ICT Governance and Implication in Higher Education: A Case Study of a Vocational College in Libya

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This study focuses on ICT governance in higher education in a developing country. The research employs an interpretive single case study to describe and understand ICT governance at a computer college in Libya. Our results reveal formal ICT governance leverages its general management structure and processes to make ICT decisions and fulfill the needs of college stakeholders. In addition, the structure supporting ICT decision-making at Beta College qualifies as "decentralized," while the ICT archetype of "Federal" best describes its ICT governance arrangements. Surprisingly, our study reveals the hybridization of the role of the Dean through the integration of "entrepreneurial activities" amid his efforts to fulfill the ICT needs of the college in the context of severe budget constraints.

Keywords: ICT governance, higher education, case study, developing country

INTRODUCTION

Several studies have shown that education plays a critical role "in economic growth and favorable labor market outcomes" (Piao and Managi, 2023, p.1). The role of education is even more pronounced in the context of developing countries as it enables the countries "to absorb modern technology and develop the capacity for sustainable growth and development" (Dao, 2017, p.155; Dao and Trinh, 2020).

Over the past few years, more and more education leaders of higher education systems have become aware of the fact that ICT can play a critical role in enhancing several performance indicators Duţă and Martínez-Rivera (2015), including the student learning experience and academic performance, school efficiency Agasisti, Antequera, and Delprato (2023) to name but a few. However, despite the rise of the implementation of ICT in higher education institutions, the expected benefits have not always been realized (Abdulrassool and Turnbull, 2020).

In this context, investigating the concept of ICT governance in a vocational college in Libya is important for at least three reasons: 1) several scholars have stressed that effective ICT governance is associated with higher benefits (Nfuka and Rusu, 2011; Weil and Ross, 2005) 2) empirical studies of ICT governance in higher education are still scarce (Scalabrin Bianchi, Dinis Sousa and Pereira, 2021) 3) even fewer studies have investigated the topic of ICT governance in higher education in the context of developing countries, particularly about academic and administrative performance, or cost-saving (Othman et al., 2011; Ndagire and Basuta, 2022). A search with the following keywords: "information technology," &

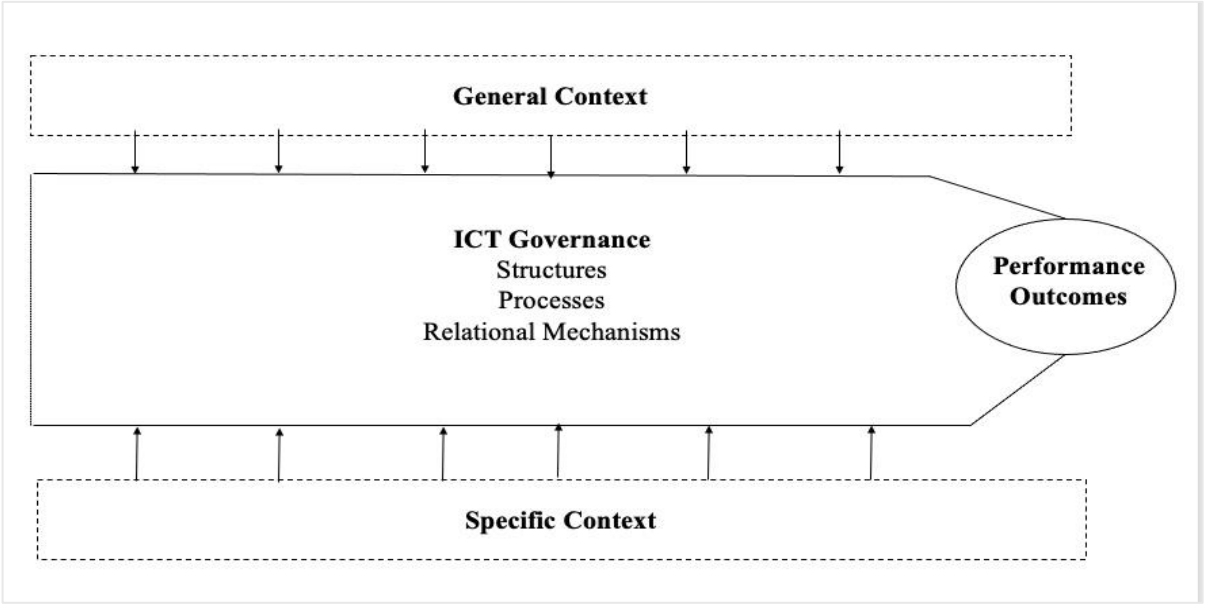
"governance", & "higher education" & ("developing country" OR "developing countries") yielded only four articles in the SCOPUS database.

The objectives of this study are twofold: 1) to contextualize and describe ICT governance in higher education in a developing country and 2) to understand how ICT governance is associated with performance outcomes.

THEORETICAL BACHGROUND

For this study, we use an initial framework (see Figure.1). As per Maxwell (1999), the theoretical framework encompasses concepts, assumptions, expectations, beliefs, and theories underpinning and guiding the research endeavor. Maxwell underscores that this framework draws from four primary sources: existing theories within the field, the researcher's expertise, the intuition of the researcher, and the findings of the researcher's inquiries. According to our framework, there are four components of ICT governance through which ICT governance in higher education can be conceptualized, each of which can be described below: general context, specific context, ICT governance dimensions, and performance outcomes.

