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Building a Specialized IT Governance Strategy for Higher Education: A Strategic Model

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Abstract: In this research, we delve into the implementation and impact of Information Technology Governance (ITG) in the dynamic landscape of university settings, where information technology is rapidly evolving. The study's primary aim is to investigate the various contingency factors that play a pivotal role in the effectiveness of ITG frameworks in academic environments. Utilizing a comprehensive approach, we conducted a systematic review of 72 scholarly articles sourced from online databases, analyzing the global application of ITG in universities through a blend of qualitative and quantitative research methods. Our findings underscore an increasing focus on ITG within the realm of higher education, a trend that has gained momentum in the aftermath of COVID-19. Notably, significant contributions to this field have emerged from Asia and Europe. Central to our study is the development of a novel ITG model, which is grounded in contingency theory and derived from a detailed case study conducted in five Moroccan universities. This model underscores the necessity for higher education institutions to adopt ITG strategies that are not only flexible but also specifically tailored to meet their individual needs and circumstances.

Keywords: IT Governance, Mechanisms, Higher Education, Best Practices, Frameworks

Introduction

Effective IT governance is crucial in higher education institutions, as noted by Reschiwati *et al*. (2021) because it facilitates research, education and learning through various technologies and platforms. Menshawy *et al*. (2022) argue that implementing formal IT governance practices at the management level can offer significant benefits and enhance performance while ensuring strategic alignment, a point also supported by Huygh and De Haes (2016). Huda *et al*., (2017); Merchan-Lima *et al*. (2021) recommend establishing an IT governance framework that includes an effective structure, processes and relational mechanisms. However, Khouja *et al*. (2018); Jairak *et al*. (2015) highlight that research on the adoption of IT governance in universities is less common than in the business sector, with only 17% of studies focusing on universities, as indicated by Tjong *et al*. (2017). Although numerous systematic reviews have been published on IT Governance (ITG) in Higher Education Institutions (HEIs) (Khouja *et al*., 2018; Tjong *et al*., 2017; Meçe *et al*., 2020; Valverde-Alulema *et al*., 2017; Yudatama *et al*., 2017), they mainly focus on various effective practices and their benefits. However, there is no clear definition in the literature of the most appropriate approach for implementing ITG in higher education institutions, nor models based on a contingent approach. Levstek *et al*. (2022) emphasize that no IT governance model is universally suitable for all organizations. Indeed, the effectiveness of a model is influenced by various contingency factors that can significantly impact the success of implementing ITG practices (Levstek *et al*., 2022). Following the contingency approach in management (Oehmichen *et al*., 2017; Müller *et al*., 2017), we believe such an approach is also necessary for the implementation of ITG. The goal of this research is to explore the contingency factors influencing the effectiveness of ITG in the context of higher education, particularly following the increased interest in the post-COVID-19 pandemic era. Our objective is to understand how different ITG models, influenced by these factors, can be adapted and implemented in universities. To do this, our study builds on previous work by conducting a systematic review of 72 articles, examining the global

implementation of ITG in universities using both qualitative and quantitative methods. Our approach stands out from previous research and enriches the academic field, as it is the first to introduce a new Information Technology Governance (ITG) model based on contingency theory, a theme not yet explored in the university context. This methodology is particularly relevant because it takes into account the unique challenges faced by universities and the evolving needs in the post-pandemic context.

We address six research questions, the first five aimed at deepening our understanding of IT governance in universities at a strategic level. The sixth question examines whether the main ITG mechanisms are universal or situational, evolving during the implementation and usage period. We conducted a case study in various Moroccan universities to answer this question. Five interviews were conducted with strategic-level officials in these universities.

The study revealed that 30% of the 28 identified strategic-level ITG mechanisms are situational, while 70% are universal. This conclusion is drawn from an analysis of five case studies, which, while not extensive enough to make broad generalizations, point to a significant limitation in the prevailing models of universal ITG. These findings challenge the current theory that ITG models can be universally applied without considering situational factors. Consequently, we propose the need for guidelines to develop a flexible strategic ITG model, underpinned by contingency theory, to accommodate varying circumstances This study aims to answer the following Research Questions (RQ):

RQ1 : What is the distribution of publications over time
RQ2 : What is the study approach
RQ3 : What is the Country of origin distribution of the studies
RQ4 : How do higher education institutions utilize frameworks and practices of Information Technology Governance (ITG)
RQ5 : To what degree do universities' strategic goals and objectives align with information technology
RQ6 : How has IT governance affected university performance after its implementation
RQ7 : Are the key IT Governance (ITG) mechanisms universal or situational

The article begins with a detailed Introduction, outlining the significance of IT governance in higher education and the study's objectives. It is followed by the materials and methods section, explaining the systematic literature review process. Next, the summary of effective ITG mechanisms section discusses various ITG practices in higher education. The results section presents the analysis and results of the study. This leads into the discussion and implications section, which interprets the findings and their impact. The manuscript concludes with the conclusion, limitations and future work section, summarizing the study and suggesting directions for further research.

Materials and Methods

This research represents a systematic and structured analysis of contemporary literature to identify IT governance mechanisms, whether universal or situational. We reviewed English-language publications available up to September 2022. To ensure the reliability and authenticity of the data, this study adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines established by Moher *et al*. (2009). The database search yielded a total of 600 eligible studies and after the screening process, 72 full-text documents were found to meet the inclusion criteria and were consequently included in the final assessment (Fig. 1).

