The Reality of Digital Transformation at Jordanian Universities from the Perspective of Administrators

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Authors' contributions

This work was carried out in collaboration between both authors. This work was carried out in collaboration between all authors. Author KWA designed the study, performed the statistical analysis, wrote the protocol, managed the literature searches, and wrote the first draft of the manuscript. Authors HAA managed the analyses of the study. Both authors read and approved the final manuscript.

Original Research Article

Abstract

The study aimed to identify the Reality of Digital Transformation at Jordanian Universities from Administrators Perspectives. To meet the study objectives, the stratified random method was chosen due to its suitability for the study. The primary tool was the questionnaire, which distributed 410 administrators, 255 of them responded.

The study used the descriptive survey method, where the four-axis study tool was developed as following: digital culture, institutional support, infrastructure, insight and vision.

The study's results indicated that the administrators' estimations for the digital transformation at Jordanian Universities had intermediate rating; moreover, the institutional support ranked first.

Furthermore, The results indicated that there are statistically significant differences in the administrators' estimations for the digital transformation at Jordanian Universities according to the experience's variable, for

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the benefit of the administrators whom have experience (less than 5 years), administrative department variable, administrative staff members who are working in (the presidency), university's variable (governmental, private), and for the benefit of private universities.

As a result, the study recommended focusing and paying attention to the institutional support for digital transformation at universities through continuous development and innovation.

1 Introduction

Technology plays a significant role in modern society, transforming the way we work, learn, and communicate. This has led to countless innovations that have deeply affected the economy and the job market. Digital transformation has been considered as one of the most important of these innovations, serving as a key driver of growth for companies and governments that striving to stay at the forefront. By developing innovative solutions, digital transformation does not only ensure their survival, in fact, it enables them to compete [1].

According to Norton et al. [2], digital transformation is a process of changing the way operations are conducted by utilizing digital technology and innovative practices.

It may seem to be simply a technological solution, but in fact, it is a combination of digital technology and human factors.

According to the rapid development, education cannot remain stable. Digital tools became widespread and their use has increased in various educational environments [3].

Mahlow and Hediger [4] figured out that the adoption of technology by universities was associated with the qualitative leap. Technology has been considered as a complex and coherent environment that enables and enhances digital learning.

Traditional teaching methods have been replaced by alternative approaches that provide more effective outcomes, relying on inference, logic, simulation, virtual reality, interactive learning, and programmed instruction. Therefore, these methods cannot be achieved through conventional educational approaches; it also requires the utilization of modern technology and a transition to digital education. This shift aimed to cultivate generations equipped with the necessary skills to thrive in the new knowledge era [5].

In light of the global COVID-19 pandemic, which has imposed a formidable challenge on the governments worldwide, digital transformation has become inevitable in all sectors, especially in education sector.

Badran [6] argued that higher education institutions serve as incubators for science and technology, which can be transformed into creative inventions that can alleviate the social and economic crises faced by nations.

According to this viewpoint, universities today are required to make complete strategic adjustments in all of their policies in order to be liberated from their isolation from the society environment and move from being mere consumers of knowledge to creators of knowledge. Universities can actively contribute to the development of a knowledge society.

1.1 Problem statement

The COVID-19 has altered our lives in many ways, particularly in the educational sector. Not only in Jordan, but throughout the world, which prompted Jordan's Supreme Council for Science and Technology to launch the "Experimental University E-Learning Initiative" for the academic year 2019-2020, with the goal of assisting students at public and private universities, and for it to become an essential part of university education in all Jordanian universities, as part of a strategic direction that puts Jordan on the path to digital transformation and immigrant integration [7].

Despite the advancements Jordan has made in this area, the Global Knowledge Index report, as reported by the United Nations Development Program in the Arab region, showed a fall in Jordan's general rating by eight percentage points, to number 103 globally out of 154 countries. The sub-indicators for higher education, estimated at 59 points, technical education, vocational training, and pre-university education were the cause of this fall. Additionally, the index for research, development, and innovation dropped by four points, while the index for information and communication technology dropped by three points [8].

As a result, Jordan's Association of Information and Communications Technology Companies issued a warning regarding the project's deterioration.

The Ministry of Digital Economy and Entrepreneurship also developed Jordan's Vision 2025 strategy to promote further digital transformation [9].

In this regard, the Jordanian Strategy Forum presented, in collaboration with the Ministry of Higher Education, a set of recommendations for Jordanian universities to consider applying international best practices and recent changes that have occurred in prestigious universities around the world in a research paper [10].

A number of studies in the field of digital transformation in educational institutions, such as Al-Sufyani [11], Mediani and Talhawi [12], and Marques et al. [13], emphasized that traditional education is no longer sufficient to achieve educational goals, particularly in the age of technology. According to Al-Muqaiti's report [14], which evaluated the reality of utilizing artificial intelligence in Jordanian universities, Jordanian universities should implement plans to boost the use of artificial intelligence in administrative and academic domains.

Hence, the researcher has been prompted to inquire about the extent to which Jordanian higher education institutions have successfully embraced the necessary digital transformation. This inquiry arises from the challenges posed by the ongoing digital transformation and the complexities it faces, particularly in light of the rapid advancements and occasional setbacks encountered during this process. Furthermore, there is a distinct absence of comprehensive studies, to the best of the scholar's knowledge that specifically address the topic of digital transformation within Jordanian universities.

1.2 Study's objectives

First, understanding the reality of digital transformation at Jordanian universities from the administrators' perspective.

Second, it is important to uncover the differences in administrators' perspective regarding the reality of digital transformation at Jordanian universities, based on variables such as experience, administrative unit, and university.

The problem statement came to answer the following questions:

1. What is the level of digital transformation at Jordanian universities, according to administrative staff members?
2. Are there statistically significant differences at ($\alpha \leq 0.05$) in the estimations of administrative staff members regarding the level of digital transformation at Jordanian universities attributed to variables such as (experience, administrative unit, and university)?

1.3 Study significance & importance

1.3.1 Theoretical importance

The importance of this study originated from its focus on a topic related to the technological revolution and its developments in the field of education, especially the digital transformation in educational institutions. It establishes a theoretical foundation for the current state of digital transformation at Jordanian universities, allowing scholars and other interested parties to do additional study. Furthermore, the paucity of studies - within the researcher's field of knowledge - related to the study's topic would aid in understanding the mechanisms and realities of digital transformation in Jordan's higher education sector (universities).