FIGURE 1
ICT GOVERNANCE FRAMEWORK



General Context of ICT Governance in Developing Countries

The adoption level of ICT governance standard frameworks is very low in developing countries (IT Governance Institute, 2008). Moreover, ICT governance implementation in developing countries needs an integral approach to improve the complicated concerns those countries face at several levels, including governmental, institutional, technical, and cultural (Nfuka and Rusu, 2010). Hence, implementing ICT governance in developing countries has been recognized as challenging. These challenges include a lack of awareness (Latif et al., 2017; Othman et al., 2011) a lack of standard terminology (Latif et al., 2017; Ndagire and Basuta, 2022) a lack of clearly defined roles and responsibilities (Latif et al., 2017) weak measurement of IT performance and value to business, inadequately defined IT-related roles, responsibilities, and accountability (Nfuka et al., 2009; Othman et al., 2011).

Specific Context of ICT Governance in Vocational Colleges in Libya

Libya is the second-largest country in North Africa, with an area of almost 1,759,540 square kilometers and an estimated population of 6,754,507. The demographics of the Libyan population are characterized by significant proportions of the young, including 25.84% between the ages of 0 and 14 and 17.09% between 15 and 24 (Central Intelligence Agency, 2018). This population structure makes Libya a country where vocational education could play an important role in its economic development.

It is important to remember that higher vocational colleges differ from universities in several ways, particularly in their mission, educational function and objectives for training students (Yang and Liu, 2024; Wang et al., 2014). The adoption of relevant educational structures and contents in the vocational college system not only helps to meet labour market needs by providing high-quality skills in demand to citizens but also contributes to the achievement of economic and social objectives (Allais, 2012; McGrath, 2012; Legusov et al., 2022).

The importance of this specific context is reflected in the structure of the higher education system in Libya. Libyan higher education system has 24 universities, 114 higher technical and vocational centres, plus 8 accredited private universities. To leverage this specific context, the Libyan government has established three kinds of vocational institutions: 1) vocational middle schools (3-years). 2) high vocational institutes (3-years). 3) vocational colleges (4-year), those three types are under the auspices of theMinistry of Technical and Vocational Education .As in most developing countries, ICT governance is unfamiliar to most public and private institutions in Libya. However, the government of Libya is aware of this shortcoming and is working to remedy it. In fact, according to Hamdy (2007) Libya had several reform plans in the last decade to improve and develop ICT framework beyond historical domains such as banking to include higher education. The government's efforts are to support curricula development and revise their scientific content. More specifically, ICT in higher education is one of the cornerstones of these reforms. Unfortunately, these goals were not fully implemented due to the lack of skilled, qualified infrastructure and the dissatisfaction of those involved in these repairs to take action (Libya Journey Analysis, 2020).

ICT Governance Dimensions, Archetypes, and Outcomes in Higher Education

The broad objective of ICT governance is to align the ICT with the business strategies and objectives from one side and enhance the association between the ICT and the business performance from the other side (Wu, Straub and Liang, 2015). Following previous studies (De Haes and Van Grembergen, 2004; Levstek, Hovelja and Pucihar, 2018; Bianchi and Sousa, 2016), we contend that governance is best characterized by three dimensions: structures, processes, and relational mechanisms. Each of the three components of ICT governance has different sub-functions (Weill and Ross, 2004). Several studies have used these dimensions when investigating ICT governance in higher education in developing countries (ex. Bianchi et al., 2020; Mangundu, 2023; Liew and Hamid, 2024). And beyond (ex. Bhattacharjya and Chang, 2007; Scalabrin Bianchi et al., 2021).

Structures

In the context of ICT governance, structure as a part of the ICT governance mechanisms encompasses the diverse entities involved in the decision-making process. A governance structure could include committees comprising technical and functional managers and directors tasked with delineating roles and responsibilities (Bianchi et al., 2017; Levstek et al., 2018). Within higher education, Hicks, Pervan and Perrin, (2010) underscore the significance of fostering effective interactions and relationships among governing bodies in institutions that advocate for the establishment of a policy group responsible for all governance-related decisions.

In higher education, Mangundu (2023) found that research demonstrated that the university's business and ICT decision-makers enact ICT governance through established structures and procedures.

Processes

ICT governance processes pertain to an organization's planning and decision-making concerning ICT-related matters, guided by chosen frameworks and tools to enhance performance (Wu et al., 2015). In other

words, it refers to the planning and making IT-related strategic decisions based on managerial decision techniques such as the Balanced Scorecard and tools used to align the IT with the business objectives and organizational performance (Weill and Ross, 2004). There are many examples of frameworks used by organizations that provide ICT governance process mechanisms: COBIT, balanced scorecards, chargeback, ITIL, IT governance frameworks and standards, strategic information systems planning, portfolio management, service level agreements, ISO/38500, OCTAVE, HEISC, NIS, IT budget control and reporting, management of risk (Bianchi and Sousa, 2016; Levstek et al., 2018). The availability of several frameworks allows organizations to choose the right combinations of IT governance structures, processes and relational and suitable mechanisms for their size, sector, industry, norms, and culture (Almeida, Pereira and Mira da Silva, 2013).

In the higher education sector, Liew and Hamid (2024) have found that the results indicate that both universities primarily utilize structural mechanisms, with relational and process mechanisms following behind in implementation. Nandi (2022) also indicated a significant difference in the dynamic and priorities between institutions that rely on performance-based funding and those that receive predetermined budgets.

Relational Mechanisms

ICT governance relational mechanisms involve the participation and interactions between IT and business ICT and communication and knowledge sharing (Bianchi and Sousa, 2016). Practices associated with relational mechanisms include cross-training, knowledge management, Shared understanding of business/IT objectives, and business/IT co-location (Bianchi and Sousa, 2016; Van Grembergen, De Haes and Guldentops, 2004). According to Weill and Ross (2004) knowledge sharing and coaching within the organization are extremely important for effective ICT governance. In their study of ICT governance, they find empirical evidence of the following practices in the higher education sector: To manage this diverse array of technologies, effective IT governance is essential, utilizing structures, processes, and relational mechanisms. Each of these mechanisms serves a purpose and, when properly implemented, should contribute positively to the organization (Bianchi and Sousa, 2016).