Data Sources

Data sources from 2015-2022 were collected from databases such as IEEE digital library, Web of Science (WoS), Scopus and Google Scholar. This search strategy involved using combined terms like "ITG" or "ITG in higher education", "IT practices", "ITG mechanisms" or "ITG mechanisms in HEIs", "contingency in higher education", "ITG structure" or "ITG process" or "ITG relational" and "best practices" or "best practices ITG in HEIs". We limited our search to documents published in English. Titles and abstracts of the retrieved articles were individually assessed by four authors to determine their eligibility for the study. Disagreements were decided by consensus among the authors when not resolvable through discussion. When abstracts did not provide sufficient information to determine a study's eligibility, the full text was retrieved for a thorough evaluation. Each study selected in the previous step was then fully evaluated.

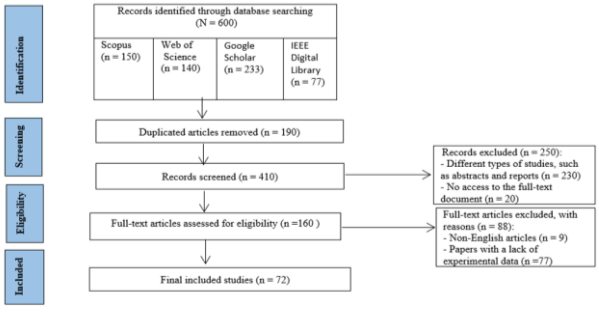

Fig. 1: PRISMA flow diagram of the study retrieval process

Eligibility Criteria

The inclusion criteria were as follows: (1) Studies had to be published in English; (2) They had to be original articles or articles containing experimental data. Studies were excluded if they met the following criteria: (1) The document exclusively focused on information technology management without mentioning ITG and included non-original editorials; (2) The literature was exclusively comprised of conference abstracts, abstract articles, or did not provide full-text access; (3) There were ambiguities concerning the duplication or trustworthiness of results in the literature; (4) The journal lacked information on at least one of the following: The use of ITG as a framework, the maturity level at the university where the study was conducted; (5) The article was not an academic research piece, thus excluding books, theses and private reports.

Data Extraction

Four members of our research team individually assessed full-text documents and performed data extraction using a standard model or spreadsheet. Extracted data included the method and objective for each article, the year of publication, the country where the studies were conducted, the mechanism examined in the study and the governance frameworks used. To avoid potential repetition or overlap, selected publications and extracted data were cross-verified by other researchers.

Summary of Effective ITG Mechanisms

Since the late 1990s, Information Technology Governance (ITG) has been examined through a series of conflicting definitions. This diversity of definitions may be related to the fundamental significance of the subject (Juiz *et al*., 2019). Several authors have argued that effectively implementing structural, processes and relational mechanisms is crucial to effective governance. Below, we will present the approaches that address each mechanism's different best effective practices in Higher Education Institutions (HEIs).

Structure

Role and Responsibility (S1): Roles and responsibilities must be defined with formal and clear functions (Jamali *et al*., 2022). This practice was considered necessary to ensure the performance and execution of IT governance responsibilities.

IT Strategy Committee (S2): The presence of an IT Strategy Committee at the institutional level is mentioned as one of the most important practices for IT governance in universities (Putz *et al*., 2017) and strategic alignment (Ahriz *et al*., 2018a). The study by Ghosh (2018) shows the central role of this good practice in universities. On the other hand, the success of this committee requires an IT innovation strategy (Dlamini, 2015). Describe the influential role of the CIO in this strategy.

IT Steering committees (S3): For the Implementation of the IT strategy, several IT steering committees are necessary (Brown and Grant, 2005). Given the large number of these committees, defining their roles and responsibilities is essential to avoid overlapping decisions and make them more efficient (Bianchi *et al*., 2020). Addo *et al*. (2021); Soobaroyen *et al*. (2019) consider the audit committee and risk management as an effective tool for achieving strategic objectives

Structure of the IT organization (S4): According to Scalabrin Bianchi *et al*. (2021), the federal mode is the most adopted by large and huge universities. On the other hand, the centralized structure is adopted by medium-sized universities. Still, these two modes can cause difficulties, whether in terms of management and data security or after a failure in the central server. This requires using backups or cloud technology after its success in some universities (Attaran *et al*., 2017).

CIO on the executive committee (S5): Having a CIO on the executive committee is essential (Fattah *et al*., 2021) since the latter influences the critical strategies of the institution. It is necessary to define the skills and experiences the expectations of the leaders of higher education of the CIOs for more efficiency of ITG (Dlamini, 2015). On the other hand, Scalabrin Bianchi *et al*. (2021) have shown the effectiveness of two good practices of project management offices (S6) and business process management offices (S7) in universities in Germany, Brazil, Portugal and Spain.

Process

Information system Planning strategy (P1): This is the most relevant best practice, according to Ajayi and Hussin (2016). It defines all the priorities and all the investments that must be discussed and approved by the IT strategy committee. In addition, the COVID-19 pandemic has created additional changes that require a new information system planning strategy (Lemoine and Richardson, 2020).

Portfolio management (P2): This is a crucial mechanism for prioritizing IT projects. Ngqondi and Mauwa (2020) have developed an effective model for portfolio management; another use in a study was found in a university in Morocco to establish a multi-criteria decision support platform to prioritize projects in universities (Ahriz *et al*., 2018b). On the other hand, (Sangiumvibool and Chonglerttham, 2017) provide accurate information that could help university administrators prepare their university budgets to control and report the IT budget (P3).

