# Information Technology Governance for Tunisian Universities
# (ITG4TU)

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## Study and document practices outside consortium

**University of Gabes, Tunisia**

**University of La Manouba, Tunisia**

**University of Tunis El Manar, Tunisia**

**University of Sfax, Tunisia**

*ITG4TU CONSORTIUM*

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# *CONTENTS*





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# 1. Introduction

Information Technology (IT) has become a very important for higher education institutions (HEI) in teaching, in research and in administration. IT is necessary in the way that provides support to university services. We can consider that IT is a strategic tool for universities. From this remark we can say that IT governance (ITG) in HEI is critical due to the strategic aspect of IT. The main objective of IT Governance is to align business strategy with IT strategy. To do so it is important that IT Governance includes strategies, policies, responsibilities, structures and processes for using IT within an HEI. The implementation of an IT Governance system in a HEI can determine who is responsible for IT strategic planning, decision making and the exploitation of IT. This way the cost in IT investment will be mastered by the introduction of project management and prioritization of investments. It is important to look in the literature to identify best practices in this domain to implement a more efficient IT Governance framework for a HEI. The motivation that drives this literature review is the development of an ITG framework for Tunisian universities within the context of a capacity building project entitled" Information Technology governance for Tunisian Universities (ITG4TU)". This work aims to define the situation outside the consortium of the project. Hence, studies describing ITG in Spain, Germany and Norway will not be included in this review. This work aims to provide a map of the state of the art of IT governance in HEI in various countries.

After reviewing the research studies on ITG, a unique review study on ITG in higher education institution was found (Valverde-Alulema, Meza-Bolaños, & Mejia-Madrid, 2017). This work, published in Spanish, shows the interest in this subject in the scientific community. It focuses on analysing the practice of IT portfolio. Nevertheless, it does not answer to specific research questions. It does not illustrate the current state of maturity and best practices in different HEI. The study conducted in our work will give a map of ITG in higher education institution in different countries.

The remainder of this paper is organized as follows: Section 2 describes the method used to perform the systematic literature review. The search results are presented in section 3. Finally, the findings about IT Governance in Higher Education Institutions in several countries are discussed.

# 2. Method

The state of the art on IT Governance in HEI is realized as a systematic literature review (SLR) based on the guidelines as proposed by Kitchenham (Kitchenham, 2007). An SLR is a means of synthesis of best quality scientific works on a specific topic or research question. The steps in the systematic literature review method are detailed below.



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## 2.1. Research questions

The review focuses on five research questions:

- What is the state of the university before implementing ITG?
- How much advanced is the implementation of ITG in the HEI?
- What framework/standards of ITG are implemented in the HEI? How the implementation process was executed?
- How IT is aligned to the university strategy?
- What best practices can be learnt from the ITG implementation? What tools are used for IT alignment, IT portfolio…?

## 2.2. Search process

The search process was a manual search on specific online databases. The selected sources are shown in table 1.

| Source | Type of source | Search URL |
|---|---|---|
| **IEEE Xplore Digital Library** | peer-reviewed paper | ieeexplore.ieee.org |
| **ACM Digital library** | peer-reviewed paper | dl.acm.org |
| **Hyper Articles en Ligne (HAL)** | Open archive | hal.archives-ouvertes.fr |
| **Springer** | peer-reviewed paper | www.springer.com |
| **Science direct** | peer-reviewed paper | www.sciencedirect.com |
| **Web ofScience (WoS)** | peer-reviewed paper | webofknowledge.com |
| **Google Scholar** | Meta search engine includes peer reviewed paper and grey literature | scholar.google.com |

**Table 1:** Literature sources

The same request was used in the search engines of the different literature sources. The search query was (" Information technology governance" OR" IT governance" OR" ICT governance") AND (" higher education"). The term university was discarded from the search query since it usually appears in the affiliation section of the paper.

## 2.3. Inclusion and exclusion criteria

After obtaining the search results from the different sources, a set of exclusion/inclusion criteria was applied:

Inclusion Criteria:

- Publications that match one of the search items,
- Publications that have best practices examples
- Publications, that are related to higher education institutions/universities
- Publications that are related to universities outside the consortium ITG4TU
- Publications that relate to the research questions.