1.3.2 Practical Importance

With the domination of information and communication technology, a new set of challenges for digital transformation have evolved, affecting the new tasks of administrative staff members. As a result, understanding its implementation in higher education institutions is crucial. As a result, it is envisaged that this study will aid decision-makers in many sectors in making suitable decisions to facilitate deep and coordinated reforms in workforce, culture, and technology, with the goal of establishing a model of digital transformation that may be copied.

1.4 Study terms and procedural definitions

Digital Transformation: Ibrahim and Al-Haddad (2018) defined digital transformation as "the use of technology within both governmental and private institutions and organizations. It helped improving the operational efficiency, and enhance services provided to employees and the public. It also, involved the utilization of technology to facilitate workflow within the organization's departments, aiming to enhance services, facilitate their accessibility, and ensuring the simultaneous saving of time and effort" (p. 2).

Operationally, it has been defined as the actual utilization of modern digital technologies, such as computers, artificial intelligence, cloud computing, and interactively within Jordanian universities. Its implementation was assessed by measuring the overall level of response from the study sample regarding questionnaire items in the following domains: digital culture, institutional support, infrastructure, vision, and insight.

Jordanian Universities: Universities are generally defined as educational institutions dedicated to higher education and research in specific fields. It helps students in shaping their knowledge and skills in various areas, as well as it represents the intellectual hub of society as they are entrusted with the primary responsibility of shaping students' cultural identity [15].

Operationally, it has been defined as official and private universities in the Hashemite Kingdom of Jordan (the study's location), which are affiliated with the Ministry of Higher Education and Scientific Research and share the common goal of achieving specific educational and learning objectives.

Administrative staff members: They are defined as an elected body of academics and educators who possess a strategic and creative vision. which characterized by their ability to employ innovative methods in executing tasks, thereby achieving desired objectives. In their work, they represent a specific educational institution through which they strive to fulfil a particular vision and mission [15].

Operationally, they are defined as employees who hold administrative positions in both private and official Jordanian universities. They possess academic levels in various scientific fields and work within different administrative units.

1.5 Study limitations

Human Limitations: This study was limited to administrative staff members at Jordanian universities (both public and private).

Spatial Limitations: The study was conducted in the following public Jordanian universities: Jordan University, Yarmouk University, Mutah University, and Hashemite University. Additionally, it was implemented in the following private universities: Middle East University, Princess Sumaya University for Technology, Al-Ahliyya Amman University, and Philadelphia University.

Time Limitations: This study was conducted during the second semester of the academic year 2021/2022.

Subject Limitations: The study focused on the perceptions of administrative staff members in both public and private Jordanian universities regarding the reality of digital transformation.

The limitations of the study were represented by the level of accuracy of the responses provided by the study participants to the questionnaire items. Given the nature of the research tools and variables, it is possible to generalize the results of the current study to similar communities, taking into account the validity and reliability indicators of the research instrument.

2 Theoretical Literature

2.1 The concept of digital transformation or digitization

The concept of "digital transformation" encompassed a wide range of dimensions and implications associated with scientific and technical progress. This includes not only commerce, but also the personal lives of all members of society's various classes, representing people's interactions in all parts of life, from work to education, knowledge, and information.

Digital transformation is closely linked to what is known as the Fourth Industrial Revolution, a process in which digital technologies affect future social and economic growth in a manner similar to that, which was supported by steam energy during the First Industrial Revolution [16].

Norton et al. [2] viewed digital transformation as the change in organizational work driven by emerging digital technologies and innovative business models. It is not just about implementing technological solutions but also about aligning digital technologies with human and organizational factors.

Connecting all sectors of the economy in society through a complete network is another meaning of digital transformation or digitization, in addition to the ability to gather relevant information, analysing it, and convert it into actions. This change does not bring benefits and opportunities only; it also brings entirely new challenges [17].

While Al Jubeir [18] explained that digital transformation is a shift in the way organizations operate that reduces boring work while increasing time for thinking about developments, accelerating daily workflow so that great technological advances are exploited to serve customers better and faster, and represents an increase in workflow efficiency, reducing errors, and increasing productivity.

Based on previous definitions, the researcher concluded that digital transformation is a shift in human cognition, culture, and mind set, rather than a shift in procedures and tactics based solely on ICT. It is a philosophy of altering people's mind sets, which reflected many decisions and actions, moreover it increases the quality and effectiveness of services offered, achieving added value for work and obtaining new skills appropriate to today's advancement and development.

2.2 Characteristics of digital transformation at universities

Digital transformation has numerous advantages and features, that helps educational institutions to be unique, as outlined by Al-Mutraf (2020) as following:

- Digital transformation can help universities accompanying the continuous changing business world.
- Digital transformation enables higher education institutions to adjust to changing conditions, allowing them to retain the level of excellence required for global competition.
- The nature of work within and outside the university campus, at both the local and global levels, allows these institutions to have an interconnected organizational structure.
- Digital transformation assists higher education institutions in achieving the requirements of integrity and transparency through meticulous distribution of roles and responsibilities and making appropriate decisions, without bureaucracy.
- Digital transformation equips universities with a globally recognized level of information and communication technology.
- Universities can create highly advanced technological infrastructure by utilizing information and communication technologies, allowing them to remain competitive in the global arena.

2.3 Goals of digital transformation at universities

The digital transformation of higher education is heavily influenced by government policies and institutional development strategies [19].

According to Sandkuhl & Lehmann [20], the goal of digital transformation in higher education is to redefine educational services and redevelop operational processes.

Jackson [21] suggested that the concept of digital transformation goes beyond the adoption of advanced digital technology alone. For higher education institutions, modifying traditional teaching and learning approaches was critical for long-term survival and competitiveness. Improving students' educational environments, enhancing operational efficiency, expanding computing power, and fostering educational innovation were four major and consistent goals for digital transformation.