ITG framework (P4): According to our review of the literature (Merchan-Lima *et al*., 2021; Ishlahuddin *et al*., 2020; Gerl *et al*., 2021), we found that COBIT, ITIL, ISO, $PRINCE_2$, PMBOK and BSC are the most implemented practices. The authors (Bianchi and Sousa, 2018) have shown that ITIL is the most used framework in

universities to manage IT services, Prince2, PMBOK frameworks for project management and ISO 27001 for security management. Other universities use their own or different frameworks. This will limit the sharing of ITG knowledge and experiences between universities by slowing the evolution of performance within universities.

Relational

IT leadership (R1): This is an important practice to consider to obtain an effective ITG (Fattah and Setyadi, 2021). Although the skills and experiences of leadership are essential, they remain insufficient if the latter has not ensured a good relationship between IT and business within the university community to achieve the effectiveness of ITG (Dlamini, 2015).

Formal communication (R3): (Scalabrin Bianchi *et al*., 2021) have demonstrated the importance of the latter's influence on all good practices. On the other hand, (Huygh and De Haes, 2016) discovered through quantitative results the positive influence of formal communication on ITG efficiency and IT innovation. However, most universities use informal channels to communicate (Scalabrin Bianchi *et al*., 2021).

Knowledge management (R5): This is a concern for most universities. Ajayi and Hussin (2016) Showed that the good capacities of structure and process reinforce the relationship between IT and business functions, allowing the discovery of knowledge and the creation of new through organizational learning. On the other hand, other studies (Scalabrin Bianchi *et al*., 2021; Montenegro and Flores, 2015; Putz *et al*., 2017) consider training and education (R6), job rotation (R8), shared understanding of business/IT goals (R2), active participation and collaboration between key stakeholders (R4), partnership with the software industry (R7) as effective practices. Table 1 summarizes the reviewed articles, including the author, year, title, country and the governance best practices discussed within each article.

Table 1: Theme used to categorize reviewed articles

Author/year	Objectives	Method	Country	Best practice
Merchan-Lima *et al*. (2021)	To analyze the effectiveness of different security management frameworks and strategies across various countries context of higher	A systematic review of information security management frameworks and strategies in education	Many countries	S2, P1, P4
Jamali *et al*. (2022)	To understand how different leadership styles in higher education institutions in Pakistan affect faculty performance and the role of organizational culture as a moderating factor	Empirical study assessing the impact of leadership styles on performance	Pakistan	S1, S3, R1, R6
Putz *et al*. (2017)	To evaluate how Brazilian Federal Universities align their IT governance strategies with their overall organizational objectives	Analysis of the strategic alignment dimension in Brazilian Federal Universities' IT governance	Brazil	S1,S3,S2, S4, S5, S6, P1, P4, R4
Ahriz *et al*. (2018a)	To create a model that enhances the alignment of university information systems with their strategic goals, using the SAM framework as a basis	Development and elaboration a Strategic Alignment Model (SAM) for university information systems	Morocco	S1,S2,P3,R1, R2, R3
Ghosh (2018)	To investigate the key factors driving IT governance in universities	Exploration of IT governance in universities, focusing on its drivers, mapping to theoretical frameworks and committee structure characteristics	United States	S1, S2, S3, P1, P2, R1, R3, R4, R5
Dlamini (2015)	To explore the evolving role of Chief Information Officers (CIOs) in higher education, focusing on their strategic and adaptive responsibilities	method likely includes qualitative research techniques such as interviews and case studies. It may involve gathering insights from CIOs in various higher education institutions	United States	S1,S2,S3,S4, S5, P2, P3 R1, R3, R5, R6,R7
Bianchi *et al*. (2020)	To investigate the effectiveness of IT governance mechanisms in higher education institutions	Empirical study, possibly involving data collection and analysis from various higher education institutions to evaluate IT governance mechanisms	South America Europe	S2, S3, P1, P5, R1

Table 1: Continue

Addo *et al*. (2021)	To explore how education leaders in Ghanaian higher education institutions translate risk management policies into practice	Likely involves a qualitative or mixed-method approach, including interviews and analysis of policy implementation within these institutions	Ghana	S2, S3, R1, R3, R4
Soobaroyen *et al*. (2019)	To examine how audit committees oversee risk management in UK higher education institutions	May involve case studies, interviews, or analysis audit committee reports and risk management policies in these institutions	Great Britain	S1,S2,S3,S5, P1, P2, R1
Bianchi *et al*. (2017a)	To analyze IT governance structures in universities across Brazil, the Netherlands, and Portugal	This research could encompass comparative studies, surveys, or interviews to understand the IT governance frameworks used in these universities	Brazil, Dutch and Portugal	S4
Attaran *et al*. (2017)	This study likely explores the potential benefits and challenges associated with implementing cloud computing in higher education settings	The study may include a review of existing literature, case studies, or surveys in in higher education	United States	S4,S3,P1,R4
Fattah *et al*. (2021)	The paper probably aims to identify key factors that determine the effectiveness of IT governance and its impact on IT performance in higher education institutions	The approach may involve develop a conceptual framework based on theoretical insights and possibly empirical data	Indonesia	P4, S5
Scalabrin Bianchi *et al*. (2021)	This study likely investigates The IT governance structures across higher education institutions in multiple countries	The research could involve a comparative analysis of IT governance practices different national contexts, possibly using surveys or case studies	Brazil, Spain, Portugal, Netherlands	S2,S3,S4,S5, S6,S7,P2,P3, P4, R1, R3, R5, R6, R7
Ajayi and Hussin (2016)	The paper probably focuses on understanding IT governance practices from the viewpoint of practitioners in a Malaysian university	This might include qualitative research methods like interviews or case studies to capture the experiences and insights of IT professionals	Malaysia	S2, S3, S4, S5, P1, P2, P3, P4, R3, R5, R6, R8
Lemoine and Richardson (2020)	This study aims to explore Strategic planning approaches for higher education institutions' during the COVID-19 pandemic	The study likely uses qualitative the analysis of institutional responses and strategies, examining case studies or conducting interviews with educational administrators	Many countries	P1, R1
Ngqondi and Mauwa (2020)	The paper focuses on developing an IT governance model suitable for institutions	It presumably employs a case study approach, analyzing the specific challenges and solutions in a low-resource setting	South Africa	S1, S2, S3 P2, P3, P4, R1, R2, R3, R6
Ahriz *et al*. (2018b)	To apply the COBIT 5 framework for IT project portfolio management in a Moroccan university	This involves a practical implementation of the COBIT 5 framework, likely through a detailed case study of its application in the university setting	Morocco	P4, P2
Sangiumvibool and Chonglerttham (2017)	Investigate the Implementation and the impact of the performance-based budgeting in Thai higher education institutions	The paper likely uses a combination of quantitative and qualitative methods, including data analysis of budgeting outcomes and qualitative interviews or surveys to gather insights from stakeholders	Thailand	P3
Ishlahuddin *et al*. (2020)	To analyze the maturity level of IT governance in a small-sized higher education institute using the COBIT 2019 framework	The study likely employs a case study approach, using the COBIT 2019 framework to assess and quantifies the maturity levels	Indonesia	P4