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Exclusion criteria:

- Publications that not match one of the search items
- Publications that do not have best practices examples
- Publications that are published before or on the 2016
- Publications that are related to universities inside the ITG4TU consortium

### 2.4. Data Collection

The different studies retrieved from the search process were stored in a reference manager (Mendeley). The data extracted from each study were:

- The publication year.
- The country of the discussed case study. Generic category was given to papers which discuss ITG in HEI in general terms without specifying the country.
- The university/HEI subject of the study.
- Information about the research questions if exists.

## 3. Search Results

The number of papers resulting in the search is summarized in table 2.

| Resource | Number of papers |
|---|---|
| **ACM** | 3 |
| **IEEE** | 49 |
| **HAL** | 7 |
| **Google Scholar** | 63 |
| **Springer** | 67 |
| **Science Direct** | 38 |
| **WoS** | 33 |
| **Total** | 260 |

**Table 2**: Search results

After filtering irrelevant, duplicate and incomplete papers, a total of 46 papers were selected for the reviewing process. Four papers could not be reviewed. because the paper complete version could not be acquired. Table 3 presents the filtering process.

| | |
|---|---|
| **Irrelevant and duplicates** | 19 |
| **Incomplete and not related to RQ, excluded by reading title and abstract** | 187 |
| **Exclusion criteria** | 4 |
| **File not found** | 4 |
| **Total for full-text reading** | 46 |

**Table 3**: Filtered search results



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The state of the art is presented as follows according to the different cases of ITG grouped by country. The selected papers are distributed as shown in table 4.

| Country of study | Number of reviewed papers | References |
|---|---|---|
| **Australia** | 6 | (Bhattacharjya & Chang, 2006a, 2006b, 2007a; Hicks, Pervan, & Perrin, 2010; Khther & Othman, 2013) |
| **Bangladesh** | 1 | (Dey & Sobhan, 2007) |
| **Brazil and Portugal** | 4 | (Bianchi & De Sousa, 2015; Bianchi & Sousa, 2016; de Souza Bermejo & Tonelli, 2011; Martins, Cunha, Figueiredo, & Dias, 2009) |
| **Brunei** | 1 | (Seyal, Poon, & Tajuddin, 2017) |
| **Ecuador** | 2 | (Montenegro & Flores, 2016; Valverde-Alulema & Llorens-Largo, 2016) |
| **Egypt** | 1 | (El-Morshedy, Mazen, Hassanein, Fahmy, & Hassanein, 2014) |
| **Gulf** | 1 | (Sahraoui, 2009) |
| **Indonesia** | 5 | (Afriliana & Gaol, 2014; Maria, Fibriani, & Sinatra, 2012; Nugroho, 2014; Sadikin, Hardi, & Haji, 2014; Suwito, Matsumoto, Kawamoto, Gollmann, & Sakurai, 2016) |
| **Malaysia** | 5 | (Ahlan, Arshad, & Ajayi, 2014; Ajayi & Hussin, 2014; Azizi Ismail, 2010; Ghavifekr & Hussin, 2011; Ismail, 2008) |
| **Poland** | 1 | (Pankowska, 2007) |
| **South Africa** | 2 | (Johl, Flowerday, & Von Solms, 2014; Ngqondi & Herselman, 2014) |
| **Taiwan** | 1 | (Hung, Hwang, & Liu, 2013b) |
| **Thailand** | 3 | (Jairak & Praneetpolgrang, 2011; Jairak, Praneetpolgrang, & Subsermsri, 2015; Praneetpolgrang, Poprom, & Kitratporn, 2006) |
| **UK** | 2 | (Barn, Clark, & Hearne, 2013; Coen & Kelly, 2007) |
| **United States and Canada** | 7 | (Bichsel & Feehan, 2014; Council III, 2006; Dlamini, 2013; Krueger, 2009; Liu, Huang, & Lucas, 2016; Winston, 2010; Yanosky & Caruso, 2008) |
| **Generic** | 4 | (Kilic & Metin, 2012; Knahl, 2013; Kwon, 2008; Mirski & Kilian, 2012) |
| **Total** | 47 | |

**Table 4**: Selected research papers per country



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# 4. Findings

The review process of the different selected papers was done by grouping the studies per country. For each country, the process consisted in answering the five research questions defined previously.

