

# DTA-SAU: A Conceptual Framework for Digital Transformation Adoption in Saudi Arabian Universities

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**Abstract**—Digital transformation in universities is reshaping academic landscapes globally, and Saudi Arabia. Universities are keen to provide high quality learning using different types of teaching methods and up-to-date technology. Thus, the shift to digitisation in Saudi universities is unavoidable, and must embrace digital transformation to satisfy students requirements. Digital transformation can promote learning and teaching through using digital tools. A literature review revealed that although there are few studies conducted on digital transformation adoption in Saudi universities, to date, there is a lack of coherent and comprehensive theoretical approach to this topic, particularly regarding adoption barriers. Our study aims to address this gap by presenting a conceptual framework for Digital Transformation Adoption in Saudi Arabian Universities (DTA-SAU), which combines the affecting factors. A mixed method (qualitative and quantitative) approach will be used to validate the DTA-SAU framework. The results will assist universities in developing countries in digital transformation adoption process.

**Index Terms**—digital transformation, technology adoption models, Saudi Arabian universities.

## I. INTRODUCTION

THE GLOBAL economy has been impacted by changes that have been unprecedentedly swift [1]. In order to stay competitive and survive in a fast-moving business environment, governments as well as companies and corporations have had to adapt and adopt a mindset that is open to implementing change [2]. With these changes in mind, both public and private sector organisations have implemented digital initiatives [3]. It is generally accepted that digital technology can be usefully deployed to enhance workplace processes and make workflow more efficient, faster and easier.

In Saudi Arabia, some of these digital initiatives have been implemented to transform a number of governmental sectors such as telecommunications, education and healthcare. This has been carried out with the aim of enhancing operations and boosting business value, as well as achieving a development that is sustainable, globally effective and which raises the amount that the digital economy contributes to Saudi Arabia GDP, and ultimately improves Saudi citizens' quality of life.

Saudi Vision 2030 clearly lays out objectives for the digital transformation of the education system, and to this end, the government have been striving to ensure those goals are met. In 2018, the Saudi Ministry of Education inaugurated the 'Future Gate' project, in collaboration with the educational technologies company TETCO. The project aims to establish digital technologies throughout the Saudi educational system, including the digitisation of curricula and establishing smart classrooms to replace paper documents and traditional classrooms [4]. This initiative aims to enhance student-teacher interaction, facilitate a combination of in-person and online learning, and improve the overall educational experience and achievements of young learners.

It worth documenting that digital transformation plays a crucial role in driving the future of higher education institutions because it focuses on developing an innovative process regarding learning, teaching, library facilities, blackboard, and other learning environment [5]. This, in fact, enables universities to drive digital transformation to improve the learning process and use online teaching facilities. For businesses, organizations, government organizations and academic institutions, digital transformation is currently seen as an unavoidable trend. Organizations are being forced by this trend to change how they handle operations, the provision of goods and services, marketing initiatives, and every other aspect of the businesses.

Numerous advantages come with digital transformation, including lower operational expenses, a larger consumer base, and quicker and more accurate decision-making. Moreover, adopting online learning reduces costs and develops students and faculty in the use of computing technology facilities. Universities are organizations that do research, offer educational services, and advance human knowledge. Therefore, such institutions may not be able to draw in, train, and lead scientists, students, and enterprises without successfully implanting digital transformation. However, digital transformation faced all types of challenges that include technical aspects related to maintain reliable and valid digitalization system, organizational aspects represented in managing and implementing transformation plans, legal and

security aspects as well as users such as, students, lecturers, human resources related obstacles [6]. Another major challenge identified is related to financing. A considerable amount of money is spent on digital equipment systems, conversion, and educational transformation[6]. Therefore, institutions must navigate these challenges carefully to realize the full potential of digital transformation.

Higher education institutions must overcome significant obstacles related to the digital transformation to incorporate digital tools and technology into teaching and learning processes as well as change and adjust current systems, processes, communication channels, and all other academic and administrative activities carried out by the institution [7]. Hence, decision making regarding adoption of digital transformation in Saudi universities entail identifying the main factors affecting the adoption process.