ICT Governance Archetypes in Higher Education

The most used and cited archetype of ICT governance is the one proposed by Weill and Ross (2004, p.58), which uses "political archetypes (monarchy, feudal, federal, duopoly, anarchy) to describe the combinations of people who have either decision rights or input to IT decisions" as presented in Table 1. According to Weill and Ross (2004, 2005), the governance arrangements of an organization vary from more centralized (most notably Monarchy) to more decentralized (most notably Feudal) and sometimes using a hybrid form composed of both approaches. More specifically, in a strictly centralized governance arrangement, all decision-making authority is in a central ICT organizational body. In contrast, in strict decentralized governance arrangements, all decision-making authority is distributed within the confines of the individual business units or processes (Brown and Grant, 2005).

TABLE 1
IT GOVERNANCE ARCHETYPES FOR ALLOCATING DECISION-RIGHT

IT Governance Archetypes	
Style	**WHO HAS THE DESIGN FOR INPUT RIGHTS**
Business Monarchy	A group of business executives or individual executives (CxOs). Includes Committees of senior business executives (may include CIO). Excludes IT executives acting independently.
IT Monarchy	Individuals or groups of IT executives
Feudal	Business unit leaders, key process owners or their delegates
Federal	C-level executives and business groups (e.g., business units or processes); IT executives may also be included as additional participants. The Equivalent of the central and state governments working together.
IT Duopoly	IT executives and one other group (e.g., CxO or business unit process Leaders)
Anarchy	Each individual user

ICT Governance Outcomes in Higher Education

IT governance performance is defined as IT governance's effectiveness in delivering four outcomes weighted by their importance to the organization in terms of cost-effective use of IT, effective use of IT for asset utilization, effective use of IT for growth, and the effective use of IT for business/administration flexibility (Weill and Ross, 2004). Several studies have revealed IT governance performance, such as the ones by Weill and Ross (2004, 2005); Jairak and Praneetpolgrang (2013); Albertin and Albertin (2008); Lunardi et al., (2014) among others. Recently, researchers such as Lunardi et al., (2014), among others, have widely acknowledged these measures due to their relevance and applicability. Organizations that have adopted formal mechanisms of IT governance have improved their organizational performance in terms of profitability, efficiency and cost savings (Lunardi et al., 2017). This is congruent with Ross, Beath and Goodhue, (1996) who define IT competence as controlling IT-related costs, providing appropriate systems when needed, and improving business strategy through IT.

Universities have unique objectives of creating and disseminating knowledge in their mission in society Zhen and Xin-yu (2007) but require adequate ICT infrastructure and information systems (IS) support to fulfil their objectives. Universities ICT comprises a variety of applications, different platforms, academic systems, and cloud applications, i.e., a heterogeneous set of technologies required in teaching, learning, and research activities while supporting the management processes (Yanosky and Caruso, 2008; Wilmore, 2014). ICT is a vital facet for universities, acting as a strong agent for change in teaching, research, knowledge generation and several other undertakings and activities at Universities (Wilmore, 2014). Scholars and practitioners like Bianchi and Sousa 2017; Bajgoric, 2014; Conger, Conger and Martin, 2010; Jairak, Praneetpolgrang and Subsermsri, 2015; Wu et al., 2015) suggest that effective and efficient use of IT at Universities to support research, teaching, and administration requires appropriate IT governance. As such, IT governance performance can be effectively achieved by utilizing appropriate IT governance mechanisms to make the right decisions. Universities have used IT governance committees for this purpose through top management committees.

Due to their importance, ICT governance in higher education systems may start from vocational colleges (Braskamp Trautvetter and Ward, 2016). Adequate ICT governance is expected to improve efficiency in Information Communication Technology (Setiawan, Satori and Munir, 2019) and enhance vocational institution outcomes (Khalil and Halis, 2017). The organization's responsiveness also characterizes higher education institutions' efficiency in responding to client's requests, service users, and stakeholders (Melville, Kraemer and Gurbaxani, 2004). The performance of ICT governance in higher education has increased in the last few years. For example, EDUCAUSE has focused on ICT governance for a few years; it supports using governance frameworks to improve ICT governance process maturity. The 2006 EDUCAUSE current ICT Issues Survey results indicate that ICT governance is one of the top six

issues where ICT leaders of higher education invest the most time (Dewey and DeBlois, 2006). Elkhouly, Masoud and Shafsha (2021) report indicated that the Libyan Department of Education that ICT will help the educational system in Libya by creating and building new learning and training methods. Moreover, ICT enhances and develops the management and the quality of education in Libya. Additionally, there has been an increase in online learning as a teaching method in Libyan universities and colleges. ICT Governance and Performance in Higher Education in Libya focuses on one of three elements:1) Cost-effective use of ICT. 2) Effective use of ICT to enhance teaching and learning. 3) Effective use of ICT enhances administrative processes (Weill and Ross, 2004).

RESEARCH METHOD

This study falls within the interpretive tradition of information communication technology (ICT) (Walsham, 1995) aiming to explore ICT governance in higher education colleges in Libya. Specifically, it investigates ICT governance arrangements at a vocational college in Libya and identifies internal and external factors influencing it. Consistent with interpretive research principles, we seek to develop insights into ICT governance and its influencing factors by examining the perspectives of key stakeholders at the vocational college, including the management team, teachers, staff, and students. Table 1 presents a summary of the data collection effort.

