formação para todo o pessoal, professores e funcionários para que tenham mais conhecimento sobre a informática." (10)

IT Governance Awareness Campaign

"(...)Eu estou trabalhando nisso para publicar sobre serviços, importância, quero ver se a gente faz um Twitter, ou Facebook". (3)

"(...) Um do os objetivos das campanhas é sensibilizar a comunidade académica, docente ou não docente do serviço que prestamos. Nas próximas semanas, irá a ver umas ações de sensibilizações de vários temas, deste a utilização a segurança. Estão previstas várias seções, ja não lembro se são 7 ou 10. Mas que tem previstas e vão ser executadas."(6)

Shared understanding of business/IT objectives

"(...)O que mais me preocupa é que não se vê conversa entre as áreas, é trabalho repetido, ninguém conversa, vamos fazer uma reunião semanal, para ver o que o pessoal esta fazendo. não tem reunião, o pessoal não tem interesse. Reunião semanal. Você chama o pessoal mas eles participam não apresentam os problemas, parece que tem vergonha de apresentar os problemas se expor. Não tem conteúdo."(3)

"Eu tenho dito reunião com os vários diretor para tentar identificar os problemas que cada um dos serviços e problemas que tenham com os serviços de infraestrutura, mas isso é um coisa que demora tempo, são reuniões entre os departamentos até compreender quais são as dificuldades, sentidas por eles e que necessidade é que tem , e que dificuldades é que sentem é que nos podemos apoiar."(6)

Knowledge management (On IT governance)

(...)Nós temos o nossos portal de serviços no (...) lá tem tudo sobre os serviços da TI desde informação das (...) tutoriais, manuais, tanto para alunos quanto para docentes." (3)

"A gente não tem nenhum portal. Todos os documentos ficam no Google drive. um portal, é mais para comunidade. Políticas de acesso, direitos de uso, no portal acadêmico."(9)

Knowledge sharing among universities

"A comunicação com universidades é praticamente nula, muito pouca. Infelizmente não tem , deveria mas não tem. Todas as universidades vão se juntar para fazer uma pressão na adobe e conseguir um desconto. Realmente esta interação em universidades falta no Brasil. No brasil na licença de adobe".(3)

(...) "Conhecimento de outras universidades. Nós temos uma entidade que se chama FCCN. Fundação para computação cientifica nacional. www.ffcn.pt onde todos os anos eles fazem um evento que se chama jornadas da FFCN. Onde são abordados os temas da rede, segurança, best practices. Em que estamos juntos nesses 3 dias a discutir os vários temas desde o wireless, ah. Multimídia. É fundamental. É o mesmo Business case, toda a gente tem alunos, docente, não docentes e problemas. O sistema voip é exatamente isso, surge da FFCN, praticas. etc. a ultima foi na universidade do Algarve, jornadas FFCN. Basicamente é isso. Tem agenda. Tem reuniões paralelas, workshop. Campus best practices. Tem um grande impacto positivo, até por que quando estamos todos os diretores, todos responsáveis todos juntos, trocamos contatos, conhecemos todos uns aos outros, um problema que um tenha o outro liga, como é que resolveu. Lista de distribuição para trocar informações entre as partes."(6)

(...) nós temos aqui alguns grupos de trabalho com outras universidades. Então eu participo de dois grupos, um é só de universidade o outro é um grupo com varias verticais, indústria, comércio, serviços. (...) a gente troca bastante informação, compartilha e está sempre buscando o que as outras instituições estão adotando de novidade. Nós trocamos informações através de e-mail, WhatsApp, reuniões presenciais. O compartilhamento dessas informações, conhecimento eu não faria