#### *A) Research Questions*

The study questions derived from the primary goal of the study as follows:

1.What are the major challenges and benefits of adopting Digital Transformation in Saudi Arabian Universities?

2.According to—Top Management members, Academic staff, IT employees and students, which factors influence Saudi Arabian Universities to adopt Digital Transformation, and to what extent?

3.What would be a conceptual framework for Digital Transformation Adoption in Saudi Arabian Universities?

By answering these questions, this study aims to create a framework to assist Saudi Arabian universities in understanding factors that impact the adoption of digital transformation and will provide a basis for researchers who are investigating this phenomenon not only at the Saudi level but at regional and international levels.

There are four sections to this paper. The first part reviews the literature in order to identify the most significant factors that have been found to influence the adoption of digital transformation. The second part presents the various technology adoption theories and framework, and this is followed by an outline of the framework used in the current study. The final section describes the methods utilised to collect the data and how the framework will be validated.

## II. LITERATURE REVIEW

Several studies were carried out and reported in the literature to identify the main factors that influence the adoption of technology in the higher education and business sectors.

Successful digital transformation in universities depends on stakeholders' awareness of digital tools and technologies. Raising awareness can reduce resistance to change and develop a more positive attitude towards digital transition by helping to eliminate uncertainty and fear of the unknown [8]. Stakeholders understand the benefits and advantages of digital tools and how they are used to increase productivity, improve learning outcomes, or open new possibilities for research and cooperation [9]. It is worth mentioning that stakeholders are more likely to support the adoption and push for

its successful implementation when they are aware of the potential advantages and positive effects of digital technologies.

One of the most influential factors found to impact the adoption of digital technologies has been top management support [10], [11]. Moreover, in the context of SMEs, top management support has been shown to be of particular significance in encouraging a positive attitude towards digital transformation [12]. In developing nations like Saudi Arabia, the ICT decision-maker is most frequently a member of a SME's senior management team, and the adoption of ICT is directly impacted by his or her support and decision [13]. It can be understood that top management support is the major factor in adopting digital transformation since decisions regarding funding and personnel cannot be made without support from top management.

Another serious barrier noted in previous studies is security and privacy, which are established worldwide issues for technology adoption and implementation [14]. A qualitative study conducted on the risks associated with participating in e-commerce found that clients are worried about the security and privacy of their data, such as emails and names, that could be used for marketing and other purposes [15]. It can be suggested that developing a high level of security and privacy is likely to improve the intention of institutions to implement digital transformation. A safe and secure environment fosters trust, safeguards sensitive data, and encourages stakeholders to embrace the changes wrought by digital transformation programmes.

The significance of providing benefits to users in digital transformation is embedded in users of digital technologies and tools. The benefits clients perceive positively affected digital transformation adoption in the United States business sector [16]. The usefulness of digital tools such as mobile technologies positively affected lecturers' perceptions of digital tools [17]. Giving benefits to users (usefulness) is likely to boost the desire of institutions to implement digital transformation. A user-centred strategy focusing on actual advantages for stakeholders fosters higher acceptance, utilisation, and support for digital technology, resulting in a successful and effective digital transformation throughout the institution.

Resistance to change is regarded as one of the most critical factors which prevent the adoption of digital transformation in higher education institutions. Changing the academic culture is complex and challenging in many cases, it is gradual [18]. For example, in a study conducted on higher education institutions in India, the authors claimed that many academic staff were not positive towards changing teaching methods or using new digital technologies, while some were reluctant to change [19]. Resistance to change is not only an issue in higher education institutions but also a global issue in all sectors. This could be attributed to the fact that resistance to change is a fear of uncertainty and lack of interest to change. Refuse to change may be attributed to particular habits, that refer to an individual's reaction to their traditional environment [20]. Instructors' resistance to change is the most critical

element influencing digital transformation adoption. The capacity of teachers to adopt new technologies and services will contribute to adopting digital transformation successfully [21]. Finally, resolving resistance to change in digital technology is critical for increasing the intention to accept digital transformation in universities. Universities may build a more positive and supportive atmosphere by understanding and minimizing opposition and encouraging stakeholders to embrace and successfully use digital technology for the institution's progress.