Whereas Al-Jawadi's [18] concluded that, the key objectives of digital transformation for universities include sharing databases among different universities and research centres, enhancing digital collaboration, establishing collaboration links among researchers, ensuring transparency and accountability in academic work, facilitating the updating of information and topics on websites, developing anti-plagiarism software, data security, and providing students and staff with updated information and ensuring their data security. Furthermore, universities can utilize modern administrative methods in the digital space.

2.4 Digital transformation requirements

In light of the permanent changing in digital world, it is important for universities to have a clear understanding of their digital transformation goals and the necessity steps to achieve a smooth and effective digital transformation. This includes considering the strategies to be followed, monitoring budgets in terms of expected profits, clarifying the vision and mission for the coming years, identifying the type and scale of information technology and infrastructure used within the university, and the level of change that will occur in the activities, trends, and prevailing values among the various university staff.

Lahtinen and Weaver [17] emphasized that there are several critical aspects must influence the digital transformation occurring at universities. The most crucial is institutional and government support for the development of ICT infrastructure. As well as sophisticated training programs for students whom seeking jobs in technology. Finally, the changes in university culture that are required for digital transformation activities to succeed, ranging from adoption of digital technology by university community workers to the development of their understanding of this transition and its benefits.

During the pandemic, the unexpected change to teaching and distance learning underscored the significance of a strong digital infrastructure. Institutions that had already invested in digital infrastructure were better positioned to respond to unexpected changes.

According to Porter [22], a strong digital infrastructure can provide greater flexibility in teaching and learning, allowing for both synchronous and asynchronous teaching methods. It also enables access for all students, including those who have disabilities, through the provision of tools and technologies that support their learning needs. Additionally, it plays a crucial role in enabling communication and collaboration between students and faculty members, whether through synchronous communication tools such as video conferencing or asynchronous collaboration tools like discussion forums and group work.

On the other hand, there is a strong need for a clear vision and strategy for digital transformation supported by institutional leadership and stakeholders. This includes investing in technology and data security, developing digital skills, and providing institutional support to develop faculty members' understanding of digital pedagogy and the integration of technology in teaching and learning. It also involves creating a supportive environment for students, including digital literacy training and access to digital resources, and the need for continuous evaluation of digital transformation initiatives to ensure their effectiveness and impact.

"Embedding digital transformation in higher education requires leadership, culture, and change management, it also requires institutional support for digital infrastructure, faculty development, and student success.

Institutions must invest in the necessary resources and policies to foster a culture of digital innovation and lifelong learning" [23].

In addition to the importance of insight and vision, a clear digital strategy that aligns with the institution's mission and overall goals ensures that digital investments are targeted and effective. It also helps build a shared understanding and vision for digital transformation across the institution.

This includes the importance of using data and analytics related to student and faculty behaviours for continuous improvement in digital transformation efforts, as well as a deep understanding of their needs and preferences in designing digital tools and technologies. The crucial role of leadership and culture in driving successful digital transformation efforts is also included, which involves having strong leadership support for digital initiatives, as well as creating a culture of innovation and experimentation that encourages risk-taking and continuous improvement.

Thus, the importance of collaboration and partnerships with industry partners and technology providers is emphasized to leverage best practices and experiences.

Insight and vision are manifested in the importance of adopting a strategic and comprehensive approach to digital transformation in higher education, building a shared vision, and committing to digital innovation across the institution (Deloitte, 2020).

As for digital culture where technology has an emotional impact on individuals and society, it is how we feel and interact with each other. They are not neutral and have their own policies and power dynamics that affect our emotions and experiences. They can be used to promote positive social change, and to strengthen existing power structures and inequality. "Digital cultures are more than just a set of tools or technological platforms; They embody social relations, values and emotions that have consequences in the real world. By exploring the emotional impact policy of technological change, we can develop a more nuanced understanding of how digital culture shapes our lives and how we can use technology to promote positive social change [24].

Meanwhile, the study of Al-Dhahshan and Al-Sayyid [25] study found that the requirements for digitizing universities into smart universities are: building a digital vision, intelligent infrastructure, intelligent human elements, an intelligent learning environment and intelligent management.

One of the most significant factors in the delayed digital transformation of universities into smart ones, as described by Al-Jawidi [18] and possibly significantly absent, was the lack of information and communications infrastructure, as well as the lack of a clear vision of smart digital operations, which resulted in limited support by leadership, scarcity of digital investments, and increased financial requirements.

2.5 Challenges of digital transformation at universities

Digital transformation usually faces a range of challenges, which are not placed in a given order based on importance and are not linked to a particular industry. Challenges include changing customer expectations experience, resisting change, resisting technology, lack of leadership support, lack of efficiency and digital transformation skills, lack of visibility and stakeholders' digital literacy [26].

Xiao [27] indicated that if these challenges are properly addressed, modern technological tools such as artificial intelligence, Internet of Things, big data, block chain, social analytics, and cloud services can enhance and transform educational practices for the better, especially at a time when students are actively and continuously engaging with technology in all aspects of their lives. Digital transformation provides them with opportunities that are not always available in the traditional classroom environment.

Rodríguez and Bribiesca [28] have summarized the key challenges facing digital transformation at universities as follows:

First, human resistance to change: Higher education institutions face numerous challenges in adapting digital transformation, such as adopting modern teaching methods and instructional models. This resistance can be a major obstacle to implementing transformative change. Successful institutions should inspire their staff to

embrace a digital maturity vision, develop the professional and educational orientations regarding the positive aspects of technology, and thereby reduce the sense of job insecurity.

Second, setting priorities: Universities are attempting to postpone large investments in time-consuming capacity-building. It was emphasized that a well-planned digitization process could be dealt with by developing a priority plan for digital investments and a road map that could guide the institution's systematic transformation in a sequential manner, rather than by the financial means required to implement the plan.

According to Trifonov and Shorokhova [29], the challenges of digital transformation are found first in faculty's low level of digital skills, as well as in the generational gap between generations considered to be citizens of these digital technologies and faculty and administrators of institutes and universities who must adapt and learn to use digital technologies.

Furthermore, Smith and Beretta [30] added another dimension to the challenges that digital transformation at universities might face, including:

First, the decentralized decision-making process, which can lead to delays in implementing decisions and large-scale projects. On the other hand, information technology systems characterized by centralized control and decision-making tend to be more efficient.