We utilized selected concepts and the dimensions of ICT governance integrated within a research framework as a starting point to direct our data collection and analysis because of their potential insightfulness. Moreover, we embraced an emergent process, enabling us to reassess the initial framework while incorporating new theoretical concepts that evolved organically throughout the research process. Our approach drew inspiration from previous studies by Walsham and Sahay, 1999;Poba-Nzaou et al., 2014. Our research focused on Beta College Tripoli, which operates under the Libyan Ministry of Technical and Vocational Education. Thus, we conducted an interpretive single case study. Table 2 shows the ICT Governance context at Beta College.

For a robust and comprehensive understanding of the ICT governance at Beta College, we employed three primary data collection methods. The first method was semi-structured interviews with a diverse group of 14 key informants. This group included the college dean, eight office managers (academic affairs, teachers' office, registration, administration), and the heads of the three engineering programs (communication engineering, control engineering, and computer engineering). We interviewed the Chief Information Officer (CIO), two teachers, and three students. Each interview, lasting approximately 60 minutes, provided unique insights into the ICT governance at Beta College.

All interviews were conducted in Arabic and recorded for nearly 8 hours, which were then transcribed verbatim, resulting in 166 pages of text. Subsequently, the Arabic verbatim was translated into English. Secondly, documents, including publicly available press releases about the college, were consulted. Lastly, the researcher was given a guided tour of the college facilities, during which notes were taken. The research process analyzed 325 pages, including interview transcriptions and collected documents.

The data analysis process began during data collection. We adopted an iterative approach guided by the "hermeneutical cycle," a central principle in interpretive research (Klein and Myers, 1999). We first read and reread through the collected material organized as a dataset and adopted a narrative approach, following Langley's (1999) to create a meta-story within a "narrative report." This method was employed to trace the development of ICT governance at Beta College and its internal and external influencing factors. Then, we continuously moved back and forth between the entire dataset we created and its components to enhance their understanding of ICT governance at Beta College. Next, they read and moved back and forth between the entire data set or its components and the initial theoretical framework. As a result, the collected data underwent multiple reviews and interpretations, with initial interpretations consistently scrutinized and challenged (Cho, Mathiassen and Nilsson, 2008; Klein and Myers, 1999). Consequently, a comprehensive understanding of the social and historical context of ICT governance at Beta College was cultivated through iterative refinement.

TABLE 2
ICT GOVERNANCE CONTEXT IN BETA COLLEGE

Case Context	Beta college
Specialization programs	1) Communication Engineering 2) Control Engineering 3) Computer Engineering
Year of creation	1993
# Teachers	105
# Students	1227
# employees	93
# IT staff	6
Percent of IT in the budget (2022)	40%
CIO report to	Report to Dean of College
# computers lab	15 labs
Other Lab	3 labs Communication lab, Control system lab, and Software lab
# desktop	280
Ratio Students/computer	4.4
# laptop	25
Software for teaching	Microsoft Office, Financial System, Google Drive, Java, Visual Basic, C++, Arduino, Mat Lab, and HFSS
Online service for students	Course registration, Course feedback
Percent of students using the college email	>50%
Percent of Teachers using the college email	>50%
Percent of staff using the college email	>50%
# of ICT user	1425
Tools / software for Cyber Security	McAfee Kaspersky Antivirus SolarWinds Security
IT governance changes last five years	New 2 Computer Labs 2021,2022 New cyber-Softer 2021, 2022 New internet contract 2022 Online application registre 2022 New Electronic Library Archiving 2024

Beta College is one of 18 technical colleges overseen by the Libyan Ministry of Technical and Vocational Education. Initially established as an urban Higher Technical School in the early 1990s, it was transformed into a 4-year Technical College approximately twenty years later. Located in the suburb of Tripoli, about 7 kilometres from downtown, Beta College offers three technical programs: Communication Engineering, Control Engineering, and Computer Engineering. About 1300 students from Libya and other Middle Eastern countries are enrolled annually. The college has an average of270 graduates annually, contributing to a network of 2400 alumni worldwide.

Beta College trains students with about 100 staff members and 110 teachers. The IT department comprises eight staff members, and the IT infrastructure consists of 30 servers running on five operating systems and 280 desktop computers, 250 specifically designated for students' use. These computers are predominantly situated in 15 laboratories, each with 16 stations.

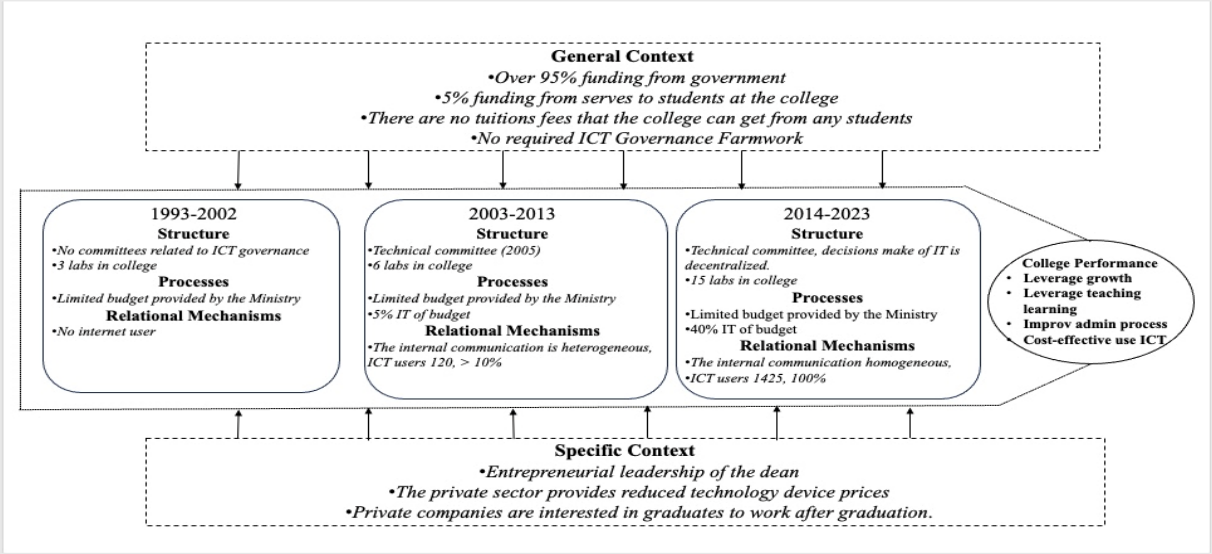
Beta College's software application portfolio is relatively low-sophisticated. It consists of Google Drive, the Microsoft Office package, Java, C Sharp, Visual Basic, C++, the SQL database, LabVIEW, Arduino, MATLAB, and HFSS.

