Towards a Framework for Elevating the Usage of eLearning Technologies in Higher Education Institutions

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***Abstract*—Adopting eLearning technologies is no longer an option in Higher Education Institutions (HEIs) to support teaching and learning activities. However, despite steps taken by most of these institutions towards effective utilization of technologies, the current situation on the ground shows two significant challenges. First, the misalignment between institutions' strategies and the technical implementation of these technologies. Second, the scattered implementation and usage of eLearning technologies among stakeholders, which increases operational overhead due to the lack of a unified approach and usage procedures that promote optimal utilization of such technologies. This paper aims to introduce a framework for elevating the usage of eLearning technologies in HEIs. It guides the alignment between strategic goals and technology implementation for effective and progressive eLearning technology usage. Design science research methodology is adopted to guide the development of this framework. It drives the development process by first being aware of the problem from a real-life context and then proposing a solution. Principles from business and IT alignment and enterprise architecture are adopted to propose this framework, which is meant to be comprehensive to have eLearning technologies fit the institution's purpose while achieving strategic goals.**

Keywords*—*eLearning; higher education; business and IT alignment; enterprise architecture

I. Introduction

Higher Education Institutions (HEIs) refer to universities, colleges, and other educational institutions that offer and deliver postsecondary education [1]. The teaching and learning activities carried out in these institutions are to prepare students for a specific profession [2]. Adopting Information and Communication Technologies (ICT) to support teaching and learning activities in these institutions is no longer an option. However, this requires continuous management and alignment of business needs with IT capabilities following HEIs' strategies. This strategic and operational alignment of business and IT has been a critical issue that faces organizations in different sectors, and the education sector is no exception.

This paper aims to develop a framework that assists in orchestrating alignment between the strategic vision and objective of HEIs with projects and activities related to using eLearning technologies. The paper is organized as follows: a literature review is carried out first to identify the gaps in IT investment and digital transformation in HEIs. Then, the business and IT alignment and the importance of employing enterprise architecture principles in HEIs are described, representing the theoretical and practical background to facilitate better management and alignment of business and IT resources in HEIs. The research methodology, which guides the research activities, is then explained. Then, the proposed framework developed according to design science research is introduced to contribute to the knowledge base. Finally, the conclusion and future work are explained.

II. Background

A. IT investments and Digital Transformation in HEIs

In the early days of adopting Information and Communication Technologies (ICT) in HEIs, they were mainly used for administrative and communication purposes rather than enhancing and supporting teaching and learning activities [3]. In recent years, however, ICT's investments and role in the education sector in general and in HEIs in particular have expanded enormously. These institutions increasingly invest in digital technologies to acquire sustainability, competitiveness, financial stability, innovation, stakeholders' satisfaction, teaching quality, institutional performance, and better ranking [4],[5]. New technologies are also adopted in these institutions to facilitate access to various online resources and distance education [6]. In a recent technical report, Morgan et al. [7] illustrate that advanced technologies in HEIs offer specialized web-conferencing tools, robotics process automation, access to artificial intelligence solutions, virtual tutoring platforms, advanced presentation technologies, and more solutions and focus on career support.

Embracing the education sector and institutions with advanced technologies is no longer a fancy option. HEIs, according to Pinho et al. [8] must adapt to the rapid changes in the technological environment as they have previously adapted to various social, political, and technical changes. According to the UNESCO National Commission [9], it is mandatory for HEIs, in particular, to proceed with technological enhancement to instruct and qualify people with the required knowledge that enables them to understand science and assists them in making the right decisions in terms of personal, professional and political choices.

The permeation of advanced technologies in every aspect of HEIs has forced these institutions to deal with holistic Digital Transformation (DT) planning, including all dimensions. A systematic literature review of DT in HEIs is carried out by Benavides et al. [10], and the findings reveal that DT in these institutions is still an emerging field and there is still a need for further research efforts to deal with the rapid changes in technology adoption in this sector. The authors state that although DT research papers related to HEIs have increased by 200% annually since 2016, the complex relationships between the actors involved in this technologically supported domain require further approaches to deal with a holistic transformation in HEIs, including business activities, processes, competencies, and models. Similarly, Durão et al. [11] pointed out that DT is not just about streamlining business processes and innovating new services. Still, it goes beyond to involve fundamental transformations in organizational procedures and capacity.

