

An exploratory study on the practices of IT-institutional alignment for effective ICT integration in university services

Byungura Jean Claude
Stockholm University, Sweden / University of Rwanda, Rwanda

Henrik Hansson and Ulf Olsson
Stockholm University, Sweden

Kamuzinzi Masengesho
University of Rwanda, Rwanda

ABSTRACT

The misalignment between information technology (IT) and institutions continues to be a major problem, more particularly in higher education institutions. This state leads to a lack of technology value addition and poor institutional performance. Prior studies proposed models and frameworks with various organizational practices of IT-Business alignment. However, similar research, considering higher education institutions, is scarce. Therefore, this study explores and identifies the dimensions and practices of IT-institutional alignment from a higher education context. An exploratory embedded multiple-case study strategy was used on the two largest universities in Rwanda and Mozambique. Document survey and interviews were used for data collection. The literature and 14 interviews were analyzed using a thematic analysis approach to identify patterns related to the alignment practices. This study identified 45 IT-alignment practices reflected from both institutions, and they were classified into six metrics as presented in the framework. Of these alignment practices, 27 reflect exceptionally the higher education context of teaching, learning, and research. The identified alignment practices can serve as a frame of reference for creating and assessing the alignment between technology and university activities in the case study of institutions or similar contexts. A statistical test and validation of these alignment practices are recommended.

Keywords: *Technology integration; Higher education; IT-institutional alignment; Alignment practices; Information Technology; Developing countries*

INTRODUCTION

With the ever-increasing mass demands for higher education, institutions of higher education have seen the integration of information technology (IT) in their services as an innovative strategy to respond to this trend. Massive amounts are invested by universities (Wagner et al. 2005) for the acquisition and implementation of digital technologies to support different academic endeavors ranging from teaching, learning, research, and administration. In the developed countries, higher education institutions have effectively aligned IT and their services with a considerable high degree of technology adoption. However, in developing countries, the increased IT-related investments in higher education do not always translate into an effective technology adoption and value addition. This situation is also apparent in Rwanda, for example, where claims about poor performance in higher education institutions keep growing, despite considerable resources invested for acquiring new technologies.

Several IT related projects in higher education do not materialize especially in universities from sub-Saharan Africa (Ssekakubo et al., 2011; Byungura, Hansson, Mazimpaka, et al., 2016). Scholars have argued that the key reason for the failure of technology integration, especially in universities, is a misalignment between technical and non-technical aspects of new technologies (Ziphorah 2014; Fallshaw 2000; Byungura, Hansson, Mazimpaka, et al. 2016; Keengwe et al. 2009; Sife et al. 2007). The above researchers uphold the consideration of both technical and non-technical dimensions when implementing IT in universities. For technical aspects, the IT-institutional alignment related frameworks, methods or models in the literature include elements such as hardware, software, and connectivity (Wagner et al., 2005; Gevaert, 2012). The non-technology aspect caters for items such as the staff IT related training (Gevaert, 2012; Pelgrum, 2001), well-designed ICT in education policies (Byungura, Hansson, Mazimpaka, et al., 2016), the vision, culture, structure and institutional leadership style among others (Keengwe et al., 2009). Therefore, having all these aspects, strategically aligned, contribute immensely to IT value addition through the increased technology adoption and use in organizations (Griffith & Dougherty, 2002).

The concept of IT-business alignment has attracted several scholars in the information system literature (Alaceva & Rusu, 2015; Chen, 2010; Chan & Reich, 2007; Peak et al., 2005; Luftman, 2003; Yayla & Hu, 2012; El-Mekawy et al., 2015; Johnson & Lederer, 2010). More particularly, a study by (Vermerris et al., 2014) explored the impact of timing and complementarity of alignment practices on business value from IT projects. In their study, four practices were used, namely: Management commitment, Communication, Shared understanding and IT investment Evaluation. Overall, all the above-explored studies focused on general business companies while education institutions are still unexplored.

While IT systems are deployed in universities as well as in general other business companies to improve service delivery, these two types of entities are different in terms of mission, processes, and activities that are supposed to be aligned with IT. The traditional universities' primary mission is to advance knowledge through teaching, learning, and research. In this context, these institutions focus mainly on social benefit and community development (Pusser & Doane, 2001; Morey, 2004). On the other hand, other general business organizations aim at maximizing financial profits through the selling and production of goods and services. Besides, while the business companies target different categories of customers, tertiary education target students as their core customers to serve (Conway et al., 1994). Therefore, considering these organizational disparities, the approaches and practices of aligning IT with their missions and activities are also different to some extents. Only some slight similarities can be observed in the administration process. Hence, a specific framework with the practices that align Information Technology and higher education institutions needs to be developed and used as a reference to know which practices are relevant for effective technology integration.

The fact that this study is a part of an ongoing overall doctoral research work, previous related studies have explored the implementation of technology-supported tools at the University of Rwanda. In brief, some findings of these studies revealed a high degree of complexity associated with several malpractices that hinder the effective IT integration in the university activities (Muianga et al., 2016; Byungura, Hansson, Mazimpaka, et al., 2016; Byungura et al., 2015; Byungura, Hansson, Kamuzinzi, et al., 2016). These studies have indicated clearly a misalignment between the information technologies and the university business processes ranging from teaching, learning, research, and administration. These shortcomings range from non-technical (human and structure) to infrastructure (methods and machines) dimensions, despite the massive amount of IT investments. Previous studies have also revealed that there has been a lack of relevant practices related to planning, acquisition, and implementation of the IT systems that were used as case studies. More precisely, the implementation strategy of these IT systems did not consider a holistic understanding of the context. Additionally, there was a little or no involvement of the systems' future

users. Therefore, all the challenges as mentioned above seem to be the result of poor alignment of technology and related institutional activities at this university.

Very few scholars such as (Brown & Motjoloane, 2005) attempted to investigate the factors influencing business-IT alignment in a South African public university. Although their study did not develop any framework for practices of this alignment, they recommended that research on this IT and educational business alignment is also crucial. Therefore, similar research on IT-business alignment, with a focus on both technical and non-technical dimensions is scarce, particularly for higher education institutions. With regard to improvements in teaching, learning, administration, and research in higher education using technology, universities must achieve a considerable level of their IT-business alignment. Thus, since the process of aligning IT and business is regarded as an essential element to gaining value from IT investments, creating and assessing this alignment becomes an important area of research, especially for higher education sector (Brown & Motjoloane, 2005). Furthermore, this is also supported by the fact that new technologies are given an essential role in today's higher education environment and institutional strategies.

In this study, we explore the alignment of technology and education activities. The main research purpose is to understand the alignment practices of IT and institutional core services from a higher education context. The study results are expected to increase the understanding of researchers and practitioners on the IT integration process in tertiary education systems, more so in developing countries. Hence, the study is guided by the following research question: What are the dimensions and practices of IT and institutional alignment in developing countries' higher education context? In this study, the terms IT, ICT and technology are used interchangeably to mean "Information Technology."

THEORETICAL BACKGROUND

IT-Business Alignment: Criteria and Practices

The practices of IT-business alignment have been discussed as contributing factors for increasing business value from IT investments. This alignment has been defined by several scholars (Reich & Benbasat, 2000; Henderson & Venkatraman, 1993; Chan & Reich, 2007; McKeen & Smith, 2003). Reading from their definitions, this concept can be briefly described as the degree to which an organization creates and maintains an integrated fit amongst business strategy, IT strategy, business infrastructure, and IT infrastructure. Therefore, several organizational practices are proposed to ensure this alignment is maintained at a unit level, system level, project level and individual level (Luftman, 2003; Tan & Gallupe, 2006; Chan & Reich, 2007).

Scholars took different positions when investigating the alignment practices with the inspiration of Luftman's prior study (Table 1) which proposed a method with six criteria or "practice categories" for assessing IT-business alignment (Luftman, 2003). This method is composed of 38 alignment practices categorized into six classifications. Some studies focused on several dimensions of IT-business alignment such as strategic, structural, social and cultural aspects (Chan & Reich, 2007; Reich & Benbasat, 2000). Other scholars and practitioners went in deep to understand the antecedents to the alignment which are recognized as several institutional practices that are clustered into different categories (Yayla & Hu, 2009; Chan et al., 2006; Preston & Karahanna, 2009). For example, using the existing literature and more especially the Luftman's method of assessing the alignment between IT and the business, (Vermerris et al., 2014) summarized the antecedents to the IT-business alignment into four practices namely- Shared understanding, Management Commitment, Communication, and IT investment Evaluation.