The Information Technology department collaborates with external partners to serve over 1,400 technology users annually. Since 2022, Beta College has allocated about 50% of its annual budget to information technology, a significant increase compared to the average budget of 5-25% in the preceding three years.

RESULTS

This section is organized along different stages of the evolution of ICT governance and associated dimensions provided in our theoretical framework. Figure 2 shows the evolution of ICT Governance at Beta College.

FIGURE 2
ICT GOVERNANCE DEVELOPING STAGES IN BETA COLLEGE



General and Specific Context at Beta College

Beta is a public higher education institution mainly financed by the government through the Ministry of Technical and Vocational, contributing around 95% of the college's annual budget. The second funding source is the money collected for student services (certificate and transcript delivery, ID card, etc.), which represents around 5% of the college's annual budget. Of note is that the college does not charge tuition fees, and studies are free.

According to the dean, Beta is characterized by a higher level of innovativeness than other vocational colleges in Libya. It is the first to implement several digital services for students:

- online registration management system for courses delivered to its students.
- online application process for prospectus students.
- online publication of the final exam results
- Creation of an Electronic Library hosting e-books, student internship reports

Our analysis has identified 3 stages in the evolution of ICT governance at Beta College that are described below: embryotic ICT governance arrangements (stages 1 and 2), established ICT governance arrangements (stage 3).

ICT Governance at Beta College: Phase I and II - Embryotic ICT Governance Arrangements

In the two first stages, ICT governance at Beta is embryotic. More specifically, between 1993 and 2003, there were no ICT-related committees at the college. Although the college had 3 labs back then, there was no budget dedicated to ICT and no internet user, nor was there any communication about technology within the college community. However, major changes were observed during the second decade, from 2003 to 2013, including the creation of the Technical Committee, which had no power or influence over ICT decision-making. At the time, 10% of the college community used the Internet, 5% of the college budget was dedicated to ICT, and less than 10% of ICT users used the college email service.

ICT Governance at Beta College: Phase III - Established ICT Governance Arrangements

Other major changes occurred during the last stage, from 2013 to the present. Major developments include:

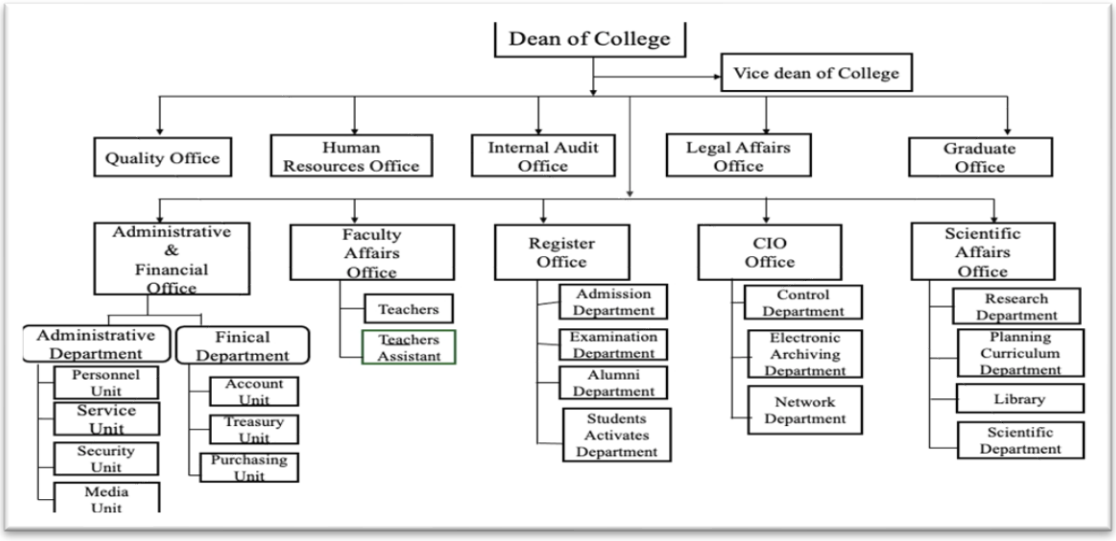
- The Technical Committee is empowered to make decisions related to ICT
- Significant increase in ICT budget (from 5% to 40% of the college budget)
- Internet use by all community members (from 10% to 100%)
- The college email service is used by 50% of ICT users (staff, teachers and students)

The other components of the framework are described in more detail below.