Second, A narrow view of university investment and return on investment. Basic digital skills in business circumstances must accommodate for procedures that are slowly changing or difficult to measure. For example, more effective operation and automated procedures can save faculty time and money while also providing better experiences.

2.6 Previous studies

The study of Rodriguez and Bribiesca [28] which was conducted in Mexico focused on the application of an integrated digital transformation model proposed by the study to assess the level of maturity possessed by higher education institutions in their digital transformation processes and compare them with other industries. The study applied the model specifically to a sample of universities. A quantitative methodology was used to verify the validity of the relationships between the model components and provide a general framework to aid in the qualitative interpretation of the results. The study concluded that there is a strong emphasis on providing infrastructure but a lack of intention to implement information and communication technology to enable new educational models and teaching methods. Additionally, universities lag behind other sectors, possibly due to a lack of effective leadership, resistance to change, insufficient innovation, and financial support.

On the other hand, the study of Teixeira et al. [31] aimed to determine the impact of higher education institutions on the digital development of Portugal, specifically the impact of public polytechnic institutes on the development of the capital city, Porto. Both quantitative and qualitative approaches were used, and data was collected through semi-structured interviews and questionnaires. The study revealed the positive impact of higher education institutions on the digital development of the Porto region. It identified key challenges for digital transformation, including cultural and behavioural resistance, a lack of change-oriented mind set, and the influence of higher education on regional development, labour market, and quality of work life. Furthermore, the study highlighted that digital transformation and Industry 4.0 made significant contributions to the development of companies in various sectors, especially in financial and accounting domains. These areas require relatively lower investments to implement new innovative systems, which in turn bring numerous benefits to companies, especially in the realm of data communications and artificial intelligence systems for generating and informing decision makers of information.

The study of Hervás-Gómez et al. [32] designed to identify the perceptions of university students in Spain towards teaching and learning processes during the COVID-19 pandemic. It explored resources such as devices and software, professional collaboration, digital pedagogy, and student empowerment in relation with the digital education and recent changes in university teaching due to the pandemic. This study employed a descriptive methodology based on opinion surveys and exploratory studies. Non-probability sampling was used, consisting of 486 students from the University School of Osuna affiliated with the University of Seville. The results showed a positive correlation between digital teaching assets, student motivation, and digital environments. The

study provided recommendations to encourage the scientific community to continue exploring experiences and self-learning and to enhance initiatives that promote competency development among future teachers. Additionally, the study emphasized the importance of pursuing integrated designs and continuous assessment, as they are essential for digital transformation in universities.

The study of Mohammed and Al-Ghubairy [33] sighted to analyse the reality of digital transformation in the Kingdom of Saudi Arabia towards adopting its use in achieving development, updating, and continuous improvement for the progress of the country, also it determined the extent of its progress in dealing with "digitalization" and assimilating its contents. This study used a descriptive-analytical methodology. Through the study and analysis, it was revealed that digital transformation in the Kingdom is progressing at an annual rate of 5% since 2011 until 2017, which represents the time series of study variables. The study also showed that the Kingdom is among the top three countries in the region and is part of the group of countries supporting technology on the Global Communications Index for 2017. These countries seek to support the infrastructure of information and communication technology and provide all the innovative technological requirements to facilitate the digital transformation process. One of the most important recommendations of the study was that policymakers should design policies that suit the implementation of digital transformation, support its progress, and provide support and endorsement by the highest political leadership to achieve digital transformation. In addition, it is necessary to promote the culture of electronic work and the use of technology.

The study of Maadi and Abu Hijair [34] aimed to determine the readiness of private Palestinian universities for digital transformation. The study used a descriptive-analytical methodology, and a questionnaire was used as a data collection tool. The study population consisted of employees working in private Palestinian universities in the southern governorates. The stratified random sampling method was used based on the university. The study reached several results; the most important was that there is a high approval for the support of top management for digital transformation, and low percentage for the suitability of strategic orientations for digital transformation. It also found that there are statistically significant between arithmetic meanratings of the study sample individuals' assessments attributed to age and occupation. On the other hand, there were not statistically significant between the ratings of the study sample individuals' assessments attributed to gender, academic qualification, and university experience. One of the most important recommendations of the study was to work on providing all the supporting factors for the readiness of Palestinian universities for digital transformation, with a focus on providing the necessary administrative and financial environment, as well as qualifying the human and organizational resources necessary for the success of the transformation process.

The study of Al-Balushi et al. [35] aimed to explore the reality of digital transformation in Sultanate Oman. The study used a descriptive qualitative methodology, with semi-structured interviews as the main data collection tool. It was conducted in four government institutions: The Ministry of Technology and Communications, the Ministry of Education, the Ministry of Health, and the Royal Oman Police, as well as one private institution, Bank Muscat. Among the key findings of the study there was clear efforts and roles undertaken by these institutions in digital transformation, including awareness, education, training, integration, readiness, and more. Although the level of transformation varied among the sampled institutions, all of them contributed to the progress of the Sultanate's digital transformation, as reported by the United Nations in 2018. The study recommended that there is a need to promote and raise awareness about electronic services through various media channels and social networks. It also emphasized on the importance of institutions to intensify their utilization of Fourth Industrial Revolution technologies, by implementing technological projects that effectively serve their digital transformation, resulting in a clear impact on their work and delivery mechanisms.

The study of Al-Mutref (2020) in Saudi Arabia sighted to investigate the possibility of digital transformation in government and private universities in the Kingdom. It also aimed to monitor the reality of digital transformation between the two types of universities amidst global crises and disasters. The study utilized a descriptive-analytical methodology and designed a scale to measure the readiness of government and private universities for digital transformation. The study sample consisted of faculty members in universities. The study found a statistically significant between government and private universities in terms of the availability of necessary physical resources for digital transformation, the digital competencies of faculty members for the benefit of those in the private sector, and the possibility of digital transformation in education during crises for the benefit of private universities. The study concluded that there is a significant impact of the education sector on the possibility of digital transformation in education during the current crises.