Table 1: Maturity Categories of IT and Business Alignment, (Luftman, 2003)

| Maturity | Brief description |
|--|---|
| Communication | Effective alignment depends on how Business and IT staff exchange ideas and understand each other through a liaison that facilitates knowledge transfer. Business awareness and IT appreciation have to be created. Continuous knowledge sharing across the institution is always paramount. |
| Competence/ value measurement | Regular evaluation of IT value to the business processes. Ensure IT and Business measurement metrics in place to understand factors of failure (inhibitors) and to learn how to improve the alignment and perceive the IT relative advantage. |
| Governance | Organizational decisions, policies, and strategies in place for IT governance activities. Structures, prioritization of IT projects and how IT is budgeted. Top management support of IT planning and acquisition, and IT steering committees are important for the alignment |
| Partnership | Organizational business perception of IT value and the IT role in strategic business. Ensure also effective management of the internal and external business-IT relationship. |
| Technology scope | Ensure there is a flexible IT infrastructure (Hardware, Software, Connectivity) that is adapted to the business environment. Additionally, evaluate and introduce appropriate new best technologies that are easily customizable to business and customer needs. |
| Skills | To ensure that IT competencies are acquired and IT human resources are developed through clear strategies for hiring, training, promotion, and motivation. Creating an enabling environment for business innovation and entrepreneurial spirit is very important for mature alignment between IT and organizations. |

The method of Luftman has been tested to more than 50 global companies worldwide with the aim of identifying specific suggestions for improving the alignment between IT and the business (Luftman, 2003). Thereafter, this method has been used in business sectors such as IT governance in finance and insurance companies (De Haes & Van Grembergen, 2009). It has also been used to understand the relationship between the alignment maturity dimensions and Information Systems (IS) strategic alignment in Chinese business companies (Chen, 2010). Although not developed uniquely for educational institutions, the Luftman's six IT-business alignment tool can serve as a frame of reference to explore the alignment practices within a particular university context. Hence, this study aim can be achieved by building from the Luftman's method and by examining the existing literature related to ICT in education, to come up with relevant and contextualized IT-institutional alignment practices for higher education institutions.

Technology and Higher Education Institutional Alignment

Today, like in any other business domains, technology is playing a prominent role in higher education institutions to modernize teaching, learning, administration, and management of university services (Brown & Motjoloane, 2005). Using the concept of IT-business alignment, these scholars explored the factors of business and IT alignment considering a higher education institution as a case study. In their study, they revealed that rational-adaptation of IS planning, IT

managerial resources and IT implementation success are the main factors of technology and business alignment in a tertiary education system. For the IT implementation success factor, universities must put in place the standard IT systems such as computer-based human resources management systems, online student administration systems, online library services, E-learning systems, and computer labs for students' learning activities. Universities must have practices that ensure higher-level institutional support for IT initiatives, IT competence development, and IT-business communication across the institution.

Since it is obvious, from the literature, that IT-business alignment include both technical and non-technical aspects, it becomes then important to consider both the technical domain of IT and the social dimension as also suggested by (Chen, 2010; Reich & Benbasat, 2000; Luftman, 2003). From the higher education perspective, these include issues such as staff and students' perceptions on new technologies (Byungura, Hansson, Mazimpaka, et al., 2016) which, in some cases, contribute to resistance to change and keep those IT premises unused. Additionally, the creation of university ICT related policies (Jhurree, 2005), communication among university managers and IT executives, and the overall joint university planning practices should be highly considered as social dimensions of IT and institutional alignment. Therefore, attaining an alignment between technology and university services is a complex process under which a specific number of criteria must be fulfilled (Ziphorah, 2014; Moses et al., 2012; Brown & Motjolo-pane, 2005). In this regard, a contextual frame of alignment practices is important to guide the university managers, staff and other partners in maintaining a high degree of IT and institutional alignment.

A social-technical perspective of IT-Business alignment

According to (Baxter & Sommerville, 2011), the term "social-technical systems" was coined by Fred Emery and Eric Trist in 1960. These authors describe this concept as systems that engage a complex interaction among people, machines, methods, and the working environment. Also suggested by (Sawyer & Jarrahi, 2014), this concept implies that people, machines, and the organizational context have to be aligned together for effective technology integration in organizations. Concerning this concept, we can assume that technical and non-technical aspects are capable of being observed in a social-technical system, as illustrated in Figure 1 below.

Based on a description of complex adaptive system theory (Miller & Page, 2009; Marion, 1999), aligning IT and educational business can be regarded as a social-technical complex process. While both general business companies and educational institutions are similar in terms of social-technical related practices of IT alignment in their services (Luftman 2000; Lee et al., 2008; Brown & Motjolo-pane, 2005), the two types of entities differ from mission, objectives, some processes and the types of their customers. For an educational institution, a particular level of this alignment is achieved through several different practices related to teaching, learning, research, and administration to improve service delivery using information technology. Hence, these practices are then categorized into distinct criteria, and they may contain both technical and non-technical aspects.

The framework represented in Figure 1 below indicates that the social (non-technical) side of the system includes elements such as human behavior or culture, and the organizational structure (policies, leadership styles, managerial processes, and IT governance units). The technical dimension is composed of machines (computers and hardware) and methods (software, connectivity and other IT processes). Thus, different practices of IT-business alignment can be undertaken in a holistic social-technical system context. It should also be noted that the elements of this social-technical systems framework are interdependent at each level of IT business alignment practices.

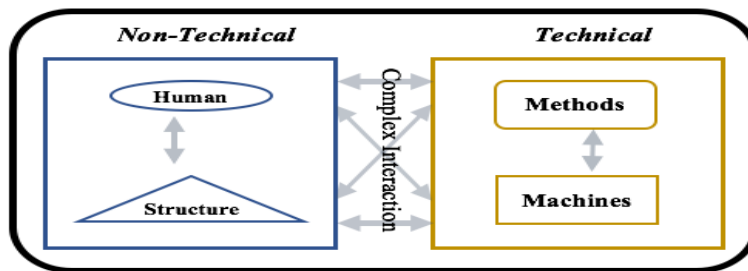


Figure 1. Social-Technical Systems Framework (Emery & Trist, 1960)

To summarize this, the alignment between IT and organizational business in a university system encompasses all the above framework aspects and the alignment practices related to each element. Therefore, a social-technical system concept can be applied to understand the maturity criteria and practices of an IT-Business alignment for the university context. In this regard, the following theoretical research model is proposed for this study.

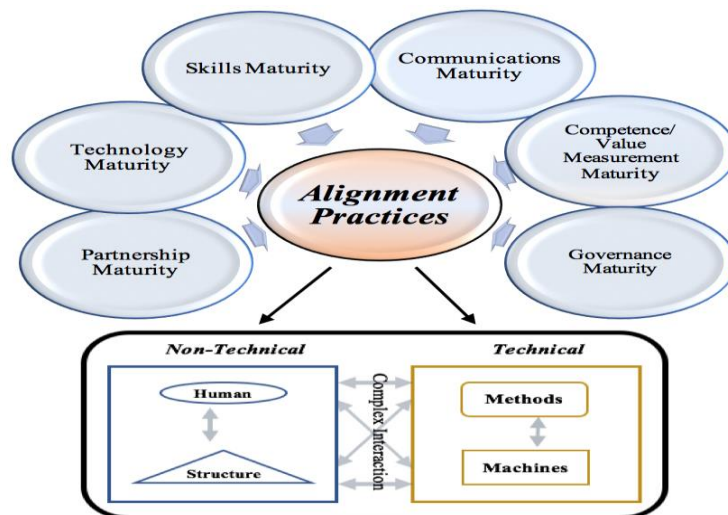


Figure 2: Conceptual Research Model: Alignment Metrics within a social-technical system

The combination of the above two theories for this study is important when aiming at revealing how the alignment practices for effective ICT integration in education fall into both technical and non-technical domains. Considering the universities as social systems that integrate information technologies, the practices behind this process involve certainly both not-technical and technical aspects. Hence, these two theories assisted in the analysis of research data and identification of the practices of IT-Institutional alignment.