Study by [22] was conducted at a British university and investigated the attitudes of 48 staff members to the adoption of e-learning. The study found that the most significant factors were staff skills and attitudes, student expectations and institutional infrastructure. Even in the context of this developed country, study participants complained of a lack of direction and specifically tailored support, which indicates that a strategy for providing such direction, resources and support is required in educational institutions wishing to implement e-learning.

Universities would like the benefits of adopting a new invention to be proportionate with the expenses of adopting the innovation. Digital transformation has reduced the costs of services provided to students and lecturers. A study conducted in Saudi Arabia [23] investigated the effect of adopting and integrating digital transformation on organisational and spending on digitalisation in Saudi universities. This study found that using digital transformation and services provided reduced students' withdrawal from the courses, which in turn positively affected the universities' academic performance. Although the study [23] investigated the students' and lecturers' views of digital transformation, it overlooked the technical issues related to required skills.

In brief, this literature review section helps emphasize the most important factors that influence digital transformation adoption. Additionally, identified significant gaps, such as a lack of studies on Saudi higher education. Furthermore, all previous research explored the elements that influence the adoption of digital transformation from a single or two points of view; in our study, we investigated these influencing factors from the perspectives of-students, academic staff, IT departments, and senior management. To close these gaps, building a conceptual framework for digital transformation in Saudi Arabian institutions has become an absolute imperative.

### III. ADOPTION THEORIES AND FRAMEWORKS

Several frameworks and theories have been developed and refined to investigate and assess the factors that influence technology adoption in a particular sector. This study conducted a thorough review of the literature relevant to this research to determine the theories used to explore technology adoption by organisations. The findings of this investigation indicated the most widely employed theories:

- Technology Organization and Environment (TOE) framework [24], [25]

- Diffusion of Innovation (DOI) [26],
- TAM Integrated with TOE framework [27], [28]
- DOI integrated with TOE [29], [30], [31]
- Technology Acceptance Model (TAM) [32], [33].

There have been many studies on what influences the decision to use IT technologies [34]. This study will use the Technology Acceptance Model (TAM), a model developed by Davis [35], as well as the TOE framework developed by Tornatzky et al. [36]. Integrating the two frameworks improves the examination of the factors. The TOE and TAM work harmoniously as they explore universities' intention to adopt digital transformation from different aspects addressed by the technological, organisational the research will exclude the environmental context, but will add the social and financial context.

### IV. PROPOSED CONCEPTUAL FRAMEWORK

This research has developed a new conceptual framework by combining the TAM model and TOE framework with some modifications to achieve our research objectives.

There are a number of technological, organisational and social concerns regarding the adoption of digital transformation at Saudi universities. The TAM (Technology Acceptance Model) and TOE (Technology – Organisation - Environment) frameworks were utilised in order to analyse the factors that influence the adoption of innovative digital technologies, as these were deemed to offer a comprehensive cover of the technological, organisational, social and financial contexts related to the research objectives. In tandem, the frameworks offer a means of obtaining insight into both individual factors and the socio-technical governance of Saudi universities that potentially influence acceptance and implementation of digital transformation. This insight provides Saudi university stakeholders the means with which to develop more effective ways to deploy digital transformation adoption initiatives that may lead to improving efficiency in administration and ultimately to better educational outcomes.

#### A. *The Theory of Technology, Organisation, and Environment*

The TOE Framework examines how an organisation adopts and uses new technology and how the environment might affect this [37]. It assesses adoption of current technologies in an organisation by separating the elements that influence the adoption process into three groups: technological context, organisational context, and environmental context. [37]. TOE is seen as an appropriate framework for investigating decisions to adopt innovation in organisations at the organisational, rather than user level. Many previous studies have employed TOE to examine the adoption of technological innovation [38], [39].