Table 1: Continue

Girl *et al*. (2021)	To apply the COBIT 2019 framework to IT governance in higher education institutions	Likely employs case study or implementation analysis, focusing on how COBIT 2019 can be adapted to the specific needs of higher education institutions	Germany	S2, S5, S6, P4, R4
Bianchi and Sousa (2018)	To explore the different frameworks used for IT governance in universities	He is an exploratory study, possibly using surveys or interviews to gather data from various universities about their IT governance frameworks	Malaysia	P4
Fattah and Setyadi (2021)	To identify the determinants of effective IT governance in higher education institutions using Partial Least Squares Structural Equation Modeling	Employs PLS-SEM, a statistical tool, to analyze the effectiveness of IT governance based on various determinants	Indonesia	S1, S2, P4, R3, R1 (PLS-SEM)
Montenegro and Flores (2015)	To develop an integrated model for ICT governance and management, applied specifically to the council for evaluation, accreditation,	Likely involves developing a theoretical model followed by practical application and evaluation within the context of CEAACES	Ecuador	S1, S2, S3, by S4, S5, P4, R2, R3, R4, R5
Bauer *et al*. (2021)	To explore how higher education institutions are governing sustainability initiatives and their readiness to drive transformation	The study likely includes qualitative and quantitative methods, such as surveys and interviews	Germany	S1, P2, R1, R2, R7
Sengik *et al*. (2022)	To propose an IT governance model for higher education institutions using design science research	Design science research methodology, which involves the creation and evaluation of artifacts	Brazil	S1, S3, S5, P1, P2, P3, of P4, R1, R2, R3, R4, R5,R6
Sofyani *et al*. (2022)	explore the impact of IT capabilities and governance on accountability and performance is higher education institutions during the COVID-19 pandemic	Likely includes a survey or data analysis method, examining the relationship between IT capabilities, governance and institutional performance during the pandemic	Indonesia	S1, P1, P3 R1, R2, R3, R4, R5, R6, R7
Bianchi and Sousa (2016)	To investigate IT governance mechanisms within higher education institutions	This study probably employs a qualitative research approach, possibly involving case studies or interviews to explore the mechanisms of IT governance in academic settings	Many countries	S1, S3, S4, S5, S6, S7, P1, P2, P3, P4,R1,R2, R3, R4, R5, R6
Adjei and Yaokumah (2017)	To examine the IT governance structures, processes *and* mechanisms within Ghanaian University	Likely involves a combination of of qualitative and quantitative research methods, including surveys, interviews and perhaps case study analysis	Ghana	S1, S3, S4, S5, P5, P4, R1, R3
Setiyawan (2019)	To propose a model for IT governance focus on cloud computing and data management context of higher education	This research probably includes model development theoretical analysis, possibly complemented by practical case studies or expert interviews	China	S3, P4, R5, R4

Results

The study on IT Governance (ITG) in universities post-COVID-19 reflects a marked increase in interest and strategic reshaping in response to the pandemic, aligning with observations by Lemoine and Richardson (2020); Addo *et al*. (2021). This trend emphasizes a pivot towards practical, experience-based research in ITG, as supported by the qualitative empirical focus prevalent in the works of Ajayi and Hussin (2016); Bianchi Bianchi and Sousa (2016).

Furthermore, the reliance on established frameworks like COBIT, ITIL and ISO IEC 38500, noted in our research, mirrors the global ITG trends identified by Merchan-Lima *et al*. (2021); Gerl *et al*. (2021). Unique to this study is the introduction of an ITG model founded on contingency theory, specifically designed for Moroccan universities. This novel approach moves away from generic models, providing a tailored understanding of ITG within the unique context of Moroccan higher education. The model distinctly categorizes ITG mechanisms as either

situational or universal, offering a new perspective in ITG literature by adapting to diverse university requirements and challenges. Methodologically, This research distinguishes itself by merging a systematic literature review with case studies specifically from Moroccan Universities, deviating from the usual emphasis on either literature reviews or standalone case studies. This hybrid methodology offers a thorough examination, including frequency analysis of diverse factors such as the year of publication, country of origin, chosen approaches, effective IT Governance (ITG) frameworks and mechanisms, the alignment of universities' strategies with IT objectives, the influence of ITG on university performance and the contrast between universal and context-specific governance mechanisms. By adopting this two-pronged approach, the study gains depth, overview as well as in-depth perspectives on the dynamic providing a comprehensive domain of ITG in higher education.