DESCRIPTION OF THE STUDY CONTEXT

University of Rwanda (UR)

The University of Rwanda (UR) is the only public higher learning institution in Rwanda. It has merged all former public universities and higher learning institutes, as a result of the Rwandan Cabinet decision of the Official Gazette No 38, 2013 (Government of Rwanda, 2013). The country's aim of merging all the public universities was to improve the quality of education through the

effective and optimum use of information and communication technologies (ICTs). This university has 14 campuses scattered across the country. It comprises six colleges namely: College of Business and Economics (CBE), College of Medicine and Health Sciences (CMHS), College of Arts and Social Sciences (CASS), College of Agriculture, Animal Sciences and Veterinary Medicine (CAVM), College of Education (CE), College of Science and Technology (CST).

Since it started its operations, the University of Rwanda has integrated several IT systems to support teaching, learning, research and library, and the overall university administrative processes. These include for example, the Moodle platform, which has been upgraded, and Turnitin and SciPro that were acquired for the first time in Rwanda to improve the quality of research. Another IT system implemented after creating the University of Rwanda is the ITS Integrator Software, an integrated educational management information system that supports the management and administration of the university services. Therefore, different subsystems of UR took part in this study to understand the practices of this institution regarding the acquisition, adoption, and use of IT systems in service delivery.

Eduardo Mondlane University (UEM)

Another case study institution that was involved in this research is the “Universidade Eduardo Mondlane (UEM)”. This institution is the oldest and biggest university in Mozambique. It was established under the former Portuguese colonial power in 1962 with the name “General University Studies of Mozambique.” At present, this institution is composed of six schools. Two schools operate in the main campus and the remainder are based in three different provinces outside of Maputo City. Furthermore, UEM comprises 17 academic campuses, which are located within a radius of 7 km within Maputo city. At the UEM, significant innovative changes have been registered under the governance of the university’s Strategic Plan 2010–2014 (UEM, 2010). This institutional master plan accentuates more on the integration of ICT in teaching, learning, and research. This trend has been a result of a long process and with the extensive participation of staff and students. This Strategic Plan includes four major reforms, namely (1) restructuring the university management, (2) reforming UEM’s financial system, (3) Curricular reform, and (3) plan for introducing and using ICT for the university service delivery (CIUEM, 2006). Several IT support systems are in place at this institution to support in all areas.

METHODOLOGY

This section describes the methodological approach used and the associated methods for data collection. The study sample and the analysis of the data are also discussed.

Research Design

The research design involved a prior review of the literature to identify and define the appropriate concepts related to the practice categories of IT-organizational alignment. After that, the empirical research was designed to explore the real-world context (Denzin & Lincoln, 2011; Creswell, 2013) of higher education institutions regarding the practices of aligning IT with their services.

As an exploratory type of research, an embedded case study with multiple units of analysis (see Figure 3) was designed and applied as a research strategy (Yin, 2009).

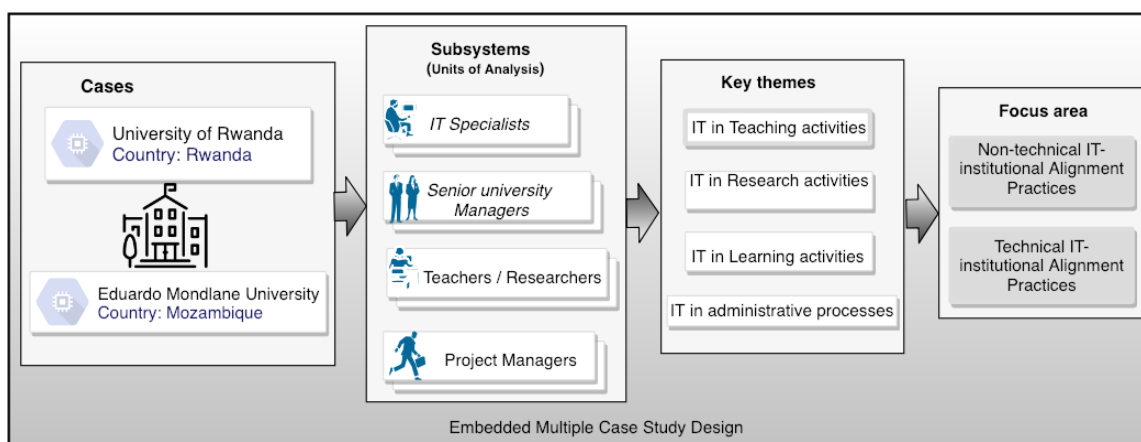


Figure 3. Applied Exploratory Embedded Multiple Case Study Design

This type of case study approach offers an opportunity for researchers to explore in-depth the phenomenon under investigation (Yin, 2009), in this case, the practices related to IT-institutional alignment within higher education settings. The exploratory embedded case study design is perfect for in-depth investigations of more contexts under study, rather than just isolated variables, by allowing use of multiple sources of evidence. Furthermore, with this approach, the research validity is improved through its capability for data source triangulation and by including different stakeholders.

The case study institutions, which are respectively the University of Rwanda (UR) and Eduardo Mondlane University (UEM), were selected based on their size and reputation from their respective countries. These are the largest and multi-campus universities with complex institutional structure and advanced interconnected ICT infrastructure in place. Having earlier established contact with researchers from the two case study universities, both of which are leading public higher education institutions in their respective countries, it was convenient to consider these cases for this study. The units of analysis for the study were the IT specialists, senior university managers, Teachers/Researchers, and project managers (team leaders) from both institutions.

The findings were analyzed across the two case study institutions to understand similarities and differences (Vannoni, 2015) on how IT has been integrated into teaching, learning, research and administration processes. To this end, the external research validity has been ensured by generalizing the analysis across these two settings (Yin, 2014). Further, the identified practices, from the literature, were compared with those from the case study institutions, and then a framework for practices of an IT-institution alignment was proposed considering teaching, learning, research and the administration in a higher education context.

Data Collection

As the type of this study's research question requires interacting with IT and educational managers and the academic staff with managerial roles, semi-structured interviews (Denscombe, 2010; Yin, 2003) were considered most suitable for getting the real-world understanding of IT-institutional alignment practices. Face-to-face semi-structured interviews were conducted during the period from May 2015 to May 2016, using an interview protocol including the metrics for assessing the IT-business alignment (Luftman, 2003).

The interview protocol was made of three categories of questions: The first part was about collecting participants' background information. The second part of questions was designed to collect the data regarding the institutional practices of ICT integration in educational services, with reference to Luftman's six maturity criteria for an effective IT and business alignment. The information provided at this stage was used to extract practices of educational institutions as follows: communication, competency/value measurement, partnership, IT governance, technology scope, and skills which are considered as IT-business alignment maturity criteria. The last part of the research instrument focused on recommendations from respondents regarding the alignment of IT with the university operations related to teaching, learning, research, and administration.

Additionally, the literature survey was conducted to collect secondary data related to the implementation, adoption, and use of ICT in higher education institutions. This approach was used to obtain more in-depth knowledge about the practices related to technology and education services. The selection of these articles was based on the following criteria:

- The research article must suggest an artifact in the form of a model, a method or a framework related to technology and at least one of the areas of intervention in education activities (Teaching, Learning, Research, and Administration)
- It should report on the practical implementation of the proposed artefact in a real-world case study institution of higher education.
- Finally, the article should have been published after the first IT-business alignment model has been developed (Henderson & Venkatraman, 1993)

Use of secondary and primary data is advised in research to ensure the validity and reliability of the study results (Lowry, 2015). This triangulation in data collection enabled the researchers to validate the themes/ statements related the alignment practices from both the literature and the interview data.

Participants

The identification and choice of participants followed the opinion of (Yin, 2003) that the sample should be familiar with the study context and the area of investigation. With reference to the research question for this study, a purposive sampling technique (Bryman, 2015; Creswell, 2014) was used to identify participants according to their ability to provide relevant information for this study. Before the participants' selection process, the predetermined eligibility criteria for respondents were set as follow:

- Participants should be at an organizational level with a strong awareness of the university's strategic and managerial processes,
- They should be at least from either technical, administrative or academic domain,
- They should have at least five years of experience in the higher education sector with a high degree of involvement in the implementation of IT projects in different university services.

Following the above participant selection criteria, 24 respondents were selected to participate in a face-to-face interview. After the interview process, 14 interviews with the categories of respondents shown in Table 2 were retained and considered as relevant and valid for this study (Myers, 2009).