Realizing the benefits and Return on Investments (ROI) of ICT projects in HEIs can be overwhelming. Previous and recent studies have shown the challenges and failures associated with ICT investments in higher education institutions. For example, Kebritchi et al. [12] pointed out the challenges that hinder successful online course adoption in higher education. Issues are categorized in relation to learners, instructors, and the developed online content itself. Ejiaku [13] also pointed out that the absence of effective policies and leadership and the lack of IT professionals with the skills to analyze and manage IT projects have hindered the successful adoption of ICT in HEIs. Another study reveals that the low penetration of ICT systems among HEIs and the low level of IT literacy among students are considered significant challenges that affect the effective adoption of ICT in HEIs in a large population country like India [14]. Cloete [15] highlights that the complexity of IT itself and realizing its impacts on education varies from context to context, which can be the main challenges of embracing technology in education. Hatlevik [16] adds that Instructors' digital competence and beliefs about ICT are critical to effectively utilizing emerging technologies in teaching and learning institutions.

Although the business value of IT in many HEIs has been realized, it has not been effectively measured [17]. The Return on Investment (ROI) of IT capabilities in these institutions and this sector are largely not assessed [18]. Recently, policymakers and researchers have been demanding ROI calculation in higher education to see how students and HEIs perform [19]. This research does not aim to develop a tool that can assist in measuring the ROI or business value of IT in HEIs. However, it provides a clear representation of the misaligned components in these institutions and how they can be viewed and integrated through a framework to facilitate their value-adding to the business.

B. Business and IT Alignment in HEIs

Business and IT alignment is defined at strategic and operational levels according to the well-known model of alignment developed by Henderson et al. [20]. Reich et al. [21] define the alignment at the strategic level as "the degree to which the IT mission, objectives, and plans support and are supported by the business mission, objectives, and plans." On the other hand, Silvius et al. [22] define business and IT alignment at the operational level as "the degree to which IT applications, infrastructure and organization enable and support the business strategy and processes."

Most researchers and practitioners who studied and practiced the possibility of bridging the gap between business and IT agree that this harmony between these two domains positively impacts overall business performance [23]–[26]. Their work shows a consensus in their findings that organizations will perform well when IT resources, including hardware, software, IT skills, assets, and management, are aligned with business strategies and services. According to Liu et al. [27], it has become more critical in recent years to have the right IT with the right capabilities aligned with the right business requirements to have business value from IT investments.

The concept of alignment in academic and business sectors is one of the most frequently studied theories. Yet, many organizations are still misaligned and fail to take full advantage of IT [28], [29]. Business and IT alignment in HEIs represent a unique challenge due to the distinctive nature of these institutions. Decision-making in these institutions is shared, organizational culture among universities and colleges differs, and academic courses and research activities are independent [17]. According to Alghamdi et al. [30], business and IT alignment in the education sector has received the least attention in the business and IT alignment literature compared to other public and private sectors.

The isolation of IT planning when strategic business planning is carried out [31], the lack of top management awareness of the significant role of IT systems in organizations [32], the weak power sometimes of IT departments [31], and the rapid changing environment of business and IT [28], have all contributed to the ineffectiveness and misuse of IT in organizations. This has led many organizations in recent years to seek a holistic approach that provides an overarching view of the organization and its components in all its hierarchical layers (strategic, business, and technology), which can be found in the Enterprise Architecture theory and practice.

C. Enterprise Architecture in HEIs

Enterprise Architecture (EA) is a field of study that recently emerged to enhance the complexity and management of organizations and their business and IT domains to achieve strategic objectives and digital transformation [33], [34]. According to Gartner Group [35], "Enterprise Architecture is the process of translating business vision and strategy into effective enterprise change by creating, communicating, and improving key requirements, principles, and models that describe the enterprise's future state and enable its evolution.". In its simplest form, EA is described by Bernard [36] as the integration between the Strategy (S), Business (B), and Technology (T) layers of an enterprise, as illustrated in Fig. 1. The strategic layer at the top level is considered to be the main driver of an enterprise, while the business layer is the place where the source of requirements is elicited. The technology layer, the bottom layer, is where the provision of systems and technology to meet the business requirements to achieve strategic goals.