Structure

Today, the organizational structure of Beta comprises five levels (Figure 3), with the first two being the dean's office (1) the vice dean's office (2) the third level consists of ten organizational units or offices: quality control, human resources, internal audit, legal affairs, administration and finance, registrar's office, scientific affairs, IT office, faculty affairs, and graduate office. Notably, the internal audit office is overseen by a government official who monitors the college's finances and reports directly to the Ministry of Finance. At the highest level related to ICT, we find the Chief Information Officer (CIO), a position created in 2013 and reports to the college's dean. The CIO is assisted by six IT staff members responsible for system development and maintenance. At this stage in the evolution of the college's governance structures, there are five committees in place: the board of the college, the scientific affairs committee, the technical committee, the personnel affairs committee, and the purchasing committee. Of note is that the CIO serves on three committees: the college board, the technical committee, which he also leads, and the purchasing committee within the college.

FIGURE 3
BETA ORGANISATIONAL CHART



Processes

The two main processes related to ICT Governance are the budgeting and ordering processes presented in Figures 4 and 5. As Figure 4 shows, the Ministry of Finance makes the final decision.

FIGURE 4
BUDGET APPROVAL PROCESS

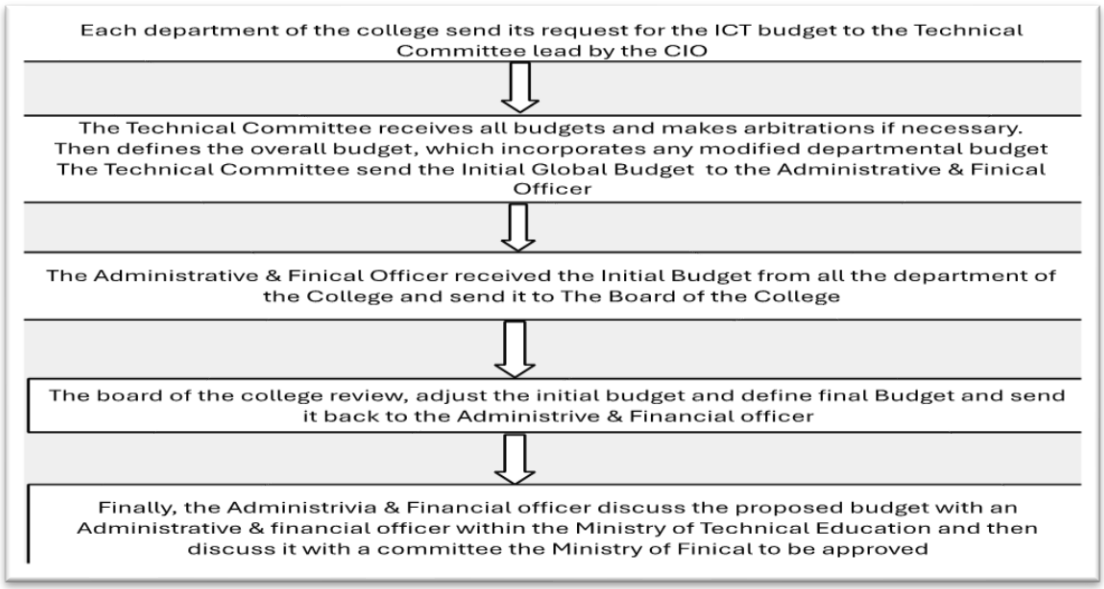
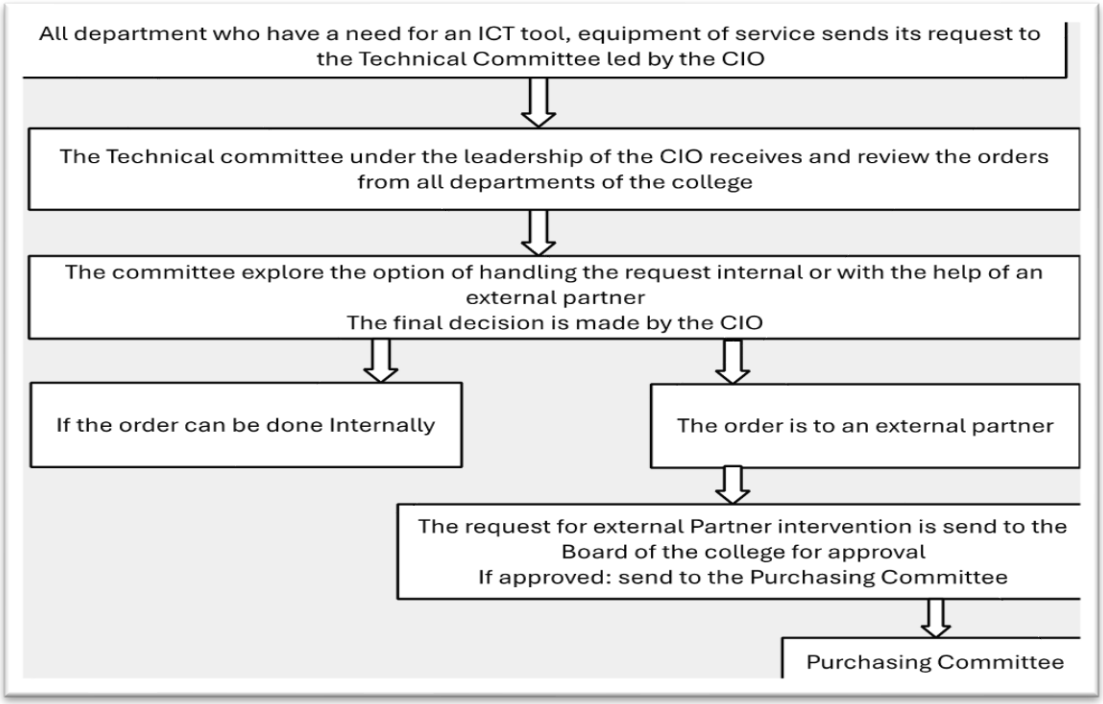


FIGURE 5
ORDERING PROCESS



Our analysis revealed that Beta College's most important ICT governance processes are "IT budget control and reporting" and "Chargeback," "Service Level Agreements," and "Demand management." The college does not rely on a formal ICT governance framework to manage its information and communication technology processes.