Table 2: Participants and roles in their respective institutions

| Institution | Respondent's post | | | |
|----------------------------|-------------------|---|-------|--|
| | Code | Educational Business | Code | Information Technology |
| Institution 1 (UR) | DTLE | Directors of Teaching and Learning Enhancement | ITSA | IT System Administrator |
| | DRIPGS | Director of Research, Innovation and Postgraduate studies | DITG | Director of IT Governance |
| | RAO | Registration and Admission Officer | ELS | E-learning specialist |
| | PPTL | Professor and Project Team Leader | | |
| Institution 2 (UEM) | CDPF | Chief Department of University Planning and Finance | DCDL | Director of Center for Distance Learning |
| | FL | Faculty Lecturer, Education Faculty | HITIC | Head of IT Innovation Center |
| | DVC | Deputy Vice Chancellor for Academic Affairs | DDIC | Deputy Director of Informatics Center |
| | DCAD | Director of Academic Development Center | | |

To ensure the qualitative rigor in this study, the data saturation principle (O'reilly & Parker, 2013) has been respected by retaining 14 interviews, given that no new themes or instances were emerging and for each category of alignment practice there was saturation. Among this sample, six were administrators, and five were IT specialists at senior and middle management level. The remaining three respondents were senior faculty members with some managerial responsibilities.

Data analysis

The data analysis was conducted to get factual evidence regarding the practices of IT-institutional alignment in a higher education context. The scientific articles and the interviews are the two types of data that were analyzed.

The primary goal of the literature survey was to get awareness of how institutions of higher education proceed with integrating technology in different service delivery processes. Hence, this enabled us to come up with an initial list of contextual practices from an educational context. These practices were compared with interview data before being incorporated in the proposed framework for IT-institutional alignment. Overall, the following two categories of literature were analyzed to understand the alignment practices within the higher education context.

Those related to IT-business alignment: A review of this literature helped in finding relevant maturity criteria (Luftman, 2003; Reich & Benbasat, 2000; Chan & Reich, 2007; Avison et al., 2004) and developing an interview protocol that was used to collect the empirical research data. Accordingly, considering the alignment practices as characterized by both social and technical aspects, the related literature was analyzed to propose a conceptual research model to guide this research process (see Figure 3).

Those related to ICT integration in education: The purpose of thematically exploring this type of documents was to get the practices related to technology and education services. The information from this type of literature was then compared with the interview manuscripts to establish relevant concepts, establish the list of the alignment practices, and categorize them under each alignment maturity as proposed by Luftman (2003).

Moreover, the interviews were recorded and transcribed before the thematic analysis. As commonly known in qualitative studies, thematic analysis is used to identify themes and patterns within the data (Guest et al., 2012; Flick, 2014; Creswell, 2013).

All the collected data were analyzed using a qualitative data analysis software, MaxQDA version 11. This computer-based tool (Corbin, 2008; Denscombe, 2010) has helped to create codes for the alignment practices and organize them under the related emerging themes. Hence, themes and patterns that are related to each practice of aligning IT and institutional activities were systematically identified and coded. Before this process, the six IT-Business alignment maturity criteria from the literature were entered into the software with respective codes. Accordingly, using MaxQDA, all the identified practices (themes) from the case study institutions and the literature were associated with each maturity criterion. This analysis process was intended to refine themes and extract their relationship with maturity criteria in line with the research aim.

After data analysis with MaxQDA software, the research team revised and renamed all extracted themes (practices) accordingly before they were used to develop the final version of IT-institutional alignment practices. The aim of redefining and renaming the themes from interviews was to make the alignment practices more understandable within an education context. Finally, iterative discussions around the themes and the members of the research team agreed on the final categories (see Table 4 below) proposed as practices for ensuring an efficient technology and institutional alignment in higher education.

The whole research process followed the ethical research guidelines (Denscombe, 2010). Before any step of data collection, the approval for research activities was sought and granted by the two case study institutions. Informed consent was also obtained from each respondent, who were all informed that participation in the interview was voluntary and that they had the freedom to withdraw at any time during the research process. After they were advised of the purpose of this study, only those respondents who expressed their willingness to participate were contacted and interviewed. All respondents were assured of confidentiality and anonymity and intended use of the data obtained for the research purpose.

RESULTS AND DISCUSSION

This section presents the developed framework for technology and institutional alignment practices based on the corrected and analyzed primary and secondary data. Both the literature and interviews from the case study institutions were examined to identify the contextual alignment practices for IT integration in higher education institutions. These practices were then categorized under the six-IT-business alignment maturity metrics proposed in the conceptual research model for this study, presented in Figure 2.

From the number of articles selected, 6 models, 10 frameworks, and 5 methods were retained and compared with Luftman's method of IT-Business alignment. The analysis of these artefacts showed a particular extent of clarifying the technology and institutional alignment practices. Furthermore, all the 21 artefacts related to ICT integration in higher education, reflected the six metrics of IT-institutional alignment. More specifically, alignment metrics such as "Partnership," "Competence/Value measurement," and "Communication" are the least reflected components. As shown in Table 3 most of the artefacts analyzed, were related to the "Technology Scope" and "Structure/Governance" when compared to the rest of the alignment metrics.

Table 3: Comparison of the literature under the alignment categories of Luftman (2003)

| No | Literature | Literature and IT alignment metrics | | | | | |
|----|------------|-------------------------------------|-----------------------|-------------|--------------------------------|------------------|--------|
| | | Communication | Structure /Governance | Partnership | Competence / Value Measurement | Technology Scope | Skills |
| 1 | F1 | S | M | M | N | M | S |
| 2 | F2 | S | S | S | N | S | S |
| 3 | MO1 | S | M | N | M | E | M |
| 4 | MO2 | S | M | N | M | M | M |
| 5 | ME1 | N | M | S | N | M | S |
| 6 | MO3 | N | N | S | N | M | N |
| 7 | MO4 | N | N | N | N | S | S |
| 8 | F3 | S | M | N | S | M | S |
| 9 | ME2 | E | E | M | M | E | E |
| 10 | F4 | M | M | N | S | M | S |
| 11 | F5 | S | S | N | N | S | S |
| 12 | F6 | M | M | N | M | M | S |
| 13 | MO5 | N | S | S | N | M | S |
| 14 | ME3 | S | M | N | S | S | S |
| 15 | F7 | S | M | N | S | M | S |
| 16 | MO6 | S | S | N | M | S | S |
| 17 | F8 | N | N | N | N | M | S |
| 18 | F9 | S | N | N | N | S | N |
| 19 | F10 | N | M | N | N | M | S |
| 20 | ME4 | M | M | N | N | E | M |
| 21 | ME5 | N | S | N | S | M | S |

Legend: *E*= Practices are extremely reflected, *M*= Practices are moderately reflected, *S*= Practices are slightly reflected, *N*= Practices are not at all reflected.

Therefore, the findings at this stage reveal that, at least for the sample of literature used in this study, several alignment practices within the context of higher education institutions have been identified under each metric of the IT-business alignment. Consequently, the above information from the analyzed literature and the exploration of empirical data enabled us to grasp the contextual alignment practices of technology integration in higher education services. The metrics and related practices of IT-institutional alignment are presented in Table 4 below.

The information presented reflect the empirical results of this study that include a reflection of what the respondents had to mention as themes and patterns related to the IT-institutional alignment practices. With reference to the six-metrics of Luftman's IT-business alignment, respondents were asked to report on the alignment practices that are observable in their respective institutions. The analysis of interview manuscripts allowed researchers to extract 45 practices from the interviews with 14 respondents from the case study universities. The identified practices are related to aligning IT with research, teaching, learning and administrative functions.