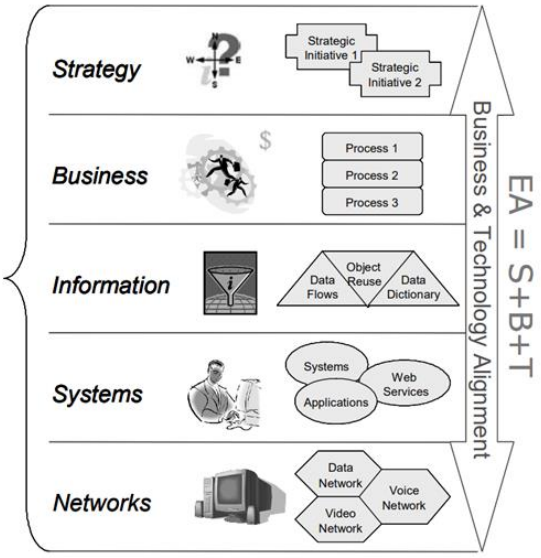

Fig. 1. The main layers of an enterprise from an enterprise architecture perspective [36].

During the last decade, there has been a growing interest in adopting EA principles and frameworks in HEIs. A recent systematic literature review carried out by Meutia et al. [37] shows that HEIs have adopted EA frameworks such as Zachman and TOGAF in the last decade for the following reasons: planning of IT infrastructure, integrating systems, developing appropriate strategic direction, achieving efficiency and effectiveness of available IT resources, ensuring standardized system development process, achieving competitive advantage through technology compared to other universities, reducing costs, supporting every business requirements, achieving better performance of systems, and finally achieving the mission and strategic goals related to the education process.

Another recent systematic mapping study of EA in the higher education domain is carried out by Bourmpoulias et al. [38]. Sixty articles were analyzed, and the authors pointed out that although the practice of EA in the education sector is widely accepted across the Americas, Asia, and Europe, the sector still faces major challenges in adopting EA principles and methodologies effectively. Among these challenges are the scarcity of EA practices in the education domain, the gap in the adoption and assessment of EA even in advanced education systems worldwide, and the focus on IT teams to lead the process and adoption of EA. The authors, on the other hand, highlight promising practices of EA in the education sector. Among these practices are adopting EA principles and frameworks in HEIs to assist in better business and IT planning, better business and IT alignment, effective change management, and better achievement of strategic goals and objectives. According to [10], EA practices and methodologies are enablers of DT in HEIs, where they can assist through systematic approaches the DT journey in these institutions.

III. Research Methodology

Design Science Research (DSR) is a research paradigm that guides a researcher in developing an artefact addressing a real-world problem and contributing to the knowledge base with the devised and evaluated solution [39]. DSR has received considerable attention in information systems research that focuses on the effective utilization of technologies in organizations [40], especially after the grounding work of [41]–[43].

Unlike the behavioral science paradigms that focus on developing and verifying theories to predict human or organizational behavior, the design science paradigm goes beyond human and organizational boundaries to develop new and innovative artefacts [42]. These artefacts are devised and evaluated following the DSR principles to solve a problem. According to Vaishnavi et al. [44], constructs, models, methods, instantiations, frameworks, architecture, design principles, and design theories are types of artefacts that can be the outcomes of a DSR project. A conceptual framework of DSR and its fundamental concepts is developed by Hevner et al. [42]. In their framework, three central components are emphasized: environment, IS research, and knowledge base. The environment specifies the boundaries of where the problem takes place involving people, organization, and technology and their underpinning components. The IS research and the knowledge base stand as a vehicle to address the issues identified in the environment based on the foundations of scientific theories and practices that support scientific IS research.

In reference [44], the authors describe a procedural workflow to carry out scientific research based on the developed DSR framework of Hevner et al. [42]. Fig. 2 shows the procedural flow of design science-based research that begins with awareness of the problem from a real-world context.

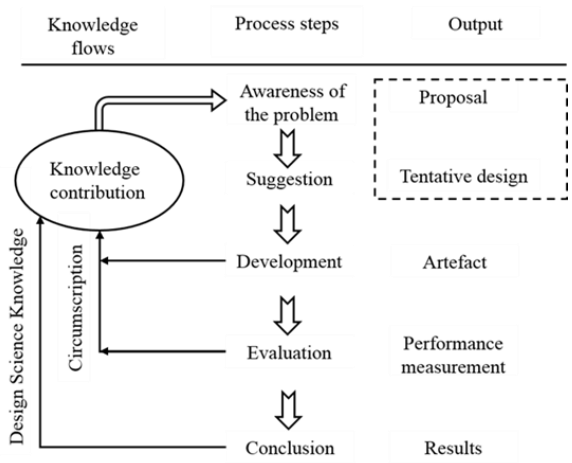

Fig. 2. A process model for DSR [44].