On the other hand, the objective of Marks et al. [36] study was to explore the digital transformation maturity and challenges in higher education institutions in the United Arab Emirates. The study employed a novel framework based on Petkovic's 2014 comprehensive and core process mapping framework and a maturity assessment framework. The research utilized a mixed-methods approach, including surveys, interviews, case studies, and direct observation. The survey targeted information technology directors, senior information officers, and senior academics interested in digital transformation from both public and private sectors of higher education institutions. The questionnaire consisted of 15 closed-ended questions. Additionally, six semi-structured interviews were conducted with IT directors, and four interviews were conducted with senior academic officials. Direct observation was used to verify actual practices rather than relying solely on self-reported information. Finally, a case study was conducted in a public university to validate and triangulate the survey results. The research findings revealed significant variations in the respondents' perceptions of digital transformation maturity levels and the basic requirements for digital transformation maturity. The results also highlighted the lack of comprehensive vision, digital transformation efficiency, and data structure and processing as major challenges for digital transformation.

The study conducted by Santos et al. [13] aimed to analyse students' perspectives on the use of digital technologies to communicate with their teachers and investigate the objectives and functions for students who use these technologies, as well as understanding their expectations. The study used a descriptive methodology, and the study sample consisted of 570 students who were holders of bachelor's and master's level in biological and health sciences departments. The results of the study indicated that students who choose digital tools such as email, instant messaging systems, publishing, and collaboration technologies to communicate with their teachers, but it was unclear whether these specific selected technologies were institutionally supported or not. The study revealed a low expectation regarding the use of social networks, video conferencing, and audio systems for communication, despite the widespread daily use of these systems for other purposes. The study recommended addressing the findings from the perspective of teachers or institutional communication and evaluating the perception of communication overload in the higher education context.

The study of Bond et al. [37] aimed to propose different policies and strategies in Germany that address educational technology innovations in higher education. The study presented the University of Oldenburg as an example, it also aimed to understand what is being proposed and what actually happens in teaching and learning in German university classrooms. The study used a descriptive methodology and utilized questionnaires. The results of this study provided an initial insightful view of how teachers and students use digital tools for teaching and learning, indicating the need for increased professional development for teachers to address academic digital illiteracy. The study also highlighted that students have access to a range of digital media for academic learning, which depends on teachers implementing digital media and university adoption policies for this purpose.

The study of Amin [38] sighted to identify digital transformation in Egyptian universities and its role in meeting the knowledge society's requirements. The study used a descriptive methodology, and a questionnaire was designed and administered to faculty members (67) from various Egyptian universities (Damanhur, Alexandria, Tanta, and Mansoura) to determine their perspectives on the requirements of digital transformation for achieving a knowledge society. The results of the field study showed high significance, confirming the response of faculty members to requirements related to developing a digital transformation strategy, designing digital educational programs, managing and financing digital transformation, and addressing human, technological, security, and legislative requirements. However, faculty members' responses showed moderate significance regarding the requirement of promoting digital culture. The study also proposed a conceptual framework to identify the requirements of digital transformation in universities for achieving the study's knowledge society.

The study of Mediani and Talaawi [2] addressed higher education in the Arab world, attempting to evaluate its status and diagnose the weaknesses that hinder its role. This was done through the analysis of education indicators and classifications based on the World Economic Forum's Global Competitiveness Index for 2016-2017. The study concluded that the competitiveness of the higher education sector in Arab countries is weak, necessitating the reform of education in general and higher education and scientific research in particular. The study highlighted the low quality of educational outcomes, high unemployment rates among learners due to a mismatch between their scientific specialties and labour market needs, and the persistence of high illiteracy rates in several Arab countries. These factors collectively represent a waste of human resources that could contribute to progress and development in the Arab world if education and training were improved and learners were adequately prepared in their respective fields.

Finally, the study of Al-Sufiani [39] aimed to develop a proposed model for digital transformation based on an analysis of the challenges faced by educational institutions. It examined the key features of digital education and identified the main obstacles preventing the implementation of digital transformation in international schools following the British curriculum in Saudi Arabia. The study used a descriptive methodology and included the school owner, teachers, and parents as the study sample. Three tools were utilized: interviews, a focus group interview guide, and observation cards. The research identified several problems faced by schools, such as inadequate curriculum coverage, and provided recommendations, including the use of an electronic model for distributing the curriculum on a semester basis and the activation of electronic formative assessment.

2.7 Commenting on previous studies and the position of the current study

This study aligned with some studies in addressing the variable of digital transformation in universities, such as the study by Amin [38], the study by Madi and Abu Hajer [34], and the study by Bond et al. [37], while disagreed with other studies which focused on the topic of digital transformation in certain schools, such as the study by Al-Soufiyani (2018).

Regarding the objective, this study agreed with some studies that aimed to investigate the reality of digital transformation in higher education in different countries, such as the study by Amin [38] and the study by Marks et al. [36]. However, it disagreed with the studies that aimed to study the reality of digital transformation in all government institutions, such as the study by Mohammed and Al-Ghubairy [33] in Saudi Arabia and the study by Al-Balushi et al. [35] in Oman.

In terms of the methodology used, this study aligned with the study of Rodrigues and Bribiesca [28] in utilizing a quantitative approach.

In terms of research instruments, this study is similar to prior studies that used closed-ended questionnaires, such as the studies by Madi and Abu Hajer [34] and Amin [38]. However, it differs from some research, such as the one by Marks et al. [36], which used a mixed-methods approach that included surveys, interviews, case studies, and direct observation. It also differs from the studies of Al-Balushi et al. [35] and Teixeira et al. [31].

Regarding the sample, it differs from the study by Al-Balushi et al. [35] and the study by Al-Soufiyani [39]. It also distinguishes itself from the study by Gomez et al. (2021).

This study has been distinguished by the different study society, both in terms of location (Jordan) and subject matter, because it is the first study - as far as the researcher is aware - that dealt with the digital transformation of Jordanian public and private universities from the perspective of the governing body members.

3 Methodology

The researcher used a descriptive survey methodology to achieve the objectives of this study. A survey was used to gather the opinions and assessments of a sufficient sample of administrators regarding the current status of digital transformation in Jordanian universities.

3.1 Study's population

The study population consisted of all administrative staff members in both public and private Jordanian universities, totalling 19,870 individuals according to the statistical report of the Ministry of Higher Education and Scientific Research (2019-2020). (Ministry of Higher Education and Scientific Research, 2021-2022), as shown in Table (1).