Table 4: The identified alignment practices as categorized under six metrics

| Metric | Code of Practice | Practice | Interviews-Institution1 | Interviews-Institution2 |
|---------------|------------------|--|------------------------------|------------------------------------|
| Communication | CP1 | Awareness on objectives, strategies, and rules for technology use | DTLE, DITG, RAO, PPTL, ITSA | DDIC, HITIC, DCAD, HITIC, DCDL, FL |
| | CP2 | New IT systems demos and FAQs developed and communicated | DRIPGS, RAO, PPTL, ITSA, | HITIC |
| | CP3 | Enabling institutional learning environment and effective communication channels | DRIPGS, ELS, RAO, PPTL, ITSA | DVC, DCAD, CDPF, DDIC, HITIC, FL |
| | CP4 | IT-Management-Pedagogical liaison staff and Centres | DRIPGS, ELS, PPTL, ITSA | DVC, DDIC, HITIC, DCAD, FL |
| | CP5 | Understanding and ownership of university business by IT staff | DITG, RAO, PPTL, ITSA | HITIC, DCDL |
| | CP6 | Understanding and ownership of IT by administrators | DITG, RAO, PPTL, ITSA | DDIC, HITIC, DCAD, DCDL |
| | CP7 | Enabling easy access to students online learning materials | DTLE, PPTL, ELS | DVC, CDPF |

| | | | | |
|--------------------------------------|-------|--|--|--|
| Structure / Governance | SGP1 | <i>Developing and validating a University aligned ICT Master Plan</i> | DRIPGS, ELS, RAO, ITSA | HITIC, DCAD, FL |
| | SGP2 | <i>Developing and enforcing policies for technical and non-technical domains</i> | DRIPGS, DITG, ELS, PPTL, ITSA | DVC, DDIC, HITIC, DCAD, DCDL, FL, CDPF |
| | SGP3 | <i>Regular follow up on using technology after training</i> | DTLE, ELS, RAO, PPTL, ITSA | DCAD, DCDL, FL |
| | SGP4 | <i>Developing motivation mechanisms and strategies for innovative IT champions</i> | DTLE, ELS, RAO, PPTL, ITSA | DDIC, HITIC, DCAD, DCDL, FL, CDPF |
| | SGP5 | <i>Top management involvement and supporting IT implementation</i> | DTLE, DRIPGS, DITG, ELS, RAO, PPTL, ITSA | DVC, HITIC, DCDL, FL |
| | SGP6 | <i>Enabling strategies, rules and procedures for IT procurement and use</i> | DTLE, DRIPGS, DITG, ELS, RAO, ITSA | DDIC, HITIC, FL |
| | SGP7 | <i>Rational IT budgeting in the overall university's financial planning</i> | DTLE, RAO, PPTL, ITSA | HITIC, DCAD, DCDL, FL, CDPF |
| | SGP8 | <i>Ensure relationship with IT infrastructure governance and university governance</i> | DITG, ELS, RAO, ITSA | DVC, DDIC, HITIC, DCAD, DCDL, FL, CDPF |
| | SGP9 | <i>Establishing Senior-level IT steering committees</i> | DITG, RAO, PPTL, ITSA | HITIC |
| | SGP10 | <i>Decentralization and empowering middle and lower level managers</i> | DITG, ELS, RAO, PPTL | DDIC, HITIC |
| | SGP11 | <i>Developing digital teaching materials and other resources</i> | DTLE, DRIPGS, ELS | DVC, HITIC, DCAD, DCDL, CDPF |
| Partnership | PP1 | <i>Creating external partnership for IT investments and funding</i> | DRIPGS, ELS, PPTL, ITSA | DVC, DDIC, HITIC, DCDL, FL, CDPF |
| | PP2 | <i>Developing other universities' partnership for IT knowledge exchange</i> | ELS, RAO, ITSA | DVC, DDIC, HITIC, DCAD, DCDL, FL |
| | PP3 | <i>Developing external partnership with IT service providers and outsourcing</i> | ELS, RAO, PPTL, ITSA | DVC, DDIC, HITIC, DCAD, DCDL, FL, CDPF |
| | PP4 | <i>Securing Government support for IT implementation</i> | DRIPGS, ELS, RAO, PPTL, ITSA | DDIC, FL, CDPF |
| | PP5 | <i>Managing IT Solutions-University activities relationship internally</i> | DRIPGS, DITG, RAO, ITSA | DVC, HITIC, DCAD, DCAD, DCDL, FL, CDPF |
| | PP6 | <i>Managing and aligning external partners' interests with university IT needs</i> | DITG, RAO, PPTL, ITSA | DCDL |
| Competence /value Measurement | CVMP1 | <i>Develop metrics for evaluating university IT expenditure and cost-benefit</i> | DITG, ELS, PPTL, ITSA | HITIC, FL, CDPF, DDIC, CDPF |
| | CVMP2 | <i>Regular monitoring and evaluation of staff IT training</i> | DTLE, ELS, RAO, PPTL, ITSA | DVC, HITIC, DCDL, FL, CDPF |
| | CVMP3 | <i>Regular measurement of People, Structure and IT infrastructure linkage</i> | DITG, RAO, ITSA | HITIC, DDIC, DCDL, CDPF, DCAD |

| | | | | |
|-------------------------|-------|---|------------------------------------|--|
| | CVMP4 | <i>Regularly measuring and monitoring Student per computer ratio</i> | DITG, RAO, | DDIC, HITIC, FL, CDPF |
| | CVMP5 | <i>Develop clear procedures and metrics for regular IT value-addition measurement</i> | DITG, ELS, RAO, ITSA | DDIC, HITIC, FL, CDPF, DCAD |
| | CVMP6 | <i>Assessing IT related policies enforcement regularly</i> | DITG, RAO, PPTL, ITSA | HITIC |
| | CVMP7 | <i>Evaluating IT skills and the implementation of training programs</i> | DITG, ELS, RAO, PPTL, | DCAD, CDPF |
| Technology Scope | TSP1 | <i>Providing relevant and timely technical support up to the lower unit</i> | DTLE, ELS, RAO, PPTL, ITSA | DVC, DDIC, HITIC, DCAD, DCDL, FL, CDPF |
| | TSP2 | <i>Ensuring primary and standard IT systems in place across campuses</i> | DTLE, DRIPGS, DITG, ELS, RAO, ITSA | DVC, DDIC, DCAD, HITIC, DCDL, FL, CDPF |
| | TSP3 | <i>Providing improved and stable connectivity and internet bandwidth</i> | DTLE, DRIPGS, ELS, RAO, PPTL, ITSA | DVC, DDIC, HITIC, DCDL, FL, CDPF |
| | TSP4 | <i>Providing easy access to internet and IT systems features for staff and students</i> | DTLE, DRIPGS, RAO, PPTL, ITSA | DVC, DDIC, HITIC, DCAD, DCDL, FL |
| | TSP5 | <i>Ensuring high level IT system security standards and maintenance operations</i> | DITG, ELS, RAO, ITSA | DVC, DDIC, DCAD, CDPF |
| | TSP6 | <i>Providing integrated technology architecture and user-friendly platforms</i> | DITG, ELS, RAO, PPTL, ITSA | DVC, HITIC, DCDL, CDPF |

| | | | | |
|---------------|-----|--|------------------------------------|--|
| Skills | SP1 | <i>Adequate Teacher's IT training to reduce resistance to technology</i> | DTLE, DRIPGS, ELS, RAO, PPTL, ITSA | DVC, DDIC, HITIC, DCAD, DCDL, FL, CDPF |
| | SP2 | <i>Adequate IT support staff and End-users training provided regularly</i> | DRIPGS, DITG, ELS, RAO, PPTL, ITSA | DVC, HITIC, DCAD, DCDL, FL, CDPF |
| | SP3 | <i>Align IT training plans to job description /responsibilities</i> | DTLE, ELS, RAO, PPTL, ITSA | HITIC, DCAD |
| | SP4 | <i>Enabling social interaction for digital knowledge sharing among staff</i> | DRIPGS, RAO, ITSA | HITIC, DCAD, CDPF |
| | SP5 | <i>Right people at the right place: Staff placement</i> | DITG, ELS, PPTL, ITSA | CDPF |
| | SP6 | <i>Establishing clear IT professionals' recruitment processes</i> | DITG, RAO, ITSA | FL, CDPF |
| | SP7 | <i>Establish IT talent attraction and retention strategies</i> | DITG, ELS, RAO, PPTL, ITSA | DDIC, CDPF |
| | SP8 | <i>Career and IT skills development in line with university priorities</i> | DITG, ELS, RAO, PPTL, ITSA | DDIC, HITIC, DCAD, DCDL, FL, CDPF |

Some of the alignment practices resulted from the interviews and were coded under each relevant practice category. A sample of relevant responses are shown below. In one interview, this respondent reflected:

“For example, I am just giving an example, to have...to have, I am talking about now ICT staff, to have the right ICT staff, the general view of, the general process of recruiting people, ICT staff is based on paper, not really on their technical skills..... yeah we are hiring engineers but they have not yet engineered something, software engineers but no single code they did previously” (Respondent, DITG)

This respondent's reflection enabled us to understand that there is a need to “Establish clear IT professionals' recruitment processes” and this was coded as (SP6), as part of the alignment practices under the category of Skills (see Table 3).