Then, an initial design is suggested to address the problem, which is driven by available relevant knowledge, either theoretical or practical. The initial design is then developed to derive the solution (i.e., the artefact). The resulting artefact is then evaluated through implementation to determine its ability to resolve identified problems. The conclusion then denotes the end of the procedural flow of the DSR, where the outcome itself is considered a contribution to the knowledge base. Some steps in the procedural flow can be iteratively carried out to

enhance the outcomes of the DSR to provide a practical and effective solution to a real-world problem.

IV. PROPOSED FRAMEWORK

Teaching and learning activities in their abstract form in a HEI consist of three main components: learning material (Courses), Instructors, and Students. eLearning technologies are constantly being procured and developed to improve these activities and maintain the essential components effectively involved in a positive relationship. This research aims to design a framework that supports HEIs to maintain an effective learning environment by elevating the usage of eLearning technologies. The alignment between operational activities in these institutions with strategic vision and objectives is considered along with principles and concepts from enterprise architecture theories while devising the framework. To achieve this, the DSR methodology is adopted as a scientific grounding to drive the development of the framework with an agile mindset that ensures continuous delivery.

A. Awareness of the Problem

Understanding the environment (people, organization, and technologies) is a primary activity in DSR to be aware of a real-world problem [42]. This assists in suggesting a solution that can address this problem and could be similar problems within the domain of study. The awareness of the problem in this research comes from threefold.

First, from the available literature on ICT investments and DT challenges in HEIs. Previous sections of this paper highlight related work that pointed out the challenges that face the effective utilization of advanced technologies in HEIs. The misalignment between eLearning technologies and HEIs' strategies can lead to a failure in achieving maximum utilization of these technologies to enhance overall teaching and learning activities. Such a challenge in the higher education sector has received the lowest attention in IT alignment research [30], [45]. A real example of misalignment practice that usually occurs in many HEIs is the isolation of implementing IT projects away from the actual needs of students and academic staff. In fact, the focus is shifted mainly to technological features rather than how these features can be utilized to improve teaching and learning quality. As a result, many HEIs have sets of scattered tools and systems with low utilization and an apparent absence of a unified ecosystem and effective utilization planning.

The literature also indicates that HEIs invest heavily in ICT to improve teaching and learning quality, one of their main common objectives. eLearning tools are employed in these institutions to achieve this quality in offering and delivering courses. However, utilizing eLearning technologies abstractly to deliver course materials has a low impact on the desired quality for three reasons. First, each instructor will develop their approach to using eLearning applications to achieve high quality in delivering course material and improving learning outcomes. As a result, the overall level of quality will vary between courses offered within one institution. Second, this quality cannot be measured due to the lack of measuring metrics. Therefore, it will be challenging to have an improvement plan since each instructor follows their way of employing eLearning tools. According to [46], quality practices in HEIs should be transformed for these institutions to remain effective. Third, learners will be confused and distracted between different tools used by other instructors. The utilization of eLearning technologies in HEIs without a unified framework that guides its adoption has a low chance of success due to the lack of alignment between institutions' vision and technological infrastructure implementation.

Second, the authors of this paper have worked for nine years as CIOs in a HEI in Saudi Arabia at (Al-Baha University). Therefore, they have carried out a requirement analysis process, which includes guided sessions to address the problem closely from the main stakeholders of the university (namely, students, academic staff, and top management), representing a real-life context. The outcomes assist in understanding the business and the actual needs of instructors and students to have effective learning activities and supporting eLearning tools during their academic journey. It also helps in being aware of the challenges, expectations, and beliefs of decision-makers towards making investments and supporting the adoption of eLearning technologies. Being CIOs at the university for several years, the authors are entirely aware of the technical capabilities of the university and its misalignment with its strategic scene.

Third, commonly utilized technologies and techniques in HEIs in Saudi Arabia and worldwide are investigated, including LMS, IT infrastructure, online course development process, and the eLearning platform's operation models. This allows for a better understanding of the environment and available ICT solutions in higher education.