#### B. *The Technology Acceptance Model (TAM)*

The Technology Acceptance Model (TAM) is used extensively to describe individuals' intent to use new technology. It is based on the Theory of Reasoned Action (TRA) and its

extension, the Theory of Planned Behaviour (TPB) [35]. The TAM focuses on perceived usefulness and ease of use, which can significantly affect digital transformation in Saudi universities. Many studies confirm that perceived ease of use positively impacts users' intent to use technology [40], [41]. Therefore, the more users believe that digital technology is easy to use, the more likely this technology is to be adopted.

### C. The proposed conceptual research framework

We developed a framework called DTA-SAU: Framework of Digital Transformation Adoption in Saudi Arabian Universities. This is to investigate the factors that influence the adoption of digital transformation. Previous studies on this subject were built upon. This included models and theories that were frequently used to measure the various elements that impact new technology adoption. This section presents and describes the research framework and hypothesis; see Fig.1. In this research, four theoretical contexts with associated factors have been defined as elements that influence the adoption of digital transformation. The following contexts are considered:

1. Organisational Context
2. Social Context
3. Technological Context
4. Financial Context

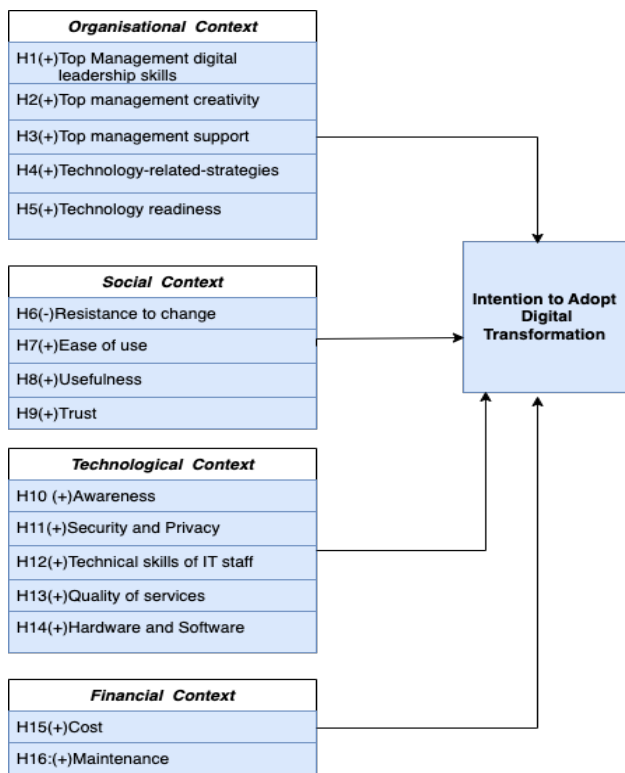


Fig 1. The proposed conceptual research framework of Digital Transformation Adoption in Saudi Arabian Universities (DTA-SAU)

### 1) The organizational context

#### a) Top Management digital leadership skills

Digital leadership skills is regarded as a critical factor in innovation process models in organisations. The process is

deemed as something created and changed constantly with certain backgrounds. Digital leadership skills is, in fact, a mixture of leadership skills and digital skills which contribute to improving organisational performance [42]. Digital leadership positively affected organisational performance in Jordan [43]. Leaders' skills are almost represented in data analysis, knowledge of web-development, programming language, financial management, operating systems, data security and knowledge of cloud computing. Many digital transformation projects failed because of the lack of leadership digital skills and knowledge about digital technologies and facilities [44], [45]. Many studies indicated the crucial role of top management digital leadership skills in the success of digital transformation [46], [47], [48]. Furthermore, some studies found a significant relationship between leaders' digital skills and the adoption of digital transformation. The authors indicated that leadership technical competencies have successfully affected the process of digital transformation [49]. These results are consistent with other studies [50], [51], [52], [53]. Therefore, top management digital leadership skills are considered a potentially critical factor that influences the adoption of digital transformation, and this leads to the following hypothesis:

**H1: A high level of top management digital leadership skills will increase the intention to adopt digital transformation in Saudi Arabian universities.**

#### b) Top management creativity

Literature documents that leaders know instinctively that creativity is the life blood of their organizations. This saying means that leaders' creative data may lead to thinking about new programmers and action plans to adopt [54]. For example, they may adopt and integrate digital technologies into the organizational system. Therefore, leaders' mission is finding out better ideas than the ideas their organizations are used to working with or committed to adopting. This, in fact, can be applied to the adoption of digital transformation in organizations and universities. Creativity is a manifold phenomenon, and humans can conceive new approaches in tangible products [55]. Creativity in organizations is the source of design, improves processes and can shape the work environment. Therefore, top management creativity is a potential important factor that influences adoption of digital transformation, this leads to the following hypothesis:

**H2: A high level of top management' creativity will increase the intention to adopt digital transformation in Saudi Arabian universities.**

#### c) Top management support

Top management support and the adoption of digital transformation focus on understanding the importance of digital tools, funding human resources and personnel initiatives, and participating in activities related to digital transformation [56]. It could be suggested that top management support is the primary factor in adopting digital transformation since decisions regarding funding and personnel can only be made with support from top management. Top management support consists of shaping and forming the organizational structure and

context to make it more adaptable to adopt digital and technological tools to the characteristics of the organisation [11]. Therefore, universities must adapt technologies to students' and academic staff's needs, such as e-learning, blackboard, and interaction groups. Several studies ascertain that support provided by top management is one of the most important organizational factors that enhance the adoption of digital transformation [11], [12]. Top management support plays a crucial role in the success related to the adoption of digital transformation [57]. Therefore, the next hypothesis can be proposed:

*H3: A high level of top management support will increase the intention to adopt digital transformation in Saudi Arabian universities.*

d) *Technology-related-strategies.*

Information technology strategies are seen as one of the main aspects that affect the adoption of digital transformation [58]. Business strategies can lead to information technology strategies, but the two strategies should be aligned. Digital transformation strategies in organizations focus on activities that can respond to rapid changes in organizational performance and achievement. Strategies should be related to digital technologies such as cloud computing, big data and mobile technologies [45], [59]. Technology-related strategies are essential in achieving digital transformation in universities. In relation to universities, digital transformation strategies can be adopted in new online teaching methods, improving blackboard performance, learning environment, and creating cooperative learning between higher education institutions. Therefore, technology-related strategies are considered a potentially critical factor that influences the adoption of digital transformation, and this leads to the following hypothesis:

*H4: Making Technology-related strategies, will increase the intention to adopt digital transformation in Saudi Arabian universities.*

e) *Technology readiness*

Technology readiness refers when evaluating the suitability of network technologies and an organization's systems for adoption, it is essential to consider their level of maturity. Technology readiness substantially influences the leadership's decision-making process on the adoption of innovation [60]. The question that can be raised here is whether the universities are ready to face and adopt digital transformation in general. Universities' readiness for digital transformation focuses on students, academic staff, and information technology departments. Students and academic staff are the end users of technology tools and facilities, while IT staff are responsible for preparing to adopt digital technologies. Many studies showed that a robust ICT infrastructure is another critical factor for success in any organization [61], [62], [63]. In related research, it was discovered that adopting new technologies is aided by the readiness of ICT infrastructure [64]. These considerations have generated the following hypothesis:

*H5: Technology readiness will increase the intention to adopt digital transformation in Saudi Arabian universities.*

2) *Social context*

a) *Resistance to change*

It is crucial to address resistance to change when organizations intend to adopt digital transformation. This is very important when executing digital transformation efforts in organizations which include public institutions, and resistance to change is a typical obstacle. People may hesitate to adopt new digital technologies for various reasons, including apprehension about the unknown, doubts about their ability to use the devices and worry about potential disturbances to their routines. Resistance to change is regarded as one of the main factors which hinder the adoption of digital transformation in higher education institutions. Refusing to change obstructs ICT adoption and incorporation into education systems [65]. The mindset of teachers and their characteristic unwillingness to shift from the old way of doing things is an obstacle to ICT adoption [65]. Therefore, the hypothesis proposes that resistance to change in the use of digital technologies will have a negative effect on the intention to adopt digital transformation in Saudi Arabian.