Another respondent put it as follows:

“Yeah, I think when it comes to system incompatibility, especially on browsers, that is really an issue on MIS system at UR, we are still using only Internet explorer to run the system. So, it can’t run on other browsers, because some system developers who are external partners did not take into consideration to what we technically call platform independence.” (Respondent, RAO).

From the above extract, it was realized that an alignment practice of “Providing integrated technology architecture and user-friendly platforms”, coded as (TSP6), is necessary to improve technology integration in university administration. The same extract can also inform the alignment practice of “Managing and aligning external partners’ interest with university IT needs”, coded as (PP6) is also important under the category of “Partnership”.

Another example of the alignment practice is the “Developing and enforcing policies for technical and non-technical domains” coded as (SGP2) which is under the Structure/Governance category. Some participants explained this alignment practice as follows:

“But until 2014, we have a kind of strategic plan, ICT strategic plan, even the overall university strategic plan, which talks about student-centered learning and then the use of ICT as a tool. We have now a new vision, but we did not design new policies connected with this new vision” (Respondent, FL).

“Ok, I go by one by one, for example, let us take Lack of policies and strategies, no it is, we have IT policies and strategies, okay, haaaa and there is no commitment towards the implementation of those policies and strategies.” (Respondent, PPTL)

Another important alignment practice is, for example, the one stating that there should be “Adequate Teacher’s IT training to reduce resistance to technology” which is coded as (SP1) under the “Skills” category. The following examples of participants’ views were used to confirm this alignment practice:

“...there has been the spirit that people should engage in the use of IT in teaching and learning. ... For example, we were told to use Moodle, the platform which was there, to upload materials, we were even trained at some point....in instructional technology and how to design videos, how to put your materials in the form that students can access and hear and read online.” (Respondent, DRIPGS)

“.... And also, try to coordinate IT related training to make sure that we are covering all teachers, and aaah we don’t have any baseline like for now we need to have a baseline to know which level of IT knowledge teachers have and which kind of training needs they have.” (Respondent, HITC).

Based on the analysis of the identified practices from interviews in line with the six categories of IT and business alignment, and the information from the interview-literature comparison matrix in Table 3, a frame of reference for technology and higher education institutional alignment practices is proposed (see Figure 4).

The framework for IT-Institutional alignment practices for a higher education context

This final version of the framework includes a set of alignment practices that are presented and described in Figure 4. Considering that the alignment between IT and university services include both technical and non-technical features, the proposed framework also includes these aspects to clarify the complexity of practices for an effective institutional alignment with the emerging

information technology. All the identified themes and patterns related to alignment practices have been placed in the six main categories.

This study came up with 45 contextual practices reflecting the higher education context (see Figure 4). Out of the total identified alignment practices, 27 reflect, in particular, the higher education context of teaching, learning, and research. Of these new alignment practices, six are from *Structure/Governance* category (SGP2, SGP3, SGP5, SGP6, SGP10, and SGP11). The two categories namely, *Partnership* (PP1, PP2, PP3, PP4, and PP6) and *Competence/Value Measurement* (CVMP1, CVMP2, CVMP4, CVMP6, and CVMP7), recorded five new alignment practices each, which are purely related to the education sector. More particularly, the Partnership category of extended to the external collaboration of the university with other partners such as the Government, IT vendors and other universities for IT outsourcing, knowledge exchange and IT funding. The other two remaining categories of *Technology Scope* (TSP1, TSP3, TSP4, and TSP5) and *Skills* (SP1, SP3, SP5, and SP6) encompass 4 new alignment practices respectively when compared to the Luftman categories (Luftman, 2003). Lastly, the *Communication* category has also registered three new alignment practices (CP1, CP2, and CP7). The remaining 18 practices are similar to the ones proposed in Luftman's method of IT-Business alignment, despite some slight wording differences to reflect the higher education context.

On the other hand, all the six practice categories from the Luftman's method have been used in the proposed IT-institutional alignment framework, but some small changes in terminology for some metric categories have been applied. For example, Governance Maturity has been changed to Structure/Governance in the proposed framework. To confirm the final proposed framework, the researchers participated jointly in the wording and terminology of the identified practices. Therefore, some adjustments were suggested before agreement on the final version of the proposed alignment practices, to reflect the higher education context.

CONCLUSION

The main objective of this study was to explore the IT-institutional alignment practices within a higher education context. In this study, using the literature (21 research articles) and 14 interviews from two case study universities, 45 alignment practices were identified and summarized in a framework (see Figure 4). This framework of practices can be used to create and assess the alignment between IT and institutional activities in the two case study institutions or similar contexts. The proposed framework includes 45 alignment practices, which were placed into 6 categories.

From a theoretical foundation of this study, the method of IT-Business alignment of Luftman was used for categorization of the alignment practices that are included in the proposed framework. The particularity of the proposed IT-institutional alignment framework is that it comprises 27 new alignments practices that are specific for IT integration in higher education institutions. Furthermore, using the concept of the social-technical system, this study found that the identified alignment practices for IT-Institutional alignment include both non-technical and technical aspects (see Figure 4).

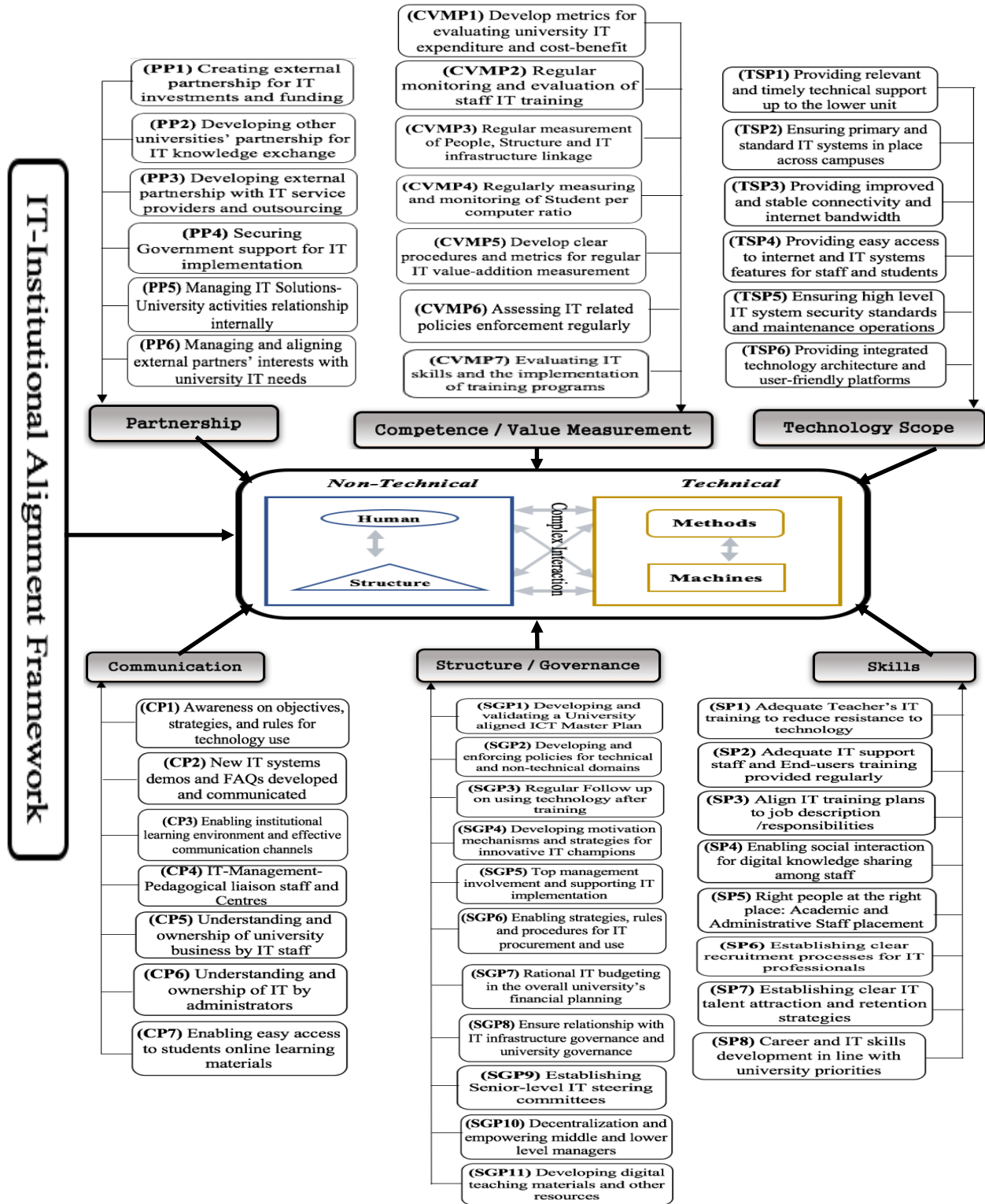


Figure 4: A framework for IT-Institutional Alignment Practices within a higher education context