Being aware of the environment and these challenges in HEIs, the proposed framework is suggested to provide a practical guideline to systematically overcome these challenges to elevate the usage of eLearning technologies in HEIs to effectively realize strategic goals through guidelines from enterprise architecture and alignment theory.

B. Developed Framework

Environmental analysis has guided the development of a set of artefacts and a framework to address the defined problem. The first artefact is shown in Fig. 3, which is a model that includes the four main key interactive components in an HEI domain that adopts eLearning technologies. These components are the Learner, Instructor, Course, and Platform, which supports teaching and learning activities (LICP). They must be aligned to maintain an effective relationship between them that result in generating business value of IT investment.

The model in Fig. 3 also illustrates the major interactive activities that are directly supported by a technological platform that assists teaching and learning activities. The learning platform should always afford the required functionalities from learners and instructors, following best practices and quality standards to ensure a successful learning journey. Therefore, the effective utilization of eLearning technologies should positively impact other activities. For instance, providing a unified process for the course development lifecycle using eLearning tools implemented on a centralized platform will support instructors in developing and

enhancing their courses to meet defined quality requirements. Moreover, such unified processes and platforms will support the creation of course libraries that can be shared with all instructors and provide students with a high-quality eLearning experience.

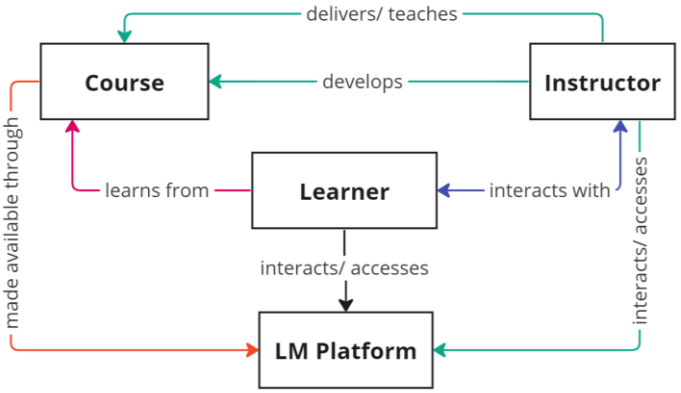

Fig. 3. Main interactive components in a HEI (LICP).

The second artefact developed based on the environmental analysis is shown in Fig. 4. It is another model that considers the principles of EA to draw the relationship between LICP components identified in the first model.

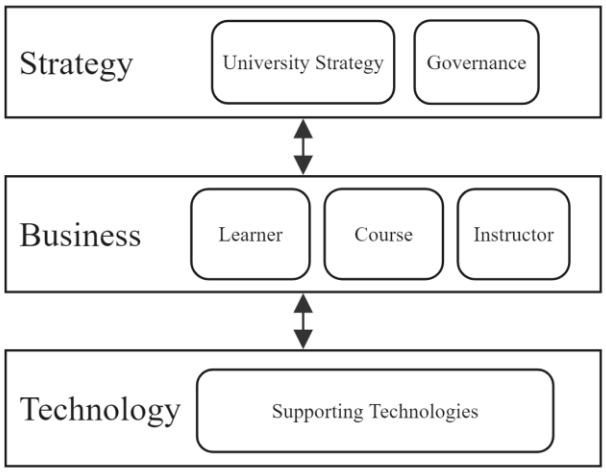

Fig. 4. LICP components from an EA point of view.

The model in Fig. 4 highlights, from an EA perspective, the need to have a comprehensive overview of the HEI that integrates supporting technologies with main business components to realize an overall institution strategy. For instance, integrating Learning Management Systems (LMS), eTest, virtual labs, and virtual classes and providing a usage guideline would support business actors (instructors and students) to effectively communicate during the teaching and learning journey, having an impact on the quality of education that the institution seeks as a strategic objective.

The model also highlights the need to define an ecosystem combining components to drive the institution's implementation, adoption, or elevation of technologies. This ecosystem is not necessarily technology-centric but rather a customized set of components driven from assessing an institution's capabilities to assist institutions in moving from the current view (as-is) to the targeted future view (to-be). An eLearning ecosystem, for example, includes policies, procedures, tools, actors, and infrastructure components such as Learning Management System (LMS), Student Information System (SIS) integration, and students email integration, labs, and eTest centers that should be harnessed according to institution's capability to elevate the usage of supporting technologies.