Table 1. Components of the study's population for all Jordanian Universities

Total	Number	University Type	Function
19870	15118	Public	**Administrators**
	4752	Private	

3.2 Study's sample

The study's sample was selected using stratified random sample by choosing eight Jordanian universities based on their geographical distribution across the Hashemite Kingdom of Jordan. Four of them were public universities, namely, the University of Jordan, Yarmouk University, Mutah University, and Hashemite University. The other four were private universities, namely, Middle East University, Princess Sumaya University, Al-Ahliyya Amman University, and Philadelphia University.

Then, a sample of administrative staff members was determined from a total of 19,870 individuals, following the table by Krejcie and Morgan [40] to determine the sample size. The study instrument was distributed to 410 administrative staff members, and 255 administrators responded to it. The following presents the demographic characteristics of the study participants according to the study variables.

Table 2. Characteristics of the study's sample of administrators at Jordanian universities according to the variables of the study

Percentage %	Frequency	Dimensions of the variable	Variable
34.1%	87	Less than 5 years	**Years of Experience**
31.8%	81	Less than10 years – 5 years	
24.3%	62	10 years – less than 15 years	
9.8%	25	15 years and above	
54.9%	140	Private	**The university**
45.1%	115	Public	
12.9%	33	Presidency Department	**The unit**
22.7%	58	Registration department	
27.5%	70	Information Technology Department	
10.6%	27	The library	
11.8%	30	Human resources department	
7.5%	19	Department of finance	
7.1%	18	Other	
%100.0	255	Total	**Total**

3.3 Study's instrument

The questionnaire was developed by referring to the theoretical literature related to digital transformation and previous studies, such as Al-Mutref's study (2020) and Amin's study [38]. Additionally, global models for measuring digital transformation maturity in institutions were consulted, including Gill and VanBoskirk [41] and Anderson and Ellerby [42]. The questionnaire, in its initial form, consisted of two parts. The first part included participants' demographic data, which were answered using multiple-choice options [43-50]. The second part consisted of four main dimensions, namely, digital culture, institutional support, infrastructure, and insight and vision. Responses to the statements were measured using a four-point Likert scale: (strongly agree, agree somewhat, disagree somewhat, strongly disagree).

The questionnaire was designed to assess the current status of digital transformation at Jordanian universities from the perspective of administrators. It comprised 40 items, in addition to personal data that included years of experience, administrative unit, and university [51-54].

3.4 Validity of the study's instrument

The initial version of the questionnaire was presented to 10 experts from Middle East University and other Jordanian universities specializing in education and information technology. They were asked to assess the suitability of the questionnaire items, their relevance to measuring the reality of digital transformation at Jordanian universities from the perspective of administrators, the alignment of the items with the provided dimensions (digital culture, institutional support, infrastructure, insight and vision), the clarity and linguistic accuracy of the items, and to suggest any necessary modifications or deletions of irrelevant items. Based on the recommendations of 80% of the experts, the proposed modifications were implemented. Consequently, the questionnaire was revised and consisted of 37 items.

3.5 Reliability of the study's instrument

The reliability of the study instrument was ensured through two methods:

3.6 Test-retest method

The questionnaire was administered to a pilot sample of 30 participants, including administrative staff members within and outside the study sample. After a two-week interval, the same questionnaire was re-administered to the pilot sample. The Pearson correlation coefficient was calculated to determine the correlation between the two administrations. The results are presented in Table 3.

Table 3. (Pearson correlation coefficient) between the first and second applications of the study tool

Between the first and second applications of the study tool		The field	Number of fields
Significance level	Pearson correlation coefficient		
0.000	**0.854	digital culture	1
0.000	**0.779	Institutional support	2
0.000	**0.779	Infrastructure	3
0.000	**0.865	Insight and vision	4
0.000	**0.842	The questionnaire as a whole	

The table shows that the correlation coefficients between the first and second administrations are high, indicating that the study instrument has an acceptable level of reliability and is suitable for the purposes of this study.

Second, the internal consistency method was employed using Cronbach's alpha coefficient. After administering the instrument to the survey sample, the reliability was calculated using Cronbach's alpha equation. Table 4 presents the reliability coefficients for the four domains of the questionnaire and the overall domain.

Table 4. Reliability coefficients for the study tool according to the method of internal consistency (Cronbach alpha)

Questionnaire directed to members of the administrative members		The field	Field Number
Paragraphs Number	persistence value - Alfa		
8	.0.836	Digital culture	1
10	0.846	Institutional support	2
9	0.811	Infrastructure	3
10	0.856	Insight and vision	4
37	0.934	The questionnaire as a whole	

The table indicates that the reliability coefficients, according to Cronbach's alpha, for the domains of the questionnaire ranged from 0.811 to 0.856, while the overall reliability coefficient (alpha) for the questionnaire as a whole was 0.934. These values are considered high and suitable for the purposes of this study.

The response scale of the questionnaire was designed according to the four-point Likert scale model, as follows: "Strongly Agree" with four levels, "Agree to Some Extent" with three levels, "Disagree to Some Extent" with two levels, and "Strongly Disagree" with only one level. The length of the scale was calculated by dividing the difference between the upper limit of the alternatives (4) and the lower limit of the alternatives (1) by 3 levels: (High, Moderate, Low), as shown in the equation: (4-3) ÷3=1.

Thus, the weights of the items are as following:

> From 1 to less than 2: Low level.
> From 2 to less than 3: Moderate level.
> From 3 to 4: High level.

3.7 Study's variables

Independent Variables of the Administrative Staff Members:

- − Years of Experience (Less than 5 years, 5 to less than 10 years, 10 to less than 15 years, 15 years or above)
- − Administrative Unit (Presidency Department, Registration Department, Information Technology Department, Library, Human Resources Department, Financial Department, and others)
- − University (Governmental, Private)

Dependent Variables: The state of digital transformation in the following domains:

- − Digital Culture
- − Institutional Support
- − Infrastructure
- − Insight and Vision
- − Statistical Analysis:

To answer the research questions, the following statistical methods were used:

- − Pearson correlation coefficient to measure the correlation and Cronbach's alpha equation to calculate the reliability and internal consistency of the study instruments.
- − Means, standard deviations, and ranks were used to detect the level of digital transformation at Jordanian universities from the perspective of administrative staff members.
- − Independent Samples T-test to examine the differences in the perceptions of administrative staff members regarding the level of digital transformation at Jordanian universities based on the variable of "university."
- − One-Way ANOVA to identify the differences in the perceptions of administrative staff members regarding the level of digital transformation at Jordanian universities based on the variables of "experience," "rank," "administrative unit," and "university." In case the results indicate significant differences attributed to the study variables, post hoc comparisons were conducted using Scheffe's method [55-57].