What is the Distribution of Publications Over Time

The publication year indicated in Fig. 2, an increase in articles between 2020 and 2022. This rise could be attributed to the presumed increase in the use of Information Technology (ITG) after 2019, following the COVID-19 pandemic, which necessitated a restructuring and planning of new governance strategies for information systems (Lemoine and Richardson, 2020; Addo *et al*., 2021). However, starting in 2022, there will be a decrease in the number of articles, possibly due to different search criteria being applied during that period and delaying publications from 2022.

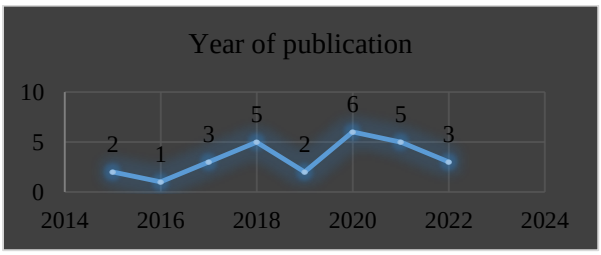

Fig. 2: Year of publication

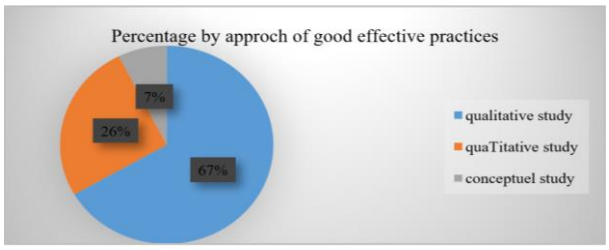

Fig. 3: Percentage by approach of good effective practices

What is the Study Approach

The research approach is depicted in Fig. 3. It can be observed that 67% of the studies are qualitative empirical studies 26% are quantitative, while conceptual studies account for 7%. This indicates that the literature is predominantly practical, with a limited number of conceptual studies for potential implementation. Structural Equation Modeling (SEM) and proficiency with smart PLS 3 reflect a trend toward adopting advanced analytical tools to investigate relationships between variables for these conceptual studies.

What is the Country of Origin Distribution of the Studies

This section emphasizes the global engagement of countries in adopting or investigating IT governance practices within their universities, as evidenced by the production of articles presenting their findings. We have presented this metric at both the national and continental levels.

Table 2 presents a detailed analysis of the distribution of countries and the number of articles published by continent in the field of IT Governance (ITG) in higher education. Asia leads in this area, while North America is the least active. Our approach differs from previous articles by using mixed methods to present a new perspective on ITG, focusing on the factors that affect its effectiveness. This approach distinguishes our study from previous reviews, as it provides a more in-depth understanding of ITG implementation and fills existing gaps in the literature. Our research also introduces an innovative ITG model based on contingency theory. A unique aspect of our study is the case study conducted in Moroccan universities, which examines the contextual nature of ITG mechanisms. This challenges conventional theories and adds distinctive perspectives to the field. Our findings are particularly relevant for the implementation of ITG in higher education institutions, offering significant implications in the context of the post-COVID-19 era. Figure 4, it is evident that Brazil and Malaysia have the highest number of publications, each contributing four articles, followed closely by Germany, the United States and South Africa, each with three articles to their credit.

Table 2: Number of countries and number of papers on ITG per continent

Continent	No. of countries	No. of papers
Asia	5	9
Europ	5	8
Africa	3	6
South America	2	5
Nord America	1	3