Based on these artefacts, the proposed framework is developed, which consists of seven iterative stages as illustrated in Fig. 5. It aims to assist HEIs in elevating the usage of eLearning technologies by adopting them in a systematic way that ensures the involvement of related organizational components from alignment and EA perspectives. This way, improving the teaching and learning journey for the main stakeholders in this sector (students and instructors) through a unified structure is prioritized while keeping LICP components aligned with the institution's strategic vision and goals through governance and an agile mindset supported by EA principles.

Each stage defined in the framework is considered a milestone in utilizing or elevating the usage of eLearning technologies in HEIs through a project roadmap. Each iteration will focus on a specific goal to promote progressive quality improvement in HEIs. Table I illustrates a summary of activities that should be carried out in each stage, along with expected outcomes.

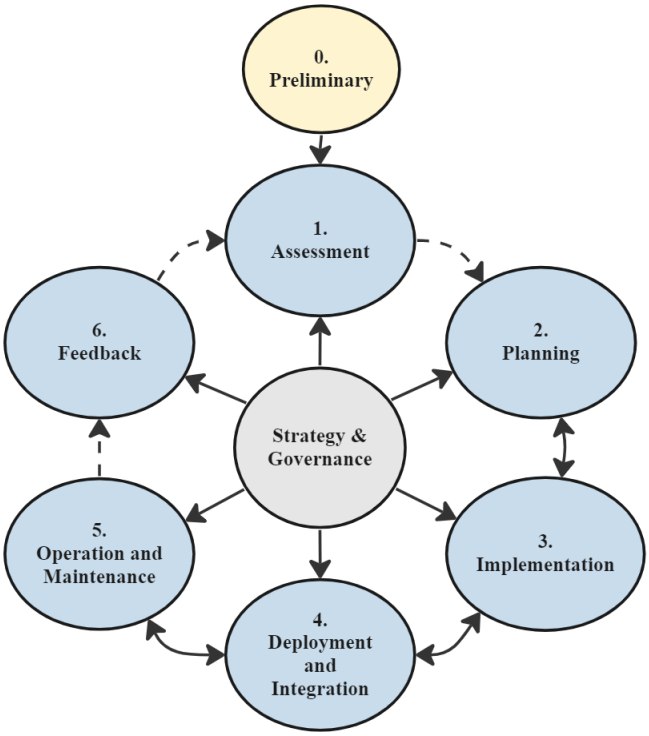

Fig. 5. Proposed framework for elevating the usage of eLearning technologies in HEIs.

TABLE I. STAGES OF THE PROPOSED FRAMEWORK

Stage	Main Activities	Main Outcomes
0 - Preliminary	• Form a core team. • Identify eLearning goals. • Select project management tools.	• Formed team members with specified roles and responsibilities. • Identified eLearning objectives. • Set up project backlog tool.
1 - Assessment	• Gap identification. • Competencies assessments for LICP components.	• SWOT analysis outcomes. • Requirements specification to reduce the gap between (As-IS) and (To-Be) state. • List of goals aligned with the institution's strategy.
2 - Planning	• Design eLearning projects. • Specify project dependencies. • Identify iterations (sequential and parallel).	• List of outcomes that must be delivered for each project. • Projects roadmap. • Projects implementation plan.
3 - Implementation	• Incremental implementation. • Update project backlog	• Project progress reports. • Tested and verified project ready to be integrated into an eLearning ecosystem.
4 - Deployment and Integration	• Update the eLearning ecosystem. • Integration with existing components.	• Updated ecosystem according to project scope.
5 - Operation and maintenance	• Maintain ecosystem operation. • Collect predefined metrics, e.g., course material usage	• Process for proactive action to avoid any technical issues. • Updated ecosystem operation manual.
6 - Feedback	• Collect feedback. • Feedback analysis.	• Feedback results. • Updated metrics.

Institution's strategy and governance are at the heart of this framework. The former guides the following assessment and planning stages, and the outcomes of all stages also impact it, while the latter controls the procedures and activities defined in each stage to ensure compliance with the requirements and regulations. Effective governance should ensure the missing alignment between the institution's layers (strategy, business, and technology). Governance also controls change management activities that support promoting eLearning culture and adopting new modes of teaching and learning. Change management also provides a systematic approach to implementing new projects approved by top management and helps to guide the activities that will be performed in the following stages of the framework.