4 Results and Discussion

"What is the level of digital transformation at Jordanian universities from the perspective of administrative staff members?"

To answer this question, the arithmetic mean, standard deviation, and ranking were calculated for the perceptions of administrative staff members on the areas of the questionnaire that measure the level of digital transformation in Jordanian universities. The results are presented in Table 5.

The results indicated that the perceptions of administrative staff members on the level of digital transformation at Jordanian universities were within the moderate range. Arithmetic mean score for their perceptions was 2.90 with a standard deviation of 0.32. Similarly, the perceptions of administrative staff members across all areas were also within the moderate range.

These results aligned with the findings of a previous study by Madi and Abu Hajer [34], which indicated a high agreement of 81.52% in support of top management for digital transformation. They also aligned with the results of the study of Mohammed and Al-Ghubairi [33], which highlighted the need to support information and communication technology infrastructure and provide innovative technological requirements to facilitate the digital transformation process.

Table 5. Arithmetic means and standard deviations of the administrative staff members estimations on the areas of the questionnaire for the level of digital transformation at Jordanian universities, arranged in descending order according to their fields

Rating	arrangement	standard deviation	SMA	The field	Field Number
Average	1	0.39	2.97	Institutional support	2
Average	2	0.44	2.96	Infrastructure	3
Average	3	0.46	2.88	Insight and vision	4
Average	4	0.39	2.79	Digital culture	1
Average	-	0.32	2.90	level of digital transformation at Jordanian universities	

The researcher interpreted these results by emphasizing the importance of organizational leadership understanding the opportunities and benefits that digital technologies can offer to improve the quality of education and research. Support can be provided through funding, policies, or guidelines. In addition to that, universities need to ensure strong technological infrastructure and develop necessary digital platforms and tools, guided by a clear mission and vision for digital transformation. This includes identifying areas where digital technologies can enhance the educational experience and exploring new and innovative ways to integrate them. As well as the researcher highlighted the recent awareness among universities need to create a digital culture within the institution that facilitates a shared understanding of the benefits and opportunities provided by digital technologies. Without these crucial elements in the digital transformation process, universities risk lagging behind in the rapidly changing digital landscape and missing out on the opportunities digital technologies can provide to enhance the educational experience.

Results related to the second research question: "Are there statistically significant differences at ($\alpha \leq 0.05$) in the perceptions of administrative staff members regarding the level of digital transformation at Jordanian universities attributed to the variables (experience, administrative unit, university)?"
This question was answered based on its variables as following:

A. Experience variable (less than 5 years, 5 to less than 10 years, 10 to less than 15 years, 15 years and more):

Arithmetic mean and standard deviations were calculated for the perceptions of administrative staff members on the study questionnaire, considering the experience variable. The results were presented in Table (6).

Table 6. Arithmetic means and standard deviations of administrative staff members' estimations for the level of digital transformation at Jordanian universities, according to the variable of experience

15 and more n=25		15 less than 10 n=62		-less than 5 10 years n=81		Less than 5 years n=87	
standard deviation	SMA	standard deviation	SMA	standard deviation	SMA	standard deviation	SMA
0.38	2.74	0.24	2.90	0.31	2.87	0.34	2.98

The mean indicated the presence of apparent differences in scores of administrative staff members' perceptions on the level of digital transformation at Jordanian universities based on the experience variable. To determine the statistical significance level of these differences in the Arithmetic mean, One-Way ANOVA analysis was used. The results are shown in Table (7).

4.1 Statistically function

The results indicate statistically significant differences in the administrative staff members estimations on the level of digital transformation at Jordanian universities based on the experience variable. The "F" value was (4.304), and this value was statistically significant at the significance level ($\alpha \leq 0.05$).

Table 7. The results of a one-way analysis of variance to reveal the significance of differences in the estimations of administrative staff members for the level of digital transformation at Jordanian universities, according to the experience variable

significance level	calculated "F" value	Average of squares	levels of freedom	sum of squares	source of contrast	variable
0.006*	4.304	0.423	3	1.269	Between groups	years of experience
		0.098	251	24.657	Inside groups	
			254	25.926	Total	

* Statistical function

To identify the source of these differences in the estimations of the administrative staff members on the level of digital transformation at Jordanian universities based on the experience variable, post-hoc comparisons were conducted using the Scheffe method, as illustrated in Table (8).

Table 8. The results of post-comparisons using Scheffe's method to reveal the source of differences in administrative staff members estimations of the level of digital transformation at Jordanian universities according to the experience variable

15 years and above	Less than 10-15 years	5 – less than 10 years	Less than 5 years		Years of experience
2.74	2.90	2.87	2.98	-	
0.24*	0.08	0.11	-	2.98	Less than 5 years
0.13	0.03	-	-	2.87	5-10 years
0.16	-	-	-	2.90	11-15 years

* Statistically significant at ($\alpha \leq 0.05$) level   *x - = the arithmetic mean*

The results demonstrated that the source of statistically significant differences among the administrative staff members estimations regarding the level of digital transformation at Jordanian universities lies in the experience variable. These differences were observed between the administrative staff members with less than 5 years of experience and those with 15 or more years of experience, for the benefit of the administrative staff members with less than 5 years of experience. It can be concluded that the estimations of the administrative staff members with less experience in digital transformation at Jordanian universities are higher than those of their more experienced counterparts. This result can be explained by the computer skills possessed by the new generation, especially as they have grown up with digital transformations and are accustomed to using computers and mobile devices, which became an integral part of their daily lives.

B) The administrative department variable (presidency, registration, information technology, library, human resources, finance, others).