## 4.1. Australia

Many papers cover the IT governance in Australia and especially in the Higher Education Institutions. In (Bhattacharjya & Chang, 2006a, 2006b, 2007a, 2007b) ,the authors explain how ITG was established in four institutions. As HEIs are crucial for the Australian economy, it plays a double role in consuming and providing IT services at the same time. This is different from Tunisian Institutions who are considered as IT consumers in most cases.

To do so, the Australian Institutions use many standards. For example, the First institution has an overall strategic plan and follows a balanced scorecard. They have an ICT enabling plan, which is regularly updated. An important issue in this regard is that this ICT enabling plan is not directly associated with a budget for strategic expenditures. For standards, it uses COBIT, P-CMM, ITIL and ISO17799. The second institution uses COBIT, ISO 17779 and ITIL. The third one implements DRP, BCP, ITIL and APT methodology while the Fourth institution did not present any standard.

The strategic objective of the universities is to achieve excellence in teaching, learning, research and development. Some priorities fixed like providing flexible learning opportunities, developing facilities and technological infrastructure to support research priorities, forming partnerships with industry and government and improving its revenue generation. An ICT plan was also enabled, and it was regularly updated to align with the university strategy.

What we can learn from this experience is that the formation of the IT strategy committee, which reports to the institution planning and management committee and advises it, is the best solution for IT governance implementation. It must include the Director of central IT services, representatives of all divisional IT groups, the Director of Finance, representatives from R&D, the Deans and the rectors and key stakeholders. The committee needs to advise using recommendations regarding the alignment of ICT with the goals of the institution fixed by the rector, monitors the activities of the central and divisional IT service providers and fosters effective communication amongst them. In all four institutions the communication was improved between central IT and divisional IT groups and other key stakeholders.

In addition, the experience shows that the consolidation of systems is based on the consolidation of services. For example, in some institutions, consolidation of the helpdesk applications and tools has led to increased satisfaction amongst users. Authors in paper (Hicks et al., 2010) present the result of a survey among 58 decision makers. The university made an initial attempt to move to a centralized IT structure because of a recommendation from an external consultant commissioned to review the universities IT governance structure. A peak governing body, the Information Plan and Advisory Committee (IPAC), were created to oversee the IT function. However, a second review by an internal audit into ICT governance in the university in early 2005 made and concludes that the IPAC was not providing sufficient



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leadership in ICT. Also, accountability and role responsibilities were not clearly defined or designated in ICT related areas. There was a lack of coordination and communication for ICT between faculties and the risk assessment was incomplete and major ICT related risks had not been addressed. We noticed that COBIT was used as a governance framework for this university.

This results in several mechanisms that have been developed to assist in the alignment of IT and business goals. These have occurred at the strategic level to ensure university-wide alignment, and at the faculty level to ensure that faculties retain a voice in the IT planning process, as well as to assist in the alignment of IT with the goals and strategies of the individual faculties.

The study cases of the Curtin University of Technology, and Viana do Castelo Polytechnic Institute are discussed (Khther & Othman, 2013). The universities must focus on encapsulating IT as part of their strategy. Furthermore, for achieving the objectives of the universities, to improve their competitiveness and effectiveness, the decision makers decide to establish strategic objectives and to make the appropriate decisions in terms of investing on IT. So COBIT 3.0, 4.0 and 4.1 are used as standards and the managers finally reduce the time required for the implementation of its IT governance program, success in achieving its fundamental goals of IT.

We can learn from this experience that the communication enhancement between IT and business has resulted in the increasing acceptance of IT.

## 4.2. Bangladesh

In (Dey & Sobhan, 2007), the authors choose one university and make a survey among the university to collect data satisfaction. In the paper, they did not explain how the university was before IT governance implementation. COBIT was designed as a high-level framework for e-Governance by the e-Governance Institute and it works well with frameworks like ITIL which focuses on specific aspects of e-Management. In the studied university, an IT Governance Structure was established, and his main role was to identify external and internal services, then identify the Human Resources and their Roles and finally form the necessary ICT committees. For the IT Governance Processes, the committee starts with identifying challenges for e-Governance implementation and mitigate them; next, they plan the necessary information systems and finally identify suitable tools and project management framework.

