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THE ROLE OF DIGITAL TRANSFORMATION IN ENHANCING EDUCATIONAL SERVICE QUALITY IN YEMENI PRIVATE UNIVERSITIES

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Abstract
This study examines the impact of digital transformation on the quality of educational services in Yemeni private universities. In recent decades, countries around the world have focused on digital transformation as a result of the development of information and communications technology. Governments have directed all their efforts and capabilities toward implementing digital transformation technologies. Digital transformation has imposed itself in various aspects, including university education at the present time, as a result of the cognitive flow of knowledge and information. Universities face various challenges imposed by their scientific and professional characteristics, transcending their traditional frameworks. The importance of digital transformation lies in its ability to solve human, administrative, and cognitive problems in universities, on the one hand, and its ability to promote development and sustainability in society, especially in developing societies with crises, on the other hand, as is the case in Yemen. This is achieved in all economic, social, cultural, and environmental aspects. Digital transformation is considered the motivating factor and the main tool in Yemeni private universities. This study relied on the descriptive analytical approach. Data was collected through a questionnaire from 297 randomly selected participants representing the study sample of academic and administrative leaders in private universities in Sana'a. The results indicated the need to focus on developing the quality of educational services and using modern innovative means and technologies. To keep pace with various international universities, there is a statistically significant role for digital transformation in its various dimensions (digital vision, infrastructure, human resources, organizational culture, transformational leadership) in enhancing the quality of educational services in Yemeni private universities. The results of the study revealed that the dimensions of human resources and infrastructure for digital transformation recorded the highest level of achievement in these institutions. The study also showed that the dimension of academic and organizational values showed the highest level of implementation among the dimensions of educational quality services in Yemeni private universities.

Keywords: Digital transformation, quality of educational services.

GENERAL FRAMEWORK OF THE STUDY

INTRODUCTION

Digital transformation is emerging as a strategic trend in the education sector, contributing to improving the quality of educational services and providing better educational opportunities (Ali and Al-Shalal, 2020: 414). With the development and proliferation of electronic devices among people, and their reliance on them in various aspects of their lives, this development has affected educational systems as a societal system. This has prompted specialists to leverage this technology to facilitate the transfer of education to students, improve the quality of educational services, and leverage it to enhance the efficiency of education, cognition, and personal skills, focusing on learner learning as the core of the educational process (Al-Iqbali, 2019: 412). Digital transformation seeks to develop the educational process because it helps automate administrative and academic activities, improves the student experience, and enhances the efficiency of interactions between teachers and students (Smith and Brown, 2021). Smart universities represent a natural and logical development of virtual and electronic university models, in light of the technological revolution and digital transformation in university education (Awf et al., 2020: 103). Digital transformation in universities depends on three basic elements: technology, students, and faculty. The presence of appropriate and advanced technology contributes to providing content that facilitates communication between

students and university faculty members, which positively impacts university outcomes, especially in times of crisis and emergency circumstances. Digital transformation has proven its worth in managing business and educational services during the COVID-19 pandemic. Countries that had modern infrastructure and technologies (digital transformation) were able to continue the educational process by benefiting from educational services provided in accordance with digital transformation. As for countries that did not benefit from technology and did not begin digital transformation, the educational process in universities stopped, including the Republic of Yemen (Al-Sawat, Al-Harbi, 2022: 649). Yemeni private universities are among the institutions seeking to adopt digital transformation to improve the quality of educational services, especially after overcoming the crisis that Yemen went through and the previous political situation, which was one of the factors of weakness. In the technical field, however, Yemeni private universities are striving to recover and overcome resource shortages, technical challenges, limited infrastructure, and widespread technological awareness. They are also attempting to keep pace with technological developments and strengthen the weaknesses of the technical and educational sectors in Yemen. In this context, current research indicates that digital transformation contributes to positive outcomes, such as improved access to information and increased student satisfaction (Johnson, 2020).