The arithmetic means and standard deviations were calculated for the estimations of the administrative staff members on the study questionnaire, considering the administrative department variable. The results are presented in Table (9).

The arithmetic means in the table indicated the presence of apparent differences in the mean of the administrative staff member's estimations on the level of digital transformation at Jordanian universities, according to the administrative department variable. To determine the level of statistical significance in the arithmetic means, One-Way ANOVA analysis was conducted, and the results are shown in Table (10).

4.2 Statistically function

The results indicated the presence of statistically significant differences in the administrative staff members estimations on the level of digital transformation at Jordanian universities, according to the administrative department variable. The value of "F" was found to be (4.592), and this value is statistically significant at the significance level ($\alpha \leq 0.05$).

Table 9. Arithmetic means and standard deviations of the administrative staff members staff estimations for the level of digital transformation at Jordanian universities, according to the variable of the administrative department

Others n=18		Financial n=19		Human Resources n=30		The library n=27		Information Technology n=70		Registration n=58		Presidency n=33	
standard deviation	SMA	standard deviation	SMA	standard deviation	SMA	standard deviation	SMA	standard deviation	SMA	standard deviation	SMA	standard deviation	SMA
0.12	2.97	0.32	3.07	0.28	2.85	0.33	2.86	0.26	2.88	0.36	2.79	0.35	3.08

Table 10. The results of a one-way analysis of variance to reveal the significance of differences in the administrative staff members estimations for the level of digital transformation at Jordanian universities, according to the variable of the administrative department

significance level	calculated "F" value	Average of squares	levels of freedom	sum of squares	source of contrast	Variable
0.000*	4.592	0.432	6	2.592	Between groups	Administrative department
		0.094	248	23.334	Inside groups	
			254	25.926	Total	

Table 11. The results of post-comparisons using the "Scheffe" method to reveal the source of differences in administrative staff members estimations of the level of digital transformation at Jordanian universities according to the variable of the administrative department

Others	Financial	Human Resources	Library	Information Technology	Registration	Presidency		Administrative department
2.98	3.07	2.85	2.86	2.88	2.79	3.08	C-	
0.10	0.01	0.23	0.22	0.20	0.29*	-	3.08	Presidency
0.19	0.28	0.06	0.07	0.09	-	-	2.79	Registration
0.10	0.19	0.03	0.02	-	-	-	2.88	Information Technology
0.12	0.21	0.01	-	-	-	-	2.86	Library
0.13	0.22	-	-	-	-	-	2.85	Human Resources
0.09	-	-	-	-	-	-	3.07	Financial

* Statistically significant at ($\alpha \leq 0.05$) level   *x - = the arithmetic mean*

Table 12. The results of the "T" test to reveal the significance of differences in administrative staff members estimations for the level of digital transformation at Jordanian universities according to the university variable

significance level	calculated T value	standard deviation	SMA	Number	Gender
0.014*	2.472-	0.32	2.86	140	Public
		0.31	2.96	115	Private

To identify the source of differences in the administrative staff member's estimations on the level of digital transformation at Jordanian universities, post-hoc comparisons were conducted using the Scheffe method, as shown in Table (11).

The results revealed that the source of statistically significant differences in the administrative staff member's estimations on the level of digital transformation at Jordanian universities lies between the administrative departments of "Presidency" and "Registration," for the benefit of the administrative staff members who is working in the "Presidency" department. It can be concluded that the estimations of the administrative staff members working in the "Presidency" department regarding the level of digital transformation at Jordanian universities are higher than those of their counterparts in the "Registration" department. This result can be attributed to the pressures placed on administrators in the "Presidency" department to acquire the latest technologies and devices and integrate them into university operations in order to keep up with the advancements in digital transformation, which consequently leads to the development of services provided by the university.

4.3 University Type Variable (Public, Private)

The arithmetic means and standard deviations were calculated for the estimations of the administrative staff members based on the study questionnaire. The Independent Samples t-test was used, the results are presented in Table (12).

4.3.1 Statistically function

The arithmetic means in the table indicated the presence of significant differences in the arithmetic means of the administrative staff members estimations regarding the level of digital transformation at Jordanian universities according to the university type variable (public, private). The Independent Samples t-test was conducted to determine the statistical significance of the differences between the estimations of the administrative staff members based on the university type variable (public, private).

The results revealed statistically significant differences in the arithmetic means of estimations by the administrative staff members regarding the level of digital transformation at Jordanian universities according to the university type variable (public, private), with a value of "t" (-2.472) and this value is statistically significant at ($\alpha \leq 0.05$). This means that the administrative staff members whom working in private universities perceive a higher level of digital transformation compared to their counterparts in public universities. This result can be interpreted by the greater emphasis on administrative aspects in private universities, especially since their primary goal is to attract larger numbers of students, which drives private universities to provide their administrative units with the best modern resources to address any possible challenges, particularly in the intense competition between private universities to accommodate a larger number of students. Additionally, these units strive to recruit specialized administrative competencies with a high level of experience and knowledge in various digital means that can be utilized to achieve the university's goals, as private universities consider them a fundamental element of human and intellectual capital.

5 Conclusion

The purpose of this study was to evaluate the level of digital transformation at Jordanian universities from administrative staff members' viewpoint. The study indicated that the perceived level of digital transformation is moderate. Based on years of experience, significant perception variations among administrative staff members were found. The study's results highlighted how important it is for universities to promote digital culture, improve institutional support, and expand their digital infrastructure. It also emphasised on how vitally vision and leadership are important in directing initiatives for digital transformation. Additionally, it is necessary to remember that technology has a significant emotional and cultural impact during the transformation process.

6 Recommendations

Based on the study results, the researcher recommends the following:

- Emphasizing institutional support for digital transformation at universities by focusing on continuous development and innovation.

- Promoting digital culture through the dissemination of an ethical code for dealing with digital transformation in administration.
- Utilizing international experiences in the field of digital transformation in educational institutions and transferring their expertise to our communities.
- Conducting scientific research in the field of digital transformation in the education sector in Jordan.

6 Future Study

- Participating in international conferences and fairs to keep up with emerging breakthroughs in digital transformation.
- Creating more adaptable organizational structures and supplying highly specialized human resources in information technology and communication.

Competing Interests

Authors have declared that no competing interests exist.

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