## 4.3. Brazil and Portugal

An IT governance model for Brazilian and Portuguese universities is proposed in (Bianchi & De Sousa, 2015). The model intends to incorporate structures, processes and relational mechanisms suitable for public universities. This study aims to contribute regarding the adoption of framework such as COBIT and ITIL in the context of public university. In (de Souza Bermejo & Tonelli, 2011) IT governance is discussed in public organization and not especially in universities (with a public university as an example). A seven-phase method was designed to implement IT Governance. It starts with the IT alignment to the business. Then, a performance and capability analysis, strategic planning, tactic planning, execution, monitoring and control



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and finally new and corrective actions phase. In the case of the public university, the alignment of IT with university strategy was done as follows. In the Organizational context with being in alignment with of Brazils scientific development strategy. In fact, the Organizational objectives are the expansion of degree courses and infrastructures to improve teaching, research and extended learning activities. Regarding the IT objectives, the policy is integration between infrastructure and applications to satisfy expansion and innovation demands.

A social approach to IT governance is presented in (Martins et al., 2009). A conceptual model based on actor-network theory (ANT) is proposed. It helps resolve social issues in ITG.

The authors of (Bianchi & Sousa, 2016) studied the example of Portuguese universities. They confirm that the higher education institutions require a variety of information technology such as software, academic system, cloud applications, wireless network and e-learning platforms. This technology is used for supporting the activities of teaching, learning and management. To control this heterogeneous set of technologies, effective IT governance is necessary making use of structures, processes and relational mechanisms. To make IT Governance possible, in Portugal, institutions base their processes on COBIT, ITIL and ISO standards. In addition, to align with the strategy of the university, they define new structures responsible for defining roles and responsibilities like Steering committees. Those committees are composed of directors, managers, executives, and other people responsible for decision-making in the organization. Those structures work within processes that refers to planning and strategic decision making of IT based on practices from ITIL, COBIT or Balanced Scorecard, including techniques and appropriate tools to align business and IT for a good performance. What we can learn from the Portuguese experience is that it is not necessary to have too many committees. In practice, it is more relevant to focus, creating a committee to oversee business-IT alignment.

## 4.4. Brunei

The IT Governance is performed by the COBIT framework (Seyal et al., 2017). The data was obtained from interviews with the Directors and Chief Information Officers of four ICT centres. In these centres the weighted average maturity level of all studied ICTs ranges from 1.40 to 1.72.

## 4.5. Ecuador

The integration of ICT inside CEAACES (Council for Evaluation, Accreditation and Quality Assurance of Higher Education Institutions in Ecuador) is discussed in (Montenegro & Flores, 2016). They have adopted regulatory and legal framework essentially Organic and Common Laws, Statutory Instruments, Agreements, Decrees and General Norms. To apply the proposed ICT model inside CEAACES three alignment scenarios were considered. The first one was the Corporative goals alignment in which COBIT processes are considered. In addition to IT goals alignment to ensure that information infrastructure, its processes and strategies are aligned with the corporative goals. Also, Business Processes Alignment to ensure that the processes are deployed in compliance with the whole corporative and IT goals. In (Valverde-Alulema & Llorens-Largo, 2016), the authors confirmed that ITs have strategic characteristics and must be



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a mandatory part of the overall planning of the universities by integrating IT planning aligned with institutional objectives. The proposed framework has adapted five processes in COBIT to the context of the university. The public university of Ecuador has been chosen as a case study. The COBIT processes ensure:

- The establishment and maintenance of the university's terms of reference of the university.
- the delivery of benefits of the university
- The optimization of the risks of the university.
- The optimization of the resources of the university.
- The transparency to the stakeholders.

The proposed framework establishes six possible maturity levels: Non-existent, Initial, Repeatable intuitive, Defined processes, Managed and measurable and Optimized.

## 4.6. Egypt

The IT governance was tested in the Central Laboratory for Agricultural Climate (CLAC), this university has no resource and supporter for public policies and issues; and has difficult quality education and research. The authors of (El-Morshedy et al., 2014) estimates that the laboratory has a capability level 1 and the domain shows two processes with capability level 3. To implement IT Governance Framework, they use the process capability model provided by COBIT 5 to measure the current (as-is) maturity of an IT -related processes. Each process will have a specific designation based on how well its practices achieve the intended purpose of this process. This process is one of the most governed processes in the laboratory. As a governmental entity, it considers the financial regulations very much and stick to it, which lead to a structured way in managing their budgets and especially IT allowances. We can learn from the Egyptian experience is that increasing the number of funded projects; increased the number of researchers and the rate of their business processing which led to more research papers and theses; and improved the co-workers' performances in general. We noticed also that the laboratory proved maturity in building an effective way of communicating between IT and the different stakeholders.