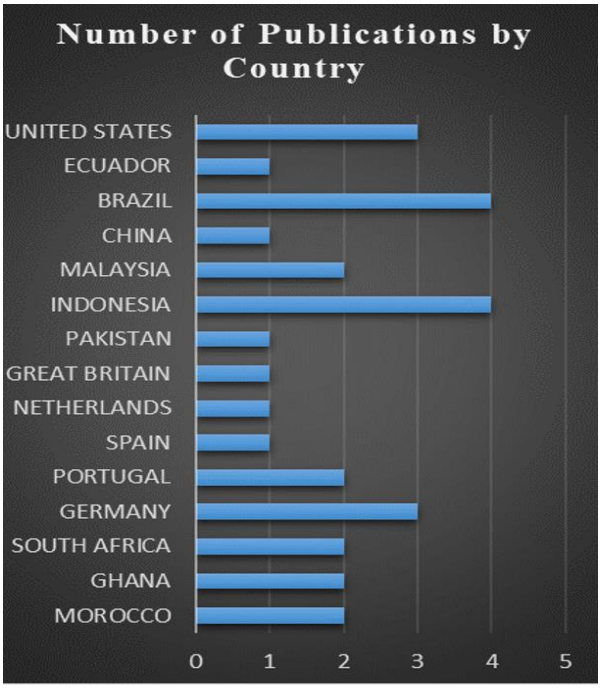

Fig. 4: Distribution of publication per country

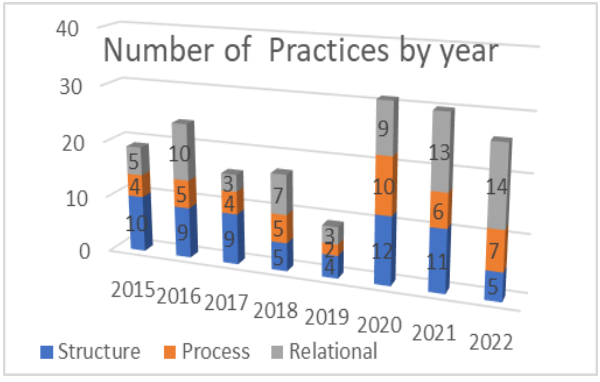

Fig. 5: Number of best practices per year

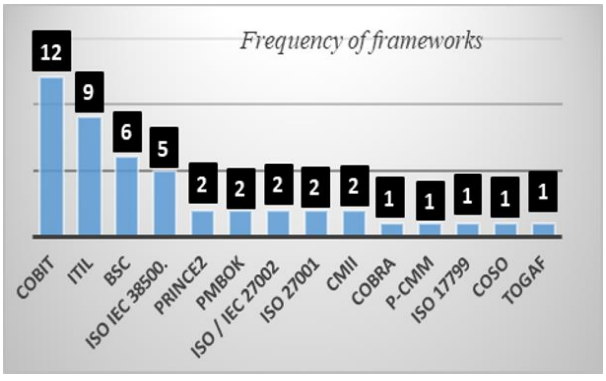

Fig. 6: Frequency of frameworks used in It governance at the university

How do Higher Education Institutions Utilize Frameworks and Practices of Information Technology Governance (ITG)

Figure 5 illustrates the number of best practices addressed yearly over the last decade. In 2019, only nine best Practices were tackled, with only three being relational, a phenomenon attributed to the COVID-19 pandemic. Conversely, the highest number of best practices was addressed between 2020 and 2022, totaling 87 best practices, representing 50% of the practices examined in this review. This reflects the growing popularity of the Information Technology Governance (ITG) topic in higher education institutions as a field of study.

However, starting in 2020, a shift occurred in the planning of university information systems due to the COVID-19 pandemic, resulting in increased adoption of relational mechanisms, Table 3 and Fig. 6 present the distribution by year and frequency of the different frameworks used within universities. COBIT and ITIL are the most commonly adopted frameworks, along with ISO IEC 38500 and BSC.

To what degree do Universities' Strategic Goals and Objectives Align with Information Technology

Strategic alignment represents a significant challenge in the higher education sector, which has received less attention in research than its enterprise domain counterpart (Alghamdi and Sun, 2017). Additionally, a previous study (Rodríguez-Abitia and Bribiesca-Correa, 2021) demonstrated that ineffective leadership, insufficient cultural changes, limited innovation and financial support negatively impact alignment. Another investigation (Sofyani *et al*., 2022) highlighted the role of IT capability in aligning strategic IT objectives with university goals. Furthermore, another study (Ahriz *et al*., 2018a) employed the Strategic Alignment Model (SAM) to examine the correlation among the four areas involved in the alignment process. This approach allows university leaders to more effectively manage their IT investments and optimize the use of available resources.

How has IT Governance Affected University Performance After its Implementation

All the best practices examined in this literature review have demonstrated their effectiveness regarding their impact on university performance. Al-Kurdi *et al.* (2020); Fitriani and Muljono (2019); Gorondutse *et al.* (2018); Obaid (2018) have revealed that proper staff training and strong leadership reinforced by a robust organizational culture have positively affected knowledge sharing and employee performance. Furthermore, a study by Peñaherrera and Osorio (2020) states that COBIT

provides resources to enhance performance and establish optimized IT governance, thereby generating time and cost savings. According to Peñaherrera and Osorio (2020), the university successfully reduced processing times for requests and incidents due to ITIL. Finally, (Piterska *et al*., 2019) have demonstrated that implementing portfolio management methods enables higher education institutions to assess the risks associated with research projects more effectively and the benefits of their implementation.

Are the Key IT Governance (ITG) Mechanisms Universal or Situational

The effectiveness of IT Governance (ITG) practices' implementation and adoption is influenced by various contingency factors (Weber *et al*., 2009; Mikalef *et al*., 2014; De Haes and Van Grembergen, 2009; 2008; Peterson *et al*., 2002) underscoring the notion that one ITG model does not fit all organizations due to situational factors affecting performance enhancement (Weber *et al*., 2009). Studies indicate the improbability of a one-size-fits-all ITG framework (Weber *et al*., 2009; Mikalef *et al*., 2014; Brown and Grant, 2005). To develop a contingency model tailored to the needs of universities, in line with our seventh research question, our study initially conducted a thorough literature analysis. This first phase involved identifying effective ITG mechanisms at the strategic level. Subsequently, we integrated these proven mechanisms with those identified in other countries, as reported in the source (Scalabrin Bianchi *et al*., 2021). Conducting a case study in five Moroccan universities, which included interviews with five senior officials of these institutions, was crucial in determining the mechanisms that are both universally applicable and specific to the unique context of Moroccan universities. The responses provided by the officials, as indicated in Table 4, facilitate the development of an adaptive IT governance model specifically designed to meet the contextual needs of Moroccan universities. The digital transformation process was integrated into the table because of its importance in the "Morocco Digital 2021" project (Ferhane and Yassine, 2022).