STUDY PROBLEM

Given the above-mentioned points and the exceptional circumstances Yemeni private universities have faced in recent years due to the unstable situation in Yemen, which has negatively impacted the quality and outcomes of education, an examination of digital transformation efforts in Yemeni private universities reveals that they began with limited momentum and have not reached the standards of Arab and international virtual universities. This shortcoming can be attributed to the lack of funding for digital transformation initiatives in Yemeni private universities, in addition to the challenges these institutions face. As highlighted by several recent studies (Al-Khatib, 2021; Shaker, 2022; Al-Awadhi, 2020; Albert, 2018), Yemeni private universities struggle to meet societal and developmental needs due to numerous challenges, such as globalization, limited student capacity, increasing demand for higher education, and scarce financial resources. Al-Abdali's study (2018) pointed to stagnant curricula and their failure to keep pace with cognitive and digital developments, in addition to the limited capacity of faculty members to employ educational technologies in teaching. Al-Khatib's study (2021, p. 56) also pointed to several challenges facing digital transformation in Yemeni private universities, including weak digital infrastructure, weak and expensive internet networks, and insufficient activation of networks and information systems. Based on previous studies that focused on specific aspects such as the reality of digital transformation and its challenges, this research explored the reality of digital transformation, its cycle, and the mechanisms for its implementation to ensure the quality of university education from additional perspectives and dimensions not addressed in those studies. Accordingly, the research problem poses the following question: "How can digital transformation contribute to improving the quality of educational services in Yemeni private universities?"

1. What is the reality of digital transformation in Yemeni private universities?
2. What is the quality of educational services in Yemeni private universities?
3. What is the role of digital transformation in the quality of educational services in Yemeni private universities?

IMPORTANCE OF THE STUDY

The importance of this study can be summarized as follows:

1. Enriching the scientific literature on digital transformation in higher education in developing countries, especially in Yemen.
2. Providing insights that can help private universities in Yemen improve the quality of their educational services through digital transformation.
3. Providing university administrations with research results that help to identify strengths and shortcomings in the quality of educational services.
4. Dealing with emergency crises that impose a shift to the digital world and its electronic services.

Digital transformation is a fundamental driver in the development and improvement of educational quality at all levels.

STUDY OBJECTIVES

This study seeks to identify the role of digital transformation in the quality of services at Yemeni private universities by achieving the following sub-objectives:

1. Determining the Level of Application of Digital Transformation in Yemeni Private Universities.
2. Measuring the Quality of Educational Services in Yemeni Private Universities.
3. Measure the direct impact of the dimensions of digital transformation (digital vision, human resources, organizational culture, and transformational leadership) on the quality of educational services in Yemeni private

universities.
Digital transformation is a strategic investment aimed at revolutionizing the way educational content is delivered and how students receive knowledge, leading to a comprehensive improvement in the quality of educational services and preparing a generation capable of keeping pace with the demands of the digital age.
4.

PREVIOUS STUDIES

Al-Khatib's study (2021) revealed the existence of challenges hindering the implementation of digital transformation in university education in Yemen. The study used a descriptive survey approach and a content analysis method. The study's results included: weak technical infrastructure, weak and expensive internet networks, and the absence of an e-learning system in many Yemeni universities. Salima, Al-Shami (2023) sought to highlight the role of digital transformation in the quality of higher education, and the role it plays in the quality of its outputs and the development of good and creative individuals. Al-Shaibani (2023) indicated that digital transformation has become a fundamental role in the development of education due to the rapid and successive technological advancement under information revolution. Sabaa (2021) showed a positive moral impact of some dimensions of digital transformation represented in (information technology infrastructure, digital education, and digital library) on student satisfaction. Hareed and Hamdawi (2020) revealed a statistically significant relationship and impact between digital transformation in its dimensions (material, institutional, and functional) and the quality of educational services at Adrar University. Al-Sawat and Al-Harbi (2022) focused on the role of digital transformation and distance learning technologies such as virtual classrooms in providing high-quality education to students in different places. Al-Balushi (2020) examined the role of digital transformation in improving the quality of educational services, through analyzing the impact of smart systems, such as predictive analytics and automated assessment tools, on improving the quality of learning and helping students achieve better academic results. Kamsker et al.(2020) addressed the impact of digital transformation on students' daily lives. Shaikh et al. (2022) indicated that digitization significantly affects students