The preliminary stage is the starting point of the proposed framework, which focuses on two activities. First, a core team will be formed to implement the following stages. Second, identify eLearning-related objectives based on HEI's strategies, which will be prepared to go through the iterative process of implementing subsequent framework stages. In this stage, the team will adopt an agile project management mindset in planning and executing each iteration. As a result, a backlog of eLearning projects and their objectives will be the outcomes of this stage that need to be approved by top management in terms of prioritization to ensure its alignment with other initiatives and projects at the HEI.

In the assessment stage, the core team uses a set of tools based on the outcomes of the preliminary stage to identify gaps between the current state and the targeted state of the eLearning tools adoption perspective, such as SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) and academic staff competencies' evaluation. etc., This stage triggers the alignment process between the institution's strategies and available eLearning capabilities. The outcomes of this stage should be a list of requirements that, once attained, should transform the institution from state (as-is) to state (to-be), realizing the institution's strategic objectives according to available and obtained capabilities.

Defining an eLearning ecosystem consisting of a set of components supports the improvement of eLearning capabilities at the institution, and this ecosystem works as an enabler for projects' implementations identified in stage two. Each project related to eLearning will be designed to use and improve this ecosystem. Integrating all components in this ecosystem is intended to create a single and comprehensive learning environment that combines all LICP dimensions for better and effective interactions. This also helps collect feedback from LICP for continuous improvement according to the institution's strategic objectives.

The planning stage uses the outcomes of previous stages to plan eLearning projects based on the targeted state of the institution. An agile project management mindset should be employed in this stage to ensure continuous delivery of the

eLearning functionality specified in each project. As mentioned, the framework is iterative and progressive and can be achieved by running multiple projects simultaneously. The core team should study projects' dependencies and design an implementation roadmap that keeps all projects aligned. Such an approach guarantees fast delivery and continuous improvement since the stages from three to six can be executed independently for each project.

The operational core team can coordinate and achieve activities in stages three, four, and five. In this, multiple projects can be running concurrently through these stages. For example, one project may focus on online course development based on a Course Development Lifecycle (CDLC) methodology, while another project may implement new functionality in the eTest center. These two projects represent valuable components of an eLearning ecosystem that aims to achieve an institution's strategic goals through a systematic approach. The role of project managers and project management tools is critical to successfully implementing defined projects since they help identify dependencies and implement the roadmap.

The feedback stage is crucial because all eLearning projects must be aligned with the institution's vision and objectives and meet the needs and expectations of students and instructors, who are the primary stakeholders of these projects. Through this framework, feedback is constantly collected and used as input for the next iteration of project implementation. This guarantees effective engagement and utilization of all features developed and applied to the eLearning environment.

V. Conclusion and Future work

Higher education institutions invest heavily in supporting technologies to achieve better outcomes regarding the quality of delivered education. However, the alignment of these technologies with higher education institutions' strategies and the exact needs of students and instructors in this sector is questionable. The absence of measuring tools to assess this alignment and the continuous rapid investments in advanced technologies in higher education require efforts to evaluate the business value of IT in this sector.

A framework for elevating the usage and adoption of eLearning technologies in the higher education sector has been proposed in this paper. Design science research is adopted as a research methodology to guide its activities, which is found suitable for the problem-based nature of this research. Being aware of the problems faced in this sector regarding effective IT utilization and adopting principles and practices from enterprise architecture and business and IT alignment, a set of artefacts and a framework are developed. These principles and practices support having a holistic view of institutions that guide the adoption of advanced technologies through systematic approaches that ensure effective business and IT alignment for better utilization.

The implementation of the framework has several advantages. First, it enforces a standardized approach to utilizing and leveraging the usage of eLearning technologies that directly impact the quality of teaching. Second, it offers a baseline for basic metrics for measuring the institution's quality improvement progress in educational technologies. Third, due to the unified implementation approach and progressive improvement, instructors' competencies should be improved, and students' academic achievement should be enhanced accordingly. Moreover, the iterative stages of the proposed framework support the inevitable adoption and adaptation of any advanced eLearning technologies.

The proposed framework is applied at AL-Baha University to evaluate its viability in elevating the usage of eLearning technologies and establishing a unified learning environment governed by a set of processes. The application and findings are published in [47].

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