Table 3: Frameworks used in IT governance per year

	Frameworks													
Years	COBIT	ITIL	PRINCE2	PMBOK	ISO 17799	BSC	COBRA	P-CMM	ISO IEC 38500	ISO/ IEC 27002	ISO 27001	CMII	COSO	TOGAF
2015	Montenegro and Flores (2015)	Montenegro and Flores (2015)	0	0	0	0	0	0	0	0	0	0	0	0
2016	Ajayi and Hussin (2016) Bianchi And Sousa (2016)	Bianchi and Sousa (2016)	Bianchi and Sousa (2016)	0	Bianchi and Sousa (2016)	Ajayi and Hussin (2016) Bianchi and Sousa (2016)	Bianchi and Sousa (2016)	Bianchi and Sousa (2016)	Bianchi and Sousa (2016)	0	0	0	0	0
2017	Putz *et al*. (2017)	0	0	0	0	Putz *et al*. (2017)	0	0	0	0	0	0	0	0
2018	Ahriz *et al*. (2018b) Bianchi and Sousa (2018) Ishlah Uddin *et al*. (2020)	Bianchi and Sousa (2018)	Bianchi and Sousa (2018)	Bianchi and Sousa (2018)	0	0	0	0	Bianchi and Sousa (2018)	0	Bianchi and Sousa (2018)	Bianchi and Sousa (2018)	Bianchi and Sousa (2018)	Bianchi and Sousa (2018)
2019	Setiyawan (2019)	Setiyawan (2019)	0	0	0	0	0	0	Setiyawan (2019)	0	0	0	0	0
2020	Merchan-Lima *et al*. (2021) Gerl *et al*. (2021) Adjei and Yaokumah (2017); Ngqondi and Mauwa (2020)	Adjei and Yaokumah (2017); Merchan-Lima *et al*. (2021)	0	0	0	Adjei and Yaokumah (2017)	0	0	Ngqondi and Mauwa (2020) Merchan-Lima *et al*. (2021)	Adjei and Yaokumah (2017)	Merchan-Lima *et al*. (2021)	0	0	0
2021	0	Scalabrin Bianchi *et al*. (2021)	0	0	0	Fattah and Setyadi (2021) Scalabrin Bianchi *et al*. (2021)	0	0	0	0	0	0	0	0
2022	Sengik *et al*. (2022)	Sengik *et al*. (2022)	0	Sengik *et al*. (2022)	0	0	0	0	Sengik *et al*. (2022)	0	0	Sengik *et al*. (2022)	0	0
Total	12	9	2	2	1	6	1	1	5	2	2	2	1	1

Table 4: Situational and universal ITG mechanisms

	Strategic ITG Mechanisms	R1	R2	R3	R4	R5
Structure	IT organization structure (Bianchi *et al*., 2017b)	S	S	U	S	S
	IT strategy committee (Putz *et al*., 2017)	U	U	U	U	U
	IT steering committees/councils	U	S	S	S	S
	Roles and responsibilities (Jamali *et al*., 2022)	U	U	U	U	U
	Project Management Office (Scalabrin Bianchi *et al*., 2021)	U	U	U	U	U
	Process management office (Scalabrin Bianchi *et al*., 2021)	U	U	U	U	U
	ITG function/officer (Wilmore, 2014)	U	U	U	U	U
	Security/compliance /risk officer (Bichsel and Feehan, 2014)	U	U	U	U	U
	Business/IT relationship Managers (Scalabrin Bianchi *et al*., 2021)	S	S	S	S	U
	CIO on Executive Committee (Fattah *et al*., 2021)	U	U	U	U	U
Process	Strategy information system planning (Ajayi and Hussin, 2016)	S	S	S	S	S
	Frameworks and standards ITG (Bianchi and Sousa, 2018)	U	U	U	U	U
	Test and experiments of solutions (Scalabrin Bianchi *et al*., 2021)	S	S	S	S	S
	Dashboard (Scalabrin Bianchi *et al*., 2021)	U	U	U	U	U
	Methodology to manage disruptive innovation (Scalabrin Bianchi *et al*., 2021)	S	S	S	S	S
	International standards/common solutions (Scalabrin Bianchi *et al*., 2021)	U	U	U	U	U
	Portfolio management Ngqondi and Mauwa, 2020)	U	U	U	U	U
	IT budget control and reporting (Sangiumvibool and Chonglerttham, 2017)	U	U	U	U	U
	Performance measurement (Purwanto *et al*., 2023)	U	U	U	U	U
	Digital transformation (Ferhane and Yassine, 2022)	S	S	S	S	S
Relational	Knowledge Management (Ajayi and Hussin, 2016)	S	S	U	U	U
	Knowledge sharing among universities (Scalabrin Bianchi *et al*., 2021)	S	S	S	S	U
	IT leadership (Fattah and Setyadi, 2021)	U	U	U	U	U
	Training and education (Scalabrin Bianchi *et al*., 2021)	U	U	U	U	U
	The partnership between the university and software industry (Scalabrin Bianchi *et al*., 2021)	S	S	S	S	S
	Corporate communication (Ajayi and Hussin, 2016)	U	U	U	U	U
	Engagement between IT and academia (Scalabrin Bianchi *et al*., 2021)	S	S	U	S	S
	A shared understanding of business/IT objectives (Scalabrin Bianchi *et al*., 2021)	U	U	U	U	U

R1 = Responsible 1
S = Situational
U = Universal

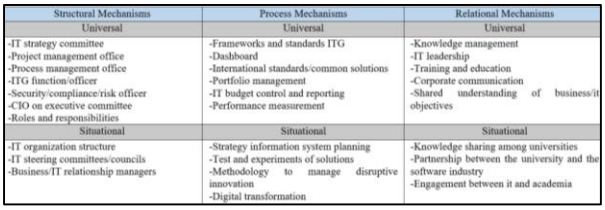

Fig. 7: Exploratory ITG model with situational and universal ITG mechanisms in HEI

Following the conduct of five interviews with strategic-level leaders at Moroccan universities, as illustrated by Fig. 7, it was observed that out of the 28 identified strategic IT governance mechanisms, 30% are situational, requiring adaptation to specific circumstances, while 70% are universal, applying broadly. This differentiation emphasizes the significance of an implementation that considers both universal principles and situational specifics. Embracing this approach allows for the tailoring of strategies and digital innovations to meet the unique needs of each organization. Furthermore, it promotes enhanced collaboration between academic institutions and the software industry, a vital synergy for effectively navigating an ever-evolving technological landscape.