From the college's inception until the end of 2012, these processes had remained unchanged, with the IT budget control and reporting process involving only the Ministry of Technical Education and the Board of College; the Purchasing Committee managed the other three processes. However, in 2013, all three processes underwent a major change with the involvement of the Technical Committee. Since then, the Technical Committee has been involved in the IT budget control and reporting process with the Board of the College and has taken responsibility for the Service Level Agreements and Demand Management. The Purchasing Committee retains responsibility for Chargeback, but this responsibility has since been shared with the Technical Committee. Of note is that the college budget is divided into three primary categories: 1) staff salaries 2) maintenance and operations and 3) overhead expenses (materials for the College). According to the Dean, the objective of the college is to allocate about 40% of the total budget to information technology and communication.

IT Budget Control and Reporting. Involve prioritizing ICT expenditures within the discretionary budget, encompassing allocations for software updates, computer lab renovations, and ICT infrastructure development. The IT budget control and reporting process unfolds in two steps: Initially, the Technical Committee drafts a proposal, which becomes part of the college's annual budget. Subsequently, the Beta College Board sends this budget to the Ministry of Technical Education after approval. The Ministry of Technical Education endeavors to secure adequate funding for vocational colleges such as Beta but faces several challenges. According to the Dean, the government of Libya typically allocates more funds to the Ministry of Higher Education to cover the needs of general higher education institutions at the expense of technical education institutions. In fact, with 115 colleges under its jurisdiction nationwide, the Ministry of

Technical Education faces the challenge of dividing its overall annual budget among many institutions. This results in a significant financial burden for vocational colleges such as Beta College.

Service Level Agreements. In Beta College, the Purchasing Committee is responsible for this aspect. Two basic types of service level agreements can be defined in Beta College service level agreements: external (internet cable and internet WIFI) and internal (Computer labs, Communication lab, Control system lab, and Software lab). Moreover, before signing and payment, the Technical Committee evaluates the contract, including what levels of service are to users in the college and are attainable by the service provider, and defines the mutually agreed-upon set of indicators of the quality of service. Also, the Technical committee receives reports from the scientific departments on the quality of the service provided and the extent of their satisfaction with the service.

Chargeback. At Beta College, chargeback consists of obtaining additional benefits in new contracts, such as additional devices, such as laptops and printers. For example, the government company of telecom submitted a new computer lab for training students in communications when it got a new internet contract last year. Also, private companies compete in submitting the best offers to obtain supply contracts, offering incentive gifts like netbooks, Digital cameras, and Data projectors. However, the technical committee tries to reduce costs in new contracts by getting additional equipment, such as modern devices, software, and hardware, to enhance and develop the old devices in Beta College without paying the additional cost—

Demand Management. Beta College manages all IT demands through one point (Technical Committee). The Technical Committee receives all requests for new devices and reports of current service levels. Moreover, the technical committee receives maintenance requests from all departments in the Beta College and carries out periodic and emergency inspections and maintenance work.

Relational Mechanisms

Our findings reveal several relational mechanisms deployed by the leadership team with all stakeholders to manage the College ICT resources and needs: Partnership and Knowledge sharing with other colleges; Partnership with IT industry companies; cross-functional academic/staff/IT training; IT training provided by IT staff to academics, administrative staff; within group corporate internal communication with WhatsApp; collaboration between IT and academics and joint planning of IT and academics.

Partnership and Knowledge Sharing With Other Colleges. According to the Dean, Beta College and another college specializing in computers have a good partnership and corporation because they use the same software and applications.

Partnership With IT Industry Companies. The Dean and the CIO underscored the critical role of the partnerships they could achieve with IT industry companies in Libya. They stressed that there are great collaborations with industry companies, such as one of the country's leaders in the telecommunication market. Thanks to these collaborations, Beta was able to update some of the college's software and provide a new telecommunication lab in 2022 at no cost. Moreover, another company offers good prices for acquiring new ICT equipment and tools.

Cross-Functional Academic/Staff/IT Training. Several informants, including the CIO, the Faculty Affairs Officer, and the Administrative and Financial Officer, praised the merits of cross-functional academic/staff/IT training dedicated to cybersecurity. In addition, our respondents indicated that when the academic or staff must use new software or a new application, some ICT company providers give Cross-functional academic/staff/IT training. However, according to the Dean, although the college ICT and administrative staff and teachers need to receive more training provided by external ICT companies, the college cannot afford it because of budget shortage. Similarly, for some years, the Dean has been unable to offer specialized ICT training organized outside of Libya to the college ICT staff. The training status outside of Libya changed in 2014, and the Ministry of Technical Education did not have enough budget for this need.

IT Training Provided by ICT Staff to Academic and Administrative Staff. According to the CIO, the ICT staff provides formal training to staff and academics when the software or equipment used by the

college is updated. Moreover, informal training is provided when staff or academics need additional help or training to use the updated software or equipment.

Within Group Corporate Internal Communication With WhatsApp. Our interviews reveal that administrative staff, teachers, and students are delighted with the four WhatsApp groups created by the ICT staff members and dedicated to internal communication within the group. More specifically, there is one group for administrative staff, one for teachers, and one for students. Given the success of these communication groups, some teachers create WhatsApp groups for students because students use WhatsApp more than email.