*H6: Resistance to change in using digital technologies will decrease the intention to adopt digital transformation in Saudi Arabian universities.*

a) *Ease of use*

Usability in digital transformation is an important aspect of successfully adopting digital technology in any organization, especially Saudi Arabian. What degree are digital technologies are easy to use is one factor which affects the use of digital tools. For instance, technical support or IT departments need to make sure that the user interface of digital tools and apps is intuitive, visually appealing, and simple to use. User-friendly features and capabilities are also important, but users need little training and technical knowledge [66]. IT departments are required to make digital technologies accessible to all users, including those with varying abilities and requirements. This needs clear instructions and support, and thorough user support is provided to assist stakeholders in efficiently using digital tools. Users' feedback is critical, and IT departments must use different mechanisms to collect it and continually enhance the user experience [67]. Therefore, Saudi Arabian universities that prioritise the ease of use of digital technology are more likely to have a positive intention to adopt digital transformation. Thus, the next hypothesis can be proposed:

*H7: A high level of ease of use for digital technologies will increase the intention to adopt digital transformation in Saudi Arabian universities*

b) *Usefulness*

The importance of providing benefits to users in digital transformation is embedded in users of digital technologies and tools. A key element in digital transformation initiatives is user-centeredness. Universities are more likely to embrace and promote the implementation of digital technology when they focus on offering actual benefits and usefulness to their

stakeholders, which include students, faculty, staff, and administrators. The benefits perceived by clients positively influenced the adoption of digital transformation in the US company sector [16]. In a survey on digital transformation in higher educational institutions in the United States [68], the authors found that respondents reported many benefits of digital technologies directly related to students' success in examinations [68]. The usefulness of digital tools such as mobile technologies, positively affected lecturer perception digital tools [17]. Therefore, according to the hypothesis, usefulness of digital tools to users is likely to have a positive intention to adopt digital transformation. Thus, the next hypothesis can be proposed:

*H8: Usefulness of digital tools will increase the intention to adopt digital transformation in Saudi Arabian universities.*

c) *Trust*

Trust is a critical component in digital transformation efforts in universities. Universities must have faith in digital tools and technology's dependability, security, and efficacy as they integrate them into their operations, teaching, research, and student services. Shifting from a social concept of trust to a digital one requires modelling and managing trust to build trustworthy digital systems [69]. A study was carried out on confidence in digital technologies among academic staff in universities. The authors found that lecturers still had no confidence in digital tools because there is still no confidence in pedagogical and educational thinking to integrate these technologies [70]. It is worth noting that ensuring service quality fosters stakeholder trust and satisfaction, promoting a supportive attitude towards digital transformation. Some confidence levels may affect the trust in digital tools and technologies. For example, the first level is reliability where stakeholders' users believe that digital technologies will perform as expected and provide consistent and accurate results [71]. The second level, trust in digital technologies will protect data integrity and prevent unauthorized modification or manipulation [72]. Therefore, according to the hypothesis, universities with a high level of trust in digital tools are more likely to have a positive intention to adopt digital transformation.