através de um portal. Vamos lá, a gente respeita muito, somos não querendo, concorrentes, eu não queria usar essa palavra. Então a gente está sempre naquele linear assim, eu vou falar de uma tecnologia que estou adotando na universidade para o cara de TI da outra universidade, até que ponto aquilo para mim é estratégico ou não. Então a gente faz essa medida, as vezes fala um pouco, não fala tudo. Então tem que ser um pouco, muito essa dosagem tem que ser medida. Então colocar em um portal é honestidade demais. Entre as universidades, são as universidades. Nós temos um grupo que aí não é só TI, as universidades fazem parte está instituído, um grupo que são as universidades comunitárias, são as universidades sem fins lucrativos, é nesse grupo que eu participo. As universidades públicas federais, a questão do compartilhamento fica mais fácil. Eu tenho trocado experiências interessantes, nós de TI, a gente se ajuda, a gente acaba ficando amigo, um ajuda o outro. Os gerentes de TI dessas universidades acabam criando uma relação próximas, mas a gente entende que eu sou o gerente de TI, da universidade x e ele da universidade y, que são duas instituições muito competitivas e tem que respeitar isso, e nós nos respeitamos. (...) Agora vou te dar um exemplo interessante, a Adobe, que é algo interessante, que é um contrato bastante caro, nós fizemos a negociação com a adobe, através desse organismo que congrega as universidades comunitárias. Nós compramos para todas as universidades que fazem parte deste grupo, que são 15 universidades, aqui no (...). Isso foi o Apsi do nosso grupo, até agora, foi essa compra em incomum do adobe, até então tinha sido mais só troca mesmo de experiências, melhores práticas, o que fazer em determinada situação."(8)

(...) "A gente depois de muita luta, conseguiu (...) não sei se você conhece na (...), então é associação das instituições privadas né, e tem ainda a (...) junto. Essa associação conseguiu criar a câmara de TI, e nós voltamos a nos reunir, fazendo encontros, reunião á cada 2 meses, e a agente começou agora em dezembro isso é bem recente, fazer esse compartilhamento, cases das instituições das conferencias, independente da ferramenta, aquela que der, a gente vai começar a fazer isso, então isso vai ajudar bastante, então criamos um documento, foi criado um espaço virtualizado para nos, um repositório de arquivos, a agente criou um documento de inventário, em planilha de Excel para ter esse nível de conhecimento, se não tem um grupo de WhatsApp, eu tenho um grupo de WhatsApp de CIOS em educação do Brasil. (...) E um CIOS de (...), da câmera de TI. Isso é muito eficaz, eu sai, quando eu voltei da TI, que eu estava fora há quatro anos (...) para se ter uma noção, eu estava tão afastada da área, que eu nem sabia configurar um computador para comprar, o que estava no mercado. Qual o melhor computador, qual a melhor configuração. (...) então eu liguei para muita gente para saber. Eu passei a mão no telefone e sai procurando (...)levei alguns telefones, desligado na cara, por que ninguém sabia quem eu era, mas teve muita gente que me atendeu. Então eu contactei as pessoas no site. Mandei os e-mails me apresentei, para perguntar, o que se estava sendo utilizado. a partir do momento que eu comecei a participar mais dos eventos, os eventos. São promovidos pelos gestores de TI de empresas. Então eu tenha agora, muita gente que eu mantenho contato para trocar informações sobre a soluções, então há. O que você usa aqui para isso, o que você usa para aquilo. Então eu valorizo, muito isso, então a importância é alta. A gente sugeriu que se fizesse, alguma experiência similar ao (...) nós conseguimos uma primeiro experiência para a compra de uma ferramenta de analise de dados no sendo mas foi uma primeira experiência, mas a ideia é a partir de 2018 de começar a implementar isso." (9)

"Compartilhamento de tecnologia com outras universidades é muito importante. A nível de infra-estrutura há umas jornadas. La union de universidades governamentais se chama Rediris, para redes e infra-estrutura. Para a parte de gestão tem um que chama CRUE. Nós estamos integrados da CRUE TIC. Estamos aqui na adoção cada vez mais de software livre. Só que requere em uma maior quantidade em recursos humanos. Nós temos grupo entre as universidades em que quando nos surge um problema, enviamos um email entre os companheiros para compartilhar as soluções. Nós compartilhamos muito informação. Ai surge um problema com qualquer aplicação, ou sistema dentro de uma universidade, se plantea e todas as demais, vão responder a esse problema, E tanto universidades quanto centro tecnológicos também estão dentro. Nesse sentido, há uma otimização de recursos humanos para a solução de problemas. Há um encontro anualmente. Todas as universidades estão lá, públicas, sim. Aqui podemos sacar coisas que fizemos todos os anos de muitas universidades. "(10)

Partnership between university and software industry

(...)"Os únicos softwares que temos são os da Microsoft em que temos um protocolo tao generalizado, tudo o reste é caso a caso em função do numero de utilizadores que necessita e não de uma forma tão massiva, e assim Microsoft é feito a nível da universidade. Não é feita a nível do regular, mas é um caso excecional dos outros pontualmente."(7)