## 4.7. Gulf Region

The case study presents a Gulf University (Sahraoui, 2009). The study shows that the structures of shared governance that would enable faculty participation in the elaboration of ICT strategies are inexistent. Also, they noticed that decisions about ICT for administrative as well as for academic purposes are taken unilaterally by administrators who are sometimes only remotely connected to HEI. No standards presented in the paper and there is no indication that they have been used to establish the framework. The main objective of the university strategy was to implement the open source software in the university and the governance try to align



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with the objectives of the university. The lessons learned from the Gulf experience is that you need to win the battle with administrators get results of the IT governance establishment.

## 4.8. Indonesia

The information technology has been applied widely in Indonesia Higher Education Institutions for various services.

The IT Governance is performed by SIPERTI (Afriliana & Gaol, 2014). SIPERTI, a Higher Education Information System, is an online computer-based information system built with the aim to organize the academic data in the colleges in Indonesia. The maturity level of the studied university was graded Meet Expectation. The weighted average of IT balanced Scoreboard measurement was equal to 2.78

In (Maria et al., 2012), the ITG is performed by COBIT model framework version 4.1 in the institutions that want to give more attention to ITG. In Satya Wacana Christian University, the average of the whole IT process is at the maturity level of 2.79. The IT processes for supporting the business goals from the financial perspectives has been standardized, documented and well communicated. A conceptual model of ITG for Indonesian higher education is proposed in (Nugroho, 2014). The proposed model is based on the main principles that should exist in the process of governance with COBIT 5 framework guide. This model is used as a reference. The implementation of this model is not yet done. Mercu Buana University case study is described in (Sadikin et al., 2014). Moreover, the implementation of IT Governance in the university is still in the first stage of its development. The IT Governance is performed by COBIT framework an analysis of the IT assessment security maturity is presented in (Suwito et al., 2016). The paper proposes a combination of framework control objective from IT Governance COBIT with Management Service in ITIL v3 and ISO/IEC 27001.

## 4.9. Malaysia

The academic faculty and universities studied used the traditional reporting provides by the traditional cost management (TCM) system (Azizi Ismail, 2010). The main challenges facing universities and other educational organizations is the lack of strategic planning and policy (Ghavifekr & Hussin, 2011). The information system was developed in an uncoordinated manner, reflecting interests of different departmental units, and a decision support system is almost non-existent (Ismail, 2008).

The IT Governance is performed by COBIT model framework in the institutions that begin give attention to ITG (Ahlan et al., 2014; Ajayi & Hussin, 2014). In the case of the public university, the alignment of IT with university strategy were done as by assuring that the organisations IT sustains and extends its strategies and objectives in aiming for optimum usage well felt by its managed users. Risk management addresses the safeguarding of IT assets, disaster recovery and continuity of operations. Resource management optimizes knowledge and IT infrastructure. Performance measurement would help the university tracks project delivery and monitors IT services. IT daily use needs benchmarks which can be used to guarantee improved services and value for IT investment



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## 4.10. Poland

Business institution governance issues and IT governance problems are presented in (Pankowska, 2007). Also, consideration of virtual university and virtual university governance components as a supplement or even substitution of traditional education were discussed. Strategy management, IT architecture development and standardization of educational processes are necessary to create reliable virtual universities. The main advantages of standardization are essentially, transparency of educational activities, their compatibility and controllability.

## 4.11. South Africa

The situation of ITG in HEI in South Africa is discussed in (Johl et al., 2014). The department of higher education and training (DHET) has not yet introduced the requirement to implement any IT governance best practices into the existing HE governance framework through legislation. Also, none of the South African HEI that are renewing their statutes provide specifically for an IT governance framework despite the significant investment in IT. There is a regulation about corporate governance in HE and is not yet promulgated into law. It recommends that an IT governance framework will be required in terms of the amended regulation, but it does not require any specific framework. This may result in the adoption of different frameworks.