*H9: Users' Trust in digital technologies will increase the intention to adopt digital transformation in Saudi Arabian universities.*

3) *Technological Context*

a) *Awareness*

The successful implementation of digital transformation in universities depends on stakeholders' awareness of digital tools and technologies. Students, teachers, staff, administrators, and other university constituents impacted by digital transformation projects are stakeholders. Stakeholders are more likely to be open to change and supportive of transformation projects when they comprehensively understand the

advantages, functions, and potential applications of digital tools [9]. The rationale behind this is that by raising the awareness of students, teachers, staff, and administrators about the benefits and possibilities of digital tools and technology, universities can build enthusiasm for embracing these changes. Therefore, increasing stakeholders' awareness of digital tools and technology is a crucial first step towards fostering the intention to adopt digital transformation in Saudi Arabian universities. Thus, the next hypothesis can be proposed:

*H10: Stakeholders' awareness of digital tools will increase the intention to adopt digital transformation in Saudi Arabian universities.*

b) *Security and privacy*

Security and privacy are paramount when integrating digital technologies into university operations. Students, faculty members and administrative staff want assurance that their personal information will be kept confidential and secure. A study in Algeria confirmed that the adoption behaviour of e-commerce is mostly influenced by security challenges and system risk [73]. To address this concern, universities must implement strong cybersecurity measures, adhere to privacy regulations, and ensure secure data handling. Corporate privacy policies should align with customer requirements to foster trust, which can encourage online engagement [74]. Moreover, universities should acknowledge and mitigate the risks associated with transferring money online, and the security and privacy of personal data should be of paramount concern. Therefore, according to the hypothesis, universities that prioritise building a high level of security and privacy are more likely to have a positive intention to adopt digital transformation.

*H11: Developing a high level of security and privacy will increase the intention to adopt digital transformation in Saudi Arabian universities.*

c) *Technical skills in IT departments*

Any organization, including Saudi Arabian universities must have technical skills to implement digital transformation efforts successfully. As universities integrate digital technology into their operations, teaching, research, and student services, having a trained IT staff is critical to ensuring these technologies are deployed, maintained, and supported effectively. Well-trained IT staff are critical for successfully implementing digital transformation in universities [75]. This skilled workforce implements and maintains the technologies and security protocols to safeguard digital assets. Building trust and confidence among stakeholders, including students, teachers, and IT staff, is integral. Therefore, according to the hypothesis, universities that have well-trained IT staff are more likely to have a positive intention to adopt digital transformation.

*H12: A high level technical skills in an IT department will increase the intention to adopt digital transformation in Saudi Arabian universities.*

d) *Quality of services*

The quality of services offered plays a significant role in driving the adoption of digital transformation in universities. High-quality services motivate students, academic staff, and other stakeholders to use digital tools actively. To ensure high-quality services, universities should prioritize users' needs and preferences, making digital tools accessible and reliable. If a low-quality service is provided, some stakeholders may be reluctant to change, but if users have a positive experience with high-quality digital services, they are more likely to overcome reluctance to change and be more open to adopting new technologies [76]. Assuring the quality of services is likely to boost the willingness of public institutions to embrace digital transformation [77]. Therefore, quality of services of digital tools are considered a potentially critical factor that influences the adoption of digital transformation, and this leads to the following hypothesis:

*H13: Ensuring the **quality of services** will increase the intention to adopt **digital transformation** in Saudi Arabian universities.*

e) *Hardware and software compatibility*

Hardware and software compatibility is vital for successful digital transformation in universities. Compatibility ensures that diverse technologies can coexist seamlessly, which enables the integration of hardware devices and software applications. Hardware and software compatibility extends to interoperability, allowing hardware and software to communicate and exchange data effectively. Compatibility with multiple operating systems and devices enables users to access digital tools irrespective of their platform preferences. Updating hardware and software to ensure compatibility with the latest technologies and security requirements is essential. High compatibility reduces technical challenges and conflicts between hardware and software, making it easier for stakeholders to adopt and use digital solutions. This, in turn, enables universities to respond swiftly to future technological advancements [78]. Therefore, the hypothesis proposes that universities with high levels of hardware and software compatibility are more likely to have a positive intention to adopt digital transformation.