Discussion

In this study, we conducted a systematic mapping analysis to assess the impact and status of best practices in IT governance within higher education. To achieve the Objective, we formulated seven Research Questions (RQs). To address these questions, we researched various academic databases, enabling us to identify 74 relevant studies. The results of the first set of Research Questions (RQ1) confirm a growing interest in information technology governance within universities starting in 2016. The authors also cite similar findings (Meçe *et al*., 2020; Oñate-Andino *et al*., 2019), although this interest tapered off in 2019 due to the COVID-19 pandemic. Regarding RQ2, we found that qualitative studies, which rely on interviews and evaluating other reviews, are predominant, followed by quantitative studies at 27% and conceptual studies at 7% for potential implementation. Research Question RQ3 reveals that the geographical distribution of these research articles is primarily concentrated in Europe and Asia, based on the number of articles addressing cases in these regions. This trend is predominantly influenced by the current culture of information technology governance and the support and vision of high-level authorities in these regions. According to QR4, since 2016, we have observed a widespread adoption of best practices. However, this trend slowed down in 2019 due to the COVID-19 pandemic. After the pandemic, many universities developed new strategies in information systems, resulting in an increased use of processes and structure, especially relational practices. The study revealed that ITIL and COBIT were the most commonly used frameworks across all countries despite challenges in implementing the latter (Bianchi and Sousa, 2018; Ahuja, 2009; Deistler and Rentrop, 2022). On the other hand, ISO/IEC 38500 and BSC were popular frameworks employed to enhance performance in managing their activities. Given the diversity of tasks and the complex structure of universities, selecting a single framework is not feasible; instead, a combination of complementary frameworks is required, as depicted in Table 3, each addressing specific needs. In this context, Ben Romdhane and Ben Slimane (2018) confirmed the difficulty of effectively applying and integrating multiple information system standards. Therefore, the issue of the diversity of governance staff training. According to RQ5, based on the literature, it is essential to align strategic IT objectives with the overall goals of the university.

To achieve this, universities must implement mature practices, supported by a strong IT capability and endorsed by the IT leadership, along with a culture of change fostered through effective staff training. Regarding RQ6, the implementation of effective practices enables highly successful strategic alignment, which has a positive impact on university performance. Given that universities have a non-profit objective, these studies have revealed that delivering high-quality education, research and administration relies on leadership support and involvement in governance processes, as well as adequate training and the sharing of governance knowledge among different stakeholders. Regarding RQ7, it is clear that no standard method for implementing IT governance mechanisms suits all particular situations. The application of IT governance is influenced by various contextual factors, both external and internal (Pereira *et al.*, 2014). However, existing studies do not clearly understand these factors or their impact on IT governance models and their implementation (Levstek *et al*., 2018). Most conceptual frameworks suggest the absence of an ideal organizational structure or IT governance model, acknowledging that IT must adapt to the unique contexts in which it is deployed (Lunardi *et al*., 2017). Still, they do not detail the specific factors affecting each IT governance implementation (Pereira and Silva, 2012). In our study, we sought to understand whether all mechanisms were essential in all circumstances and whether there was a need for new IT governance models based on contingency theory. The responses collected reveal an exploratory IT governance model, illustrated in Fig. 7, distinguishing mechanisms perceived as primarily situational or universal. These results prompt us to reassess the notion that models of IT governance are universally applicable. Instead, they suggest the need to base future developments on contingency theory. However, a study developed a contingency model specifically designed for SMEs (Levstek *et al*., 2022), different from the model used by universities due to their size and long-term mission in education and research. In contrast, SMEs favor an IT governance focused on agility and flexibility, aligned with changing needs and competitive market challenges. This disparity reflects universities' need to maintain strict continuity and compliance within their unique academic environment.

Ultimately, these results in the understanding that there is no universally applicable IT governance model and organizations must instead develop customized strategies based on their unique environment, organizational culture and specific strategic objective.

Conclusion

This study introduces a novel approach to Information Technology Governance (ITG) in higher education institutions, specifically tailored for the unique context of Moroccan universities post-COVID-19. Its innovation lies in developing a contingency-based ITG model that integrates both universal and situational mechanisms, a significant departure from the traditional one-size-fits-all frameworks. This approach is underpinned by a comprehensive systematic literature review of 72 articles, offering a global perspective on ITG trends and practices. The study marks a shift towards practical, experience-based research, emphasized by the inclusion of empirical evidence from case studies in Moroccan universities. This methodology not only aligns IT governance with the strategic goals and digital transformation needs of universities but also addresses the specific challenges and requirements in a rapidly evolving educational landscape, particularly in the aftermath of the pandemic.

The current study faces limitations due to its narrow sampling range, which challenges the generalization of its findings. Future research should focus on establishing a consensus around an information governance framework for higher education institutions. Our literature review indicates that the use of various frameworks leads to a lack of clarity regarding the most appropriate frameworks. Incorporating the contingency approach might be beneficial in this context. To progress in this direction, it is suggested to conduct design science research within Moroccan universities, aiming to develop a scientific approach specifically tailored to this issue.

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Author's Contributions

Chahid Abdelilah and Souad Ahriz: Participated in all experiments, coordinated the data-analysis and contributed to the written of the manuscript.

Kamal EL Guemmat: Coordinated the mouse work, data analysis reviewed.

Khalifa Mansouri: Data analysis reviewed, and results evaluation, designed the research planed and organized the study.

Ethics

Authors should address any ethical issues that may arise after the publication of this manuscript.

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