Another case of ITG in South Africa shows the role ITG in supporting teaching and learning techniques through eLearning strategies in the institutions of higher learning is discussed in (Ngqondi & Herselman, 2014). To investigate the role of ITG in supporting eLearning strategies a purposive case study was conducted in three institutions of higher learning (university A, university B and C). Findings indicated that embracing ITG in the institution of higher learning contributes effectively in using eLearning as a teaching and learning tool. Furthermore, they indicate that ITG practices are still challenged in the university setup since the execution of IT responsibilities are centrally managed and championed by IT unit.

## 4.12. Taiwan

Based on a survey of 71 schools listed on Taiwanese university directory (Hung et al., 2013b), the Information Security Governance for Universities in Taiwan is discussed. It showed that there is a high reliance on IT by schools, but the maturity of information security governance is generally deficient (39.7% of schools were rated Poor, 33.7% Needs improvement, and 26.5% Good).

## 4.13. Thailand

Aspects of ITG in Thai universities were explored in (Jairak & Praneetpolgrang, 2011). The ITG status in Thai universities is in the initial stage and not all IT projects can be aligned with university strategy. Despite of the importance lent to IT executives by many ITG performance measurements, many indicators are not used in association with this importance. This means there are still many gaps that need to be translated into ITG practice. Thai universities still have



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many obstacles in ITG implementation (IT executives are not clear in ITG principle, limited budget for starting ITG, lack of comprehension in ITG framework concepts, and ITG frameworks are not appropriate with their university context). Furthermore, IT executives also suggest that Thai universities should have to develop their own ITG framework that can be accepted from stakeholders. Even though, ITG improvement in universities has many obstacles, it can be solved and improved by co-operation from stakeholders

In (Jairak et al., 2015), sufficiency economy philosophy (SEP), a guideline to the development of Thai society, is used as a base for the design of IT Governance best practices. A set of 65 practices were used to deal with ITG issues in Thai universities. The practices were divided inti nine dimensions:

1. IT/business strategy alignment;
2. value creation from IT resources;
3. IT project investments;
4. IT budget management;
5. IT human resource management;
6. IT user management;
7. IT for university social responsibility;
8. Green IT; and
9. Quality assurance in IT department.

A framework for ITG for Thailand public universities was proposed and implemented since 2006 by using the Balanced Scorecard (BSC) tool (Praneetpolgrang et al., 2006). BSC is a multi-dimension tool to specify the operation and strategic management in all levels by linking objectives, program, project or activities, evaluation and strategies of the organization together. Financial and non-financial are both important measurements in BSC.

## 4.14. United Kingdom

In the UK, the Joint Information Systems Committee (JISC), a government funded body for driving innovation in UK education and research, has developed an IT governance framework that could assist HEIs (Barn et al., 2013; Coen & Kelly, 2007). The framework is built around five perspectives: governance, management, resources, structures and services. The toolkit which accompanies the framework contains a set of self-assessment questions and good practice guides to assist institutions in assessing the robustness of their approach to the management and governance of information systems and IT. JISC and the Leadership Foundation for Higher Education has commissioned a strategic ICT (SICT) toolkit that aims to provide a maturity measure of the extent of strategic alignment of an institution. This tool was used to do a survey of 65 senior managers at a UK institution (Barn et al., 2013). The study addresses strategic business and ICT alignment in higher education.



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The results indicate that Enterprise Architecture and integration requirements between business and IS planning are central to increasing the maturity levels for universities engaged in business and IT alignment (BIA) but are not being adequately understood by the academy.

## 4.15. United States of America and Canada

EDUCASE published several works on ITG in HEI in the US (Krueger, 2009; Yanosky & Caruso, 2008). It realized a survey of 438 CIOs and other IT leaders at HEI in the USA and Canada (Yanosky & Caruso, 2008). Most respondents said that IT governance at their institutions stood at low to moderate levels of maturity (60% initial or repeatable maturity level). Regarding the use of a specific framework, 55% reported use of at least one framework such as COBIT, ITIL, or ISO standards in their ITG processes. This survey showed that the most cited driver for pursuing IT governance is aligning IT goals with institutional goals (74%). In (Council III, 2006), the case of South Louisiana Community College is detailed. It shows that COBIT is used as a framework for ITG. In (Winston, 2010), case studies of three public US universities were discussed. From one hand, the governance at the University of Memphis and Indiana State University were similar in that each had an established level of maturity, a long-term CIO, and was framed around a committee structure with broad based campus participation that informed decision making. In the other hand, the governance at the University of Tennessee, Knoxville was not based on the committee structure, had a history of instability, and a high turnover in CIOs.