The concept of the social-technical system enabled us to highlight from the social side, that there are some alignment practices that are required to improve the individual culture (SP1, SP4, CP5, CP6, SGP3, and SGP4) or organizational structure, management style and governance (SGP5, SGP6, SGP7, SGP8, SGP9, SGP10, PP5, CVMP1, CVMP6, and CP4) for an effective integration of technology. For the technical side of this concept, the alignment practices such as (TSP1, TSP2, TSP3, TSP4, TSP5, TSP6, SP1, SP2, CP2) were also identified as related to methods and machines (software and hardware). As a result, higher education institutions should use this concept to ensure that the overall alignment process follows a social-technical perspective for an adequate fit between IT and the university business functions.

By comparing the two case study institutions, the findings showed that the two institutions were still at a lower level in terms of using ICT in teaching and learning. Likewise, the study indicated few differences in terms of technology adoption and usage at the two case study universities. Contrary to this, the findings point to a high degree of IT systems use in research and administration services from both cases.

Regarding the alignment practices, for each identified IT-institutional alignment practice, respondents from each of the case study institutions advocated for it (see Table 4). In addition, the respondents from both education and IT were homogenous regarding their responses to the proposed technical and non-technical alignment practices.

From both the case study institutions, it was also revealed that the most emphasized IT-Institutional alignment practices are (SP1), (SP2) from the “Skills” category, (TSP1), (TSP2), (TSP3) from “Technology Scope” category, (PP3), (PP5) from “Partnership” category, (SGP2), (SGP5), (SGP8) from “Structure/Government” Category, and (CP1), (CP3) from “Communication”. The vast majority of the respondents from the two institutions have intensely discussed these alignment practices and recommended them for improving the integration of IT systems in teaching, learning, research, and administration.

Furthermore, while the technical aspects such as hardware, software, and Internet connectivity are more advanced at UEM compared to UR, both of the case study institutions have similar drawbacks related to the non-technical perspectives. These include, for example: (1) staff’s high degree of resistance to change in terms of technology uptake, (2) lack of clear institutional ICT related policies, (3) high student-computer ratio, (4) lack of top management involvement in ICT projects implementation, (5) lack of strategies for IT staff retention and career development, and (6) misunderstanding between IT and academic staff. From the technical dimension: the lack of IT support to faculty and students, and inadequate training on IT were the main the challenges affecting the integration of technology in teaching and learning activities.

Subsequently, the findings of this study have also made a practical contribution to the literature. If statistically tested and validated, the identified alignment practices may help higher education institutions to assess and maintain a consistent fit between new technologies and the activities of teaching, learning, research, and administration. This study has also contributed theoretically to the existing knowledge about IT and organizational alignment, mainly by extending the understanding of the alignment practices for effective technology integration in the higher education sector. While the explored literature in this study indicated a lack of clarity on which practices are relevant for university-IT alignment, the proposed framework of IT-institutional alignment practices constitutes a clear, structured and focused knowledge base that can serve as a starting point for empirical studies. Moreover, this framework can assist when designing appropriate policies and strategies related to the integration of ICT in higher education institutions.

While the framework still needs further development and statistical validation to be considered an inclusive model, researchers and practitioners, especially from universities in developing countries, are invited to test it in their respective contexts, to increase its relevance in the area of technology integration in teaching, learning, research, and administration. In addition, the proposed alignment practices may not be relevant in some institutions not used in this research as case studies. As a result of this, we recommend appropriate modifications where necessary; to achieve a better fit between information technology and education activities in respective institutional contexts. Hence, the results of this study cannot be generalized to other universities apart from those used in this case study. Additionally, not all the alignment practices could be given the same degree of importance by all academic institutions. Any alignment practice proposed in this study should only be considered in the context of the specific institutional context in which the proposed framework will be applied.

Finally, further research should focus on testing and evaluation of this proposed framework of IT-institutional alignment practices. In other words, the evaluation of this framework should aim to understand its usability, coherence, relevance, and efficiency. Moreover, future studies should measure the importance of each alignment practice in the proposed framework for development of a comprehensive IT and institutional alignment model. A follow-up study could also end up splitting the proposed alignment practices into several others depending on the case study context under investigation. This study was conducted in two institutions from a sub-Saharan region, therefore, for research generalizability, any further similar study should include more universities from different regions, while also applying an embedded multiple case study design.

REFERENCES

- Alaceva, C. & Rusu, L., (2015). Barriers in achieving business/IT alignment in a large Swedish company: What we have learned? *Computers in Human Behavior*, vol. 51, pp.715–728.
- Avison, D. et al., (2004). Using and validating the strategic alignment model. *Journal of Strategic Information Systems*, vol. 13, no. 3, pp.223–246.
- Baxter, G. & Sommerville, I.,(2011). Socio-technical systems: From design methods to systems engineering. *Interacting with computers*, vol. 23, no. 1, pp.4–17.
- Brown, I. & Motjoloane, I., (2005). Strategic business-IT alignment, and factors of influence: a case study in a public tertiary education institution: reviewed article. *South African Computer Journal*, vol. 35, pp.20–28.
- Bryman, A., (2015). *Social research methods.*, Oxford university press.
- Byungura, J.C., Hansson, H., Mazimpaka, O., et al., (2016). Exploring Teacher Adoption and Use of an Upgraded eLearning Platform for ICT Capacity Building at University of Rwanda. In Paul Cunningham and Miriam Cunningham (Eds), ed. *IST-Africa 2016 Conference Proceedings*. ISTAfrica, pp. 978–1.
- Byungura, J.C., Hansson, H., Kamuzinzi, M., et al., (2016). ICT Capacity Building: A Critical Discourse Analysis of Rwandan Policies from Higher Education Perspective. *European Journal of Open, Distance and E-Learning*, vol. 19. no. 2, pp.46–62.

- Byungura, J.C., Hansson, H. & Thashmee, K., (2015). User Perceptions on Relevance of a Learning Management System: An Evaluation of Behavioural Intention and Usage of SciPro System at University of Rwanda. In T. António Moreira, S. András, & M. Ildikó, eds. *European Distance and E-Learning Network 2015 Annual Conference*. Barcelona, Spain, pp. 582–562.
- Chan, Y.E. & Reich, B.H., (2007). IT alignment: what have we learned? *Journal of Information technology*, vol. 22, no. 4, pp.297–315.
- Chan, Y.E., Sabherwal, R. & Thatcher, J.B., (2006). Antecedents and Outcomes of Strategic IS Alignment: An Empirical Investigation. *IEEE Transactions on Engineering Management*, vol. 53, no. 1, pp.27–47.
- Chen, L., (2010). Business-IT alignment maturity of companies in China. *Information and Management*, vol. 47, no. 1, pp.9–16.
- CIUEM, (2006). Plano Estratégico 2007-2011 de ICTs da Universidade Eduardo Mondlane.
- Conway, T., Mackay, S.; & Yorke, D., (1994). Strategic planning in higher education: Who are the customer. *The International Journal of Educational Management*, vol. 8, no. 6, pp.29–36.
- Corbin, J., (2008). *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, London: Sage publications.
- Creswell, J.W.,(2013). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* 3rd ed., Tousand Oaks, California: SAGE Publications.
- Creswell, J.W., (2014). *Research design : Qualitative, quantitative, and mixed methods approaches* 4th ed., LA: SAGE Publications.
- De Haes, S. & Van Grembergen, W., (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management*, vol. 26, no. 2, pp.123–137.
- Denscombe, M.,(2010). *The Good Research Guide: for small-scale social research.*, London: McGraw Hill.
- Denzin, N.K. & Lincoln, Y.S., (2011). *Introduction: The discipline and practice of qualitative research* 4th ed., Thousand Oaks CA: Sage.
- EI-Mekawy, M., Rusu, L. & Perjons, E., (2015). An evaluation framework for comparing business-IT alignment models: A tool for supporting collaborative learning in organizations. *Computers in Human Behavior*, vol. 51, pp.1229–1247.
- Fallshaw, E.M., (2000). It planning for strategic support: Aligning technology and vision. *Tertiary Education and Management*, vol. 6, no. 3, pp.193–207.
- Flick, U., (2014). *An introduction to qualitative research* 5, ed., Thousand Oaks, California: SAGE Publications.
- Gevaert, R., (2012). A sustainable model for ICT capacity building in developing countries. In *26th Large Installation System Administration Conference (LISA 12)*. USENIX, pp. 123–134.