(...) "Hoje o Norte ai é, tentar resolver o problema com o menor custo possível. Então ai o software open para nós, sim seria uma primeira opção. Mas nós temos alguma coisa em nuvem (...) nós usamos o office 365 da Microsoft, então nós não temos mais esse servidor de e-mail interno aqui na universidade, está todo na nuvem (...) Agora nós migramos todos os servidores de e-mail para o office 365 e agora em 2017 é liberar o OneDrive também, por que muito pesquisador, professor

fica requisitando muita área em disco, mais área, mais área, e para compartilhamento de arquivos e tudo mais, isso nos gera um passivo de storage, backup, e ai colocando isso na nuvem me desonera isso bastante. A Microsoft garante a disponibilidade do dado. Existe uma interface administrativa que fica na TI, que tem ferramentas para a recuperação dos dados do OneDrive. Então a ideia é usar, é claro que, sempre a gente fica, dorme com um olho fechado e um aberto. Com você está com seus e-mails todos na nuvem na Microsoft, com seus dados, na nuvem da Microsoft, você está nas mãos de um terceiro, nada impede da Microsoft amanha lançar uma política dizendo, olha agora eu vou começar a cobrar. O que está lá tudo bem, é teu é de graça ok, mas daqui pra frente eu vou começar a cobrar. O custo de fazer o processo inverso, seria muito alto, então a gente acaba tendo que submeter as políticas desses fornecedores (...) Essa é a grande novidade, e eu acho que isso é mundial, qual instituição e de ensino não paga, é gratuito. É um programa da Microsoft, a Google também para não ficar atrás, daqui a pouco a Apple, essa questão de tecnologias educacionais é uma estratégia. Por uma questão estratégica deles, eles oferecem esses serviços de ensino gratuitos" (8)

"Utilizamos o serviço de e-mail da Google. Isso diminui muito os nossos custos com infraestrutura. (...) Nós temos um acordo com a Google, para estes incentivos para a área académica." (9)

Engagement between IT and Academia

"A gente teve algumas iniciativas com as escolas e departamentos académicos, para desenvolvimento de aplicativos, soluções, mas qual é o grande o timing da academia não é o mesmo timinho nosso. Então vamos lá, quando eu tenho uma necessidade de negócio que tenha um tempo para ser colocada em produção, se eu for busca, já busquei alternativa disso na academia, eu tenho que entregar o problema para o professor, que vai passar para os alunos, que vai fazer um ensino em cima daquilo ali, que vai usar como um case para ensinar o aluno, e não é isso que estou precisando, estou precisando de mão de obra. Agora, a gente sim tem uma iniciativa que está em andamento que é de reconhecimento facial. Eu tenho uma necessidade de negócio de implementar um sistema que tenha reconhecimento fácil, tem inúmero soluções no mercado a um custo alto, que também não é exatamente o que eu preciso. Ai fui na academia, conversei com o professor, e isso eu não tenho uma necessidade urgente e sim, tem um projeto de pesquisa onde tem um aluno pesquisando, desenvolvendo e fazendo. Aquilo ali no fim, vai gerar um produto que eu vou usar. Também, o contrário acontece, um aluno, também desenvolveu em um projeto de pesquisa, um software que é tipo o Waze. Seria um Waze para navegar dentro do campus. Oh.. os royaltis ai, hehe. Eu estou no prédio 11 e quero ir na biblioteca, ele mapeia os caminhos dentro do campus, que é aonde o google não entra, ele mapeia os caminhos por dentro do campus e te leva na biblioteca. Ah, eu preciso tirar um dinheiro, onde é que eu tenho um caixa eletrônico do banco do Brasil, ah você tem um caixa eletrônico do banco do Brasil lá no outro prédio, ele te leva la. Esse foi um projeto de pesquisa de um aluno que montou a Engine, nós achamos interessante e ai nos contratamos o aluno para dar ao aplicativo mais um corpo de aplicativo de produção, para aquele projeto que ele tinha feito. Isso foi um acaso, falando com um professor da necessidade da TI com a faculdade de informática, dali daquela conversa saiu essa oportunidade. Ai eu estou estreitando cada vez mais, estou indo lá, estou conversando, estou ajudando (...) Indiretamente, existe ou projeto de pesquisa, para contar veículos, solução para estacionamento. E a gente tem ajudado na infra-estrutura. E isso são iniciativas muito pontuais, não há um processo de governança por trás. Hoje nos temos um aplicativo, para aluno é muito estressante ele fica muito ansioso do dia da prova até publicar a nota, e o nosso aplicativo recebe um push, mostra isso, então isso a gente acompanha nas redes sociais e é bastante interessante á manifestação positiva, recebi o sms da nota, o push da nota, ai ele entra no aplicativo e verifica a nota. Nós temos um roadmap de ações no aplicativo bastante interessante. Vagas no estacionamento, ele olha no aplicativo e ve as vagas que estão disponíveis. Nós ainda não conseguimos levar o aluno até a vaga, que esse é aquele projeto que estamos ali com a faculdade. De levar o aluno até a vaga que está disponível, mas eu já digo que dentro daquele estacionamento tem 30 vagas." (8)