A survey of 505 US HEI (Liu et al., 2016) was conducted to explain the relationship between IT governance, security outsourcing, and cybersecurity breaches. It appears that centralized IT governance in a university is associated with fewer cybersecurity breaches, and that the effect is much stronger when the university has a more complex IT environment. Another finding of this survey is that outsourcing information security leads to a lower probability of encountering cybersecurity breaches. The risk management effort related to IT is discussed in (Bichsel & Feehan, 2014). This study showed that institutions using a standard framework (COBIT, ISO…) have more advances in their risk management strategies Another study (Dlamini, 2013) demonstrated the role of CIO in higher education institution. In fact, such a position inside the university is no longer related to technical issues only, but also has a strategic effect on the institution mission. A CIO need to have multidimensional personalities, diverse work experience and a higher education background.

## 4.16. Generic Category

Various studies showed the importance of ITG for higher education institutions (Kilic & Metin, 2012; Knahl, 2013; Kwon, 2008; Mirski & Kilian, 2012). These works highlighted the fact that using framework standards such as COBIT is a good practice to implement.



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# 5. Discussion

To the best of author´s knowledge the only systematic literature review available in the literature is the one by Valverde-Alucema (Valverde-Alulema et al., 2017). The difference between this work and the one presented in this paper is twofold. The first is the focus on the previous paper, which is aimed to review project portfolio and not IT Governance as a whole. The second is the results of the SLR process that are constructed towards the demonstration of the importance of IT Governance and not on the effective results of the initiatives performed and illustrated in the papers presented in the study.

However, there are also other papers not reported in this paper worth to mention in this discussion section. For instance, there are some recent efforts strictly focussed on Data Governance (Mlangeni & Ruhode, 2017), a nascent topic that is not tackled by any of the papers reported in the SLR. In the Islamic world, a recent study (Al-rahmi, Zeki, Alias, & Saged, 2017) portraits the usage of IT in organizations, but without given any specifics for HEIs. In Indonesia, the paper (Wiradinata, 2017) is reporting one of the issues of every IT Governance deployment, the cascading of the model into specific objectives. Regarding Taiwan, in the paper by (Hung, Hwang, & Liu, 2013a) it is reported the construction of an Information Security Governance Maturity model. Finally, in Malaysia, authors present a paper devoted to present a paper on an IT governance framework for achieving the development of academic programme (Musa et al., 2014). This approach is more specific and although is not covering the HEI as a whole, efforts are more than related to the work presented in this paper.

To sum up, and as reported earlier, this paper presents a view from ITG initiatives in HEIs worth to note in the design of specific ITG frameworks for this organizations. This is the cornerstone for a specific framework to lead ITG in a given country.

# 6. Conclusion

The literature review shows a mixed situation of ITG in HEI. Some countries have the support of top level government in introducing ITG in higher education institutions such as Ecuador, South Africa or the UK by adopting regulatory frameworks and common laws. Countries such as the US, Australia, Thailand or Malaysia have a well spread culture of IT governance. The different case studies presented in this review show that there is no consensus on the ITG framework or standard to use in HEI. From one hand, most institutions are implementing COBIT, ITIL or ISO best practices. In the other hand some counties have developed their own framework such as the UK solution. The lessons learnt from the various case studies are summarized in the following best practices:

- Establishing a committee structure for IT assets
- Effective communication between the IT, the business and the different stakeholders



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- Alignment of IT strategy with the institution strategy
- Use of balanced scorecard

As a future work, we need to focus on how reach a consensus on the ITG framework for HEI. The implementation of the lessons learnt from the various case studies can lead to this consensus, but we need to find the limitations on these actions. The level of maturity of a HEI is very important to identify the actions to be taken. This SLR is a starting point for the definition, design and implementation of a common ITG framework for the Tunisian universities.

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