Collaboration Between IT and Academics and Joint Planning of IT and Academics. The CIO and the three Teachers we interviewed reported that during the academic planning, the IT committee works with the teachers to get new information about equipment, tools, and software that teachers prefer for their courses. For example, at the beginning of each semester, the academic staff sends a request form for new tools and equipment to the Technical Committee. After that, they have discussions to identify and select the brand that better suits the needs of the college.

ICT Governance Performance

Although our interviews did not reveal the use of formal indicators to assess IT governance performance, our analysis shows that the college has performance-related concerns managed intuitively: ICT to leverage growth, ICT to leverage teaching and learning, ICT to improve administrative processes, and Cost-effective use of ICT.

ICT to Leverage Growth

Since 2022, prospective students can submit applications online. As a result, the number of applicants increased considerably to reach about 1500 students, knowing that the college's capacity is about 600. Beta has been organizing an entrance exam to select the best 40% of students to be accepted to deal with this situation.

ICT to Improve Administrative Processes

The college created and successfully implemented an online student registration system and an online publication of the results to reduce the administrative task burden. As stated earlier, the ICT team created four separate WhatsApp groups to facilitate communication throughout its administrative processes within sub-groups of the community, i.e., between teachers, administrative staff, and students. All the members of each subgroup use WhatsApp groups. Given the success of WhatsApp groups, other groups were created to bring together students and teachers in the context of a given class.

Other initiatives worth mentioning in this register are: 1) the implementation of email in 2018, which is now used by around 50% of college community members (teachers, administrative staff, and students) 2) improving data management and implementing an electronic archiving system for the college staff 3) realizing cybersecurity awareness courses led by the IT department.

ICT to Leverage Teaching and Learning

To enhance students' learning experience, the management renewed all the computer equipment in the college's teaching laboratories and associated software and infrastructure in 2020 and 2022. At the same time, the number of teaching laboratories increased from 6 in 2013 to 15 labs in 2023. Lastly, in 2024, the college created a virtual library that allows students to download books and accept theses written by graduate students for their final internship.

Cost-Effective Use of ICT

According to the CIO, the ICT department adopted partial cloud services to contain the rising cost of ICT use. He insisted that with the cloud option, the college has access to sufficient data storage capacity and up-to-date software applications while paying the best price in the market. Of note is that, as a member of the Board of the College, the CIO is championing the Board with options and ideas to reduce ICT costs

and, at the same time, have access to good quality tools. In addition, the ICT department manages all the ICT maintenance, monitoring, update and support activities internally to keep the costs down.

DISCUSSION AND CONCLUSION

As stated earlier, while there is widespread agreement on the crucial role of ICT and its governance in higher education, limited research has focused on ICT governance in developing countries. At the same time, it's essential to recognize the potential of vocational colleges in a developing country such as Libya, particularly their contribution to economic development. In our effort to describe and understand ICT governance in higher education institutions in the context of developing countries, we analyzed the case of a vocational college in Libya. Although from the outset and throughout our study, we found that respondents were utterly unfamiliar with ICT governance concepts, the analysis of our results reveals explicit concerns on the part of the college management members, as well as teachers and administrative staff, which fall within the realm of ICT governance. In other words, despite the potential benefits of formal ICT governance structures, Beta College relies on its existing management structures and procedures to manage ICT-related rights and decisions, addressing the needs of its college community. ICT governance is thus, in fact, practised, but with a more informal and intuitive approach, not based on any framework such as COBIT, ITIL, or ISO/IEC series. Not surprisingly, previous studies have reported empirical evidence of ICT governance based on informal and intuitive approaches (ex. Schlosser et al., 2015; Usher and Olfman, 2009) depending on the level of maturity (Van Grembergen et al., 2004).

Our result is also consistent with Khouja et al., (2018) who investigated differences in adopting regulatory frameworks and laws related to ICT governance in higher education across countries and revealed the absence of such frameworks in Libya. Based on Weill and Ross (2004, 2005); Brown and Grant (2005) Beta College ICT arrangements qualify as a centralized structure, as the final decision-making for ICT is centralized with the Board of college for which the CIO is one of the members (Hicks, Pervan and Perrin, 2012; Bhattacharjya and Chang, 2006). Going back to the archetypes Weill and Ross (2004) defined, the ICT governance arrangements at Beta qualify as "Federal". The ICT decision is made by the College Board, which is composed of a representative of each college department or unit. It seems essential to remember that there is no consensus on the most suitable ICT governance structure for higher education institutions. For example, while Esmailzadeh et al. (2022) advocate for a federal structure to involve all stakeholders in decision-making, Bianchi et al. (2020) suggest a centralized structure for institutions like Beta College with a single campus.

Our analysis reveals a blending of the Dean's role. According to Cleverley-Thompson (2016) the Dean's responsibilities in higher education encompass organizational leadership, personal scholarship, external relations, department administration, and student support. Surprisingly, at Beta College, the Dean's role includes entrepreneurial activities, particularly environmental scanning, defined as acquiring and utilizing information about external events and trends to aid in organizational planning (Auster and Choo, 1994). Our findings indicate that the Dean and CIO actively establish partnerships with various stakeholders to support the college in meeting its ICT service and equipment needs and overcoming budget constraints. This underscores the influence of the institutional context on ICT governance (Brown and Grant, 2005), emphasizing the importance of considering the organizational environment in governance decisions.

This study offers implications for research and practice, providing a deeper understanding of ICT governance in higher education within a developing country through a detailed description (Geertz, 1973). It highlights the significance of prioritizing individuals with entrepreneurial skills for Dean appointments in resource-constrained settings, urging governments to develop such skills among Deans.

In conclusion, while further empirical studies are needed to address the limitations of this single case study, our findings provide valuable insights for stakeholders involved in ICT governance in higher education institutions.

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