- Government of Rwanda, (2013). Low no 71/2013 of 10/09/2013 establishing the University of Rwanda and determining its mission, powers, organization and functioning. *Official Gazette n°51 of 23 December 2013*, pp.34–54.
- Griffith, T.L. & Dougherty, D.J., (2002). Beyond socio-technical systems: introduction to the special issue. *Journal of Engineering and Technology Management*, vol.19, pp.205–216.
- Guest, G., MacQueen, K.M. & Namey, E., (2012). *Applied thematic analysis.*, Thousand Oaks, California: Sage publications.
- Henderson, J.C. & Venkatraman, H., (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM systems journal*, vol. 32, no. 1, pp.472–484.
- Jhurree, V., (2005). Technology integration in education in developing countries: Guidelines to policy makers. *International Education Journal*, vol. 6, no. 4, pp.467–483.
- Johnson, A.M. & Lederer, A.L., (2010). CEO/CIO mutual understanding, strategic alignment, and the contribution of IS to the organization. *Information & Management*, vol 47, no. 3, pp.138–149.
- Keengwe, J., Kidd, T. & Kyei-Blankson, L., (2009). Faculty and Technology: Implications for Faculty Training and Technology Leadership. *Journal of Science Education and Technology*, vol.18, no. 1, pp.23–28.
- Lee, S.M. et al., (2008). Developing a socio-technical framework for business-IT alignment. *Industrial Management & Data Systems*, vol. 108, no. 9, pp.1167–1181.
- Lowry, L.D., (2015). Bridging the Business Data Divide: Insights into Primary and Secondary Data Use by Business Researchers. *laSSIST Quarterly*, vol. 39, no. 2, pp.14–25.
- Luftman, J.N., (2000). Assessing Business-IT Alignment Maturity. *Communications of the Association for Information Systems*, vol. 4, no. 14, pp.1–50.
- Luftman, J.N., (2003). Assessing IT / business alignment. *Information Systems Management*, vol. 20, no. 4, pp.9–15.
- Marion, R., (1999). *The edge of organization: Chaos and complexity theories of formal social organizations.*, Newbury Park, CA: Sage.
- McKeen, J.D. & Smith, H., (2003). *Making IT happen: Critical issues in IT management.*, Chichester, Hoboken,NJ: Wiley.
- Miller, J.H. & Page, S.E., (2009). *Complex adaptive systems: An introduction to computational models of social life.*, Princeton university press.
- Morey, A.I., (2004). Globalization and the emergence of for-profit higher education. *Higher Education*, vol. 48, no. 1, pp.131–150.
- Moses, P. et al., (2012). ICT Infrastructure, Technical and Administrative Support as Correlates of Teachers’™ Laptop Use. *Procedia -Social and Behavioral Sciences*, vol. 59, pp.709–714.
- Muianga, X. et al., (2016). Blended learning systems in tertiary education: A comparative analysis of two universities from Rwanda and Mozambique. In *E-Learn: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*. Washington DC: Association for the Advancement of Computing in Education (AACE)., pp. 1006–1015.

- Myers, M.D., (2009). *Qualitative research in business & management*, London: Sage Publications.
- O'reilly, M. & Parker, N., (2013). 'Unsatisfactory Saturation': a critical exploration of the notion of saturated sample sizes in qualitative research. *Qualitative research*, vol. 13, no. 2, pp.190–197.
- Peak, D., Guynes, C. & Kroon, V., (2005). Information technology alignment planning-a case study. *Information & Management*, vol. 42, no. 5, pp.635–649.
- Pelgrum, W.J., (2001). Obstacles to the integration of ICT in education: results from a worldwide educational assessment. *Computers & education*, vol. 37, no. 2, pp.163–178.
- Preston, D.S. & Karahanna, E., (2009). Antecedents of IS Strategic Alignment: A Nomological Network. *Information Systems Research*, vol. 20, no. 2, pp.159–179.
- Pusser, B. & Doane, D., (2001). Public purpose and private enterprise: The contemporary organization of postsecondary education. *Change: The Magazine of Higher Learning*, vol. 33, no. 5, pp.18–22.
- Reich, B.H. & Benbasat, I., (2000). Factors that influence the social dimension of alignment between business and information technology objectives. *MIS quarterly*, vol. 24, no. 1, pp.81–113.
- Sawyer, S. & Jarrahi, M.H., (2014). The Sociotechnical Perspective: Information Systems and Information Technology. In T. Heikki & T. Allen, eds. *Computing Handbook: Information Systems and Information Technology*. Sound Parkway NW: Chapman and Hall/CRC Press.
- Sife, A.S., Lwoga, E.T. & Sanga, C., (2007). New technologies for teaching and learning: Challenges for higher learning institutions in developing countries. , vol. 3, no. 2, pp.57–67.
- Ssekakubo, G., Suleman, H. & Marsden, G., (2011). Issues of Adoption: Have E-Learning Management Systems Fulfilled their Potential in Developing Countries? In *Proceedings of the South African Institute of Computer Scientists and Information Technologists Conference on Knowledge, Innovation and Leadership in a Diverse, Multidisciplinary Environment* . Cape Town: ACM, pp. 231–238.
- Tan, F.B. & Gallupe, B., (2006). Aligning Business and Information Systems Thinking: A cognitive approach. *Engineering Management, IEEE Transactions*, vol. 53, no. 2, pp.223–237.
- UEM, (2010). Plano estratégico da UEM 2010-2014. Available at: http://www.uem.mz/images/pdfs/PEstratetigo-2010_2014_pt.pdf [Accessed June 28, 2017].
- Vannoni, M., (2015). What are case studies good for? Nesting comparative case study research into the lakatosian research program. *CrossCultural Research*, vol. 49, no. 4, pp.331–357.
- Vermerris, A., Mocker, M. & Van Heck, E., (2014). No time to waste: the role of timing and complementarity of alignment practices in creating business value in IT projects. *European Journal of Information Systems*, vol. 23, no. 6, pp.629–654.
- Wagner, D. et al., (2005). *Monitoring and Evaluation of ICT in Education Projects A Handbook for Developing Countries*, Washington DC: World Bank.

- Yayla, A.A. & Hu, Q., (2012). The impact of IT-business strategic alignment on firm performance in a developing country setting: exploring moderating roles of environmental uncertainty and strategic orientation. *European Journal of Information Systems*, vol. 21, no. 4, pp.373–387.
- Yayla, Q. & Hu, A.,(2009). Antecedents and drivers of IT-business strategic alignment: Empirical validation of a theoretical model. In *European Conference on Information Systems*. pp. 159–169.
- Yin, R.K., (2014). *Case study research: Design and methods* 5th ed., Thousand Oaks, CA: Sage Publications.
- Yin, R.K., (2009). *Case study research:Design and method* 4th ed., Tousand Oaks, CA: Sage.
- Yin, R.K., (2003). *Case Study Research. Design and Methods* 3rd ed., California: Sage Publications.
- Ziphorah, R.M., (2014). Information and Communication Technology Integration: Where to Start, Infrastructure or Capacity Building? *Procedia - Social and Behavioral Sciences*, vol. 116, no. 1, pp.3649–3658.