APPENDIX N – ORIGINAL TRANSCRIPTS FOR THE EVALUATION OF THE ARTEFACT

Interviewee 3	
Criterion	**Comments**
1	No essencial os mecanismos propostos, são uma base suficientemente abrangente para focar os principais domínios de governança das TI em Instituições de Ensino Superior (IES). Considera acrescentar dois mecanismos, que na prática poderão ter um impacto positivo na implementação com sucesso de um modelo de GTI, a saber: Um Processo que eventualmente poderás considerar como atividade do Processo de Gestão de Desempenho que referes, e que seria o processo de Gestão de Nível de Serviço das TI. A implementação de ITSM em qualquer instituição deve garantir o acordo de níveis de serviço com os diversos tipos de stakeholders. A ausência deste mecanismo dificulta a compreensão por parte destes últimos de qual o valor que as TI trazem para a instituição, para lá da burocracia, normalmente associada a estes processos ITSM. Uma segunda proposta, é um mecanismo relacional, de Prémios e Incentivos no contexto da gestão de Recursos Humanos, com o objetivo de motivar os colaboradores da instituição, a realizar os comportamentos desejados pelas chefias.
2	Ao refletir um pouco sobre esta questão, optei por responder CP (Concordo em Parte), embora num primeiro momento considerava mais adequado uma resposta D (Discordo), e isto não pela proposta especifica dos mecanismos apresentados, mas antes porque, na minha opinião quaisquer que seja a abordagem ou modelo de Governança das TI a implementar numa IES (ou noutro tipo de instituição) nunca será de "fácil" implementação. O esforço será sempre significativo, e tanto maior, quanto menor o grau de maturidade da instituição nas questões de ITSM, e na disponibilidade para a mudança organizacional que este tipo de abordagem implica. Na minha opinião este será mesmo um dos principais fatores chave para o sucesso e "facilidade" da implementação desta baseline a capacidade de Gestão da Mudança Organizacional, necessária.
3	A resposta fundamenta-se "somente" nas realidades que conheço de algumas IES Públicas Portuguesas. Assim discordo, pois da prática que conheço, as IES estão ainda numa fase muito inicial de adoção destas metodologias de Governança das TI. Diria mesmo que excetuando os mecanismos relacionados com a Gestão de TI (ITSM) nomeadamente a implementação de processos fundamentais como Incident Management; Service Requests, Problem Management, Asset Management e implementação de funções de ServiceDesk, as nossas IES ainda não estão suficientemente sensibilizadas para a importância da implementação de um conjunto significativo dos mecanismos propostos, particularmente no que diz respeito a mecanismos relacionais, onde a comunicação, liderança das TI, gestão e partilha de conhecimento ainda estão num nível muito inicial de maturidade.
4	Ao analisar com algum detalhe a lista de mecanismos propostos, consideraria a opção de consolidar alguns deles, pois em certa medida me parecem redundantes ou até certo ponto tratam as mesmas questões. Assim consideraria consolidar os seguintes mecanismos: • As estruturas IT Organisation Structure e Roles and Responsabilities. A definição de uma estrutura de TI, terá implícito a definição de papeis e responsabilidades atribuídas a cada um dos intervenientes. Se observares na tua descrição do S1 de algum modo já identificas alguns papeis e responsabilidades (... gestores de TI ...reportam ao diretor de TI e não...) • Os Processos Dashboard e Performance Measure - consideraria consolidar apenas num processo ex: (Performance Management). O dashboard é apenas um instrumento (entre outros) que pode ser utilizado para gerir e acompanhar o desempenho da instituição nomeadamente da GTI analisando e acompanhando indicadores e métricas definidas previamente. • Os Processos Test and Experiments of Solutions e Methodology to manage Disruptive Innovation. porque não consolidar num só processo de Gestão da Inovação. Onde são disponibilizados diversas atividades e recursos (como os que descreves) que auxiliam na identificação, testes e adoção de novas tecnologias e processos de inovação para ser adotado pela IES.