*H14: A high level of **hardware and software compatibility** within institutions will increase the intention to adopt **digital transformation** in Saudi Arabian universities.*

4) *Financial context*

a) *Cost-effectiveness*

Universities would like the benefits of adopting a new invention to be proportionate with the expenses of adopting the innovation. Low-cost inventions are more likely to be used [79]. In the context of electronic data interchange, cost-effectiveness is a crucial variable [80]. Moreover, powerful PCs, reduced hardware and software prices, and ready-to-use, user-friendly software make it more likely for universities to adopt new information technologies, eliminating costs as barriers to universities adopting new information technologies [81].

Many studies have found that online education is cost-effective compared to traditional classroom instruction [82], [83].

Therefore, Universities assess the cost in relation to the advantages before adopting new technologies. Using technology in learning environments is cost-effective once the technology is in place and the organizational culture is amended to embrace these new learning patterns [84]. Therefore, cost-effectiveness is considered a potentially critical factor that influences the adoption of digital transformation; this leads to the following hypothesis:

*H15: **Cost-effectiveness** of digital tools will increase the intention to adopt **digital transformation** in Saudi Arabian universities.*

b) *Maintenance*

In universities, maintenance is a vital part of digital transformation. As universities integrate digital tools and facilities into their operations, teaching, research, and student service, ensuring their correct operation and dependability over time is critical to reap the digital transformation's benefits [85]. Regular maintenance ensures that digital tools and facilities run consistently and optimally, resulting in a great user experience [86]. Proactive maintenance reduces annoyance and resistance to adopting digital technology by minimizing interruptions caused by unanticipated system faults [87]. Proper maintenance helps to preserve the long-term benefits of digital transformation, demonstrating the worth of these technologies. Therefore, a well-maintained digital infrastructure instills trust in users, encouraging them to embrace and effectively employ digital tools. Keeping suitable levels of digital tools and facilities is likely to promote the desire of institutions to implement digital transformation. Proactive maintenance assures digital technology's dependability, performance, and ongoing advantages, creating a pleasant atmosphere that encourages stakeholders to embrace and support the institution's transformation activities. Therefore, the hypothesis proposes that, universities which prioritize appropriate maintenance of digital tools and infrastructures are more likely to have a positive intention to adopt digital transformation.

*H16: An **appropriate level of maintenance** will increase the intention to adopt **digital transformation** in Saudi Arabian universities.*

## V. CONCLUSION AND FUTURE WORK

This study has developed a conceptual framework specifically adapted for the exploration of technology adoption in Saudi Arabian universities. The TAM and TOE technology acceptance models have been merged and modified to create the DTA-SAU framework which identifies all the crucial factors that potentially affect adoption of digital transformation in Saudi Arabian universities.

The study takes a mixed method approach to gather data and validate the DTA-SAU framework. The names of all twenty-eight universities were entered to SPSS software. Simple random sampling (SRS) technique was used to draw

the sample of Saudi universities. According to SRS method, each university had an equal chance of being selected in the sample. Each university was given a unique ID number which was used in drawing the sample. Seven universities were selected randomly which would represent all Saudi universities. Phase one uses a quantitative methodology and involves distributing a survey to respondents in seven Saudi Arabian universities, targeting various groups of respondents (students, academic staff, IT support departments and top management members). There will be dedicated questionnaires designed specifically for each target group. We aim for at least 400 responses to be collected from Saudi Arabian universities to validate the proposed framework and the hypotheses.

Phase two of the study will use a qualitative approach, and semi-structured interviews are conducted. The targeted group for the interviews will be only the top management members in Saudi Arabian universities, including Deans, Deputy Deans, Heads of Department, Deputy Heads of Department and Head of IT Support Department. These interviews are intended to produce qualitative information that would encapsulate the tangible context in which decision-making occurs. For data analysis we will use IBM-SPSS for quantitative method (questionnaires) and NVivo for qualitative method (interviews).

As a result, the DTA-SAU conceptual framework will give decision-makers in universities a better understanding of the challenges and benefits of digital transformation in Saudi Arabian universities and assist them in a more informed decision-making process.

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