	• Consideraria a revisão da designação do mecanismo relacional Partnership between University and Software Industry, para algo mais genérico como por exemplo External IT Relationship – onde as parcerias com entidades externas não se restringia a fornecedores de software, mas algo mais abrangente como fornecedores de serviços e produtos de TI e outros parceiros externos que permitam à IES compreender as tecnologias disponíveis no mercado e o valor que as mesmas poderão trazer para a instituição através da sua adoção. Flexibilidade, novos públicos e não só redução de custos.
5	No global concordo com o detalhe apresentado nas descrições dos mecanismos. Eventualmente procuraria não ser tão explicito na inclusão de exemplos concretos de determinadas tecnologias ou referencia a determinados produtos (ex: blackboard, Microsoft Power BI, Google....).
6	A questão da simplicidade / facilidade de compreensão dos mecanismos, estará sempre dependente do nível de maturidade da própria IES no que se refere aos conhecimentos existentes nesta temática.
10	A aplicabilidade prática dos mecanismos propostos parece-me possível, obviamente que os mecanismos de Estrutura Organizacional e os Processos serão aquela cuja dificuldade de implementação será menor. Da minha experiência prática a componente dos Mecanismos Relacionais, são os de mais difícil implementação, dado que dependem essencialmente do comportamento adotado por todas as partes interessadas (desde técnicos de TI, a outros serviços da instituição até às chefias e direções executivas). Aqui o papel da Gestão da Mudança é fundamental assim como o exemplo de comportamento desejado que deve ser dado pelos responsáveis da instituição.

Interviewee 4	
Criterion	**Comments**
1	Alterar o termo Governação para Governança, pois é o que utilizado no Brasil De uma forma geral, contempla o espectro para a Governança da TI em Universidades.
2	Se pensarmos em Universidades Federais no Brasil, não é fácil de implementar Ainda se tem muitas resistências e, também, falta visão orientada para gestão de TI. A visão é puramente técnica
3	Não corresponde a realidade. Ainda falta muito para que as Universidades Federais brasileiras e arrisco a dizer que as Universidades particulares também, compreensão sobre foco a seguir, documentação através de planos, mensuração do atingimento de objetivos através de indicadores, principalmente, de alinhamento da TI ao negócio e não do negócio a TI
4	Sem comentários
5	Acho que deveria apresentar mais um nível de detalhe já que a palavra utilizada é implementação. Governança são boas práticas de gestão. Por isso, eu vejo modelo acima em termos de processos, mas não em termos de atividades e indicadores por atividade. Se fosse estabelecido mais este nível, poderia facilitar mais a compreensão pelos gestores e integrantes das TIs das Universidades, do que efetivamente deve ser feito para implementar Governança de TI.
6	
7	Conforme explicado na resposta 5, acredito que os 3 pilares – estrutura, processos e relacionamentos – estão bem detalhados em seus processos e/ou práticas. Porém, na minha visão detalhar melhor cada um dos processos e/ou práticas dos mecanismos e também os indicadores de monitoramento destes processos/práticas bem como das atividades dentro das práticas, deve permitir uma melhor compreensão do todo. Minha experiência mostra que devem ser bem detalhados e exemplificados cada um dos processos e/ou práticas (o TCU chama de práticas, neste nível) dentro de cada mecanismo.
8	Sim, com certeza.
9	Baseada em minha experiência, a linguagem do modelo acima está fácil para gestores compreenderem. Porém, a aplicação (o como fazer) de cada processo (ou prática) de cada mecanismo não está visível para o gestor de TI
10	Com certeza, se for aberta em atividades e indicadores de monitoramento por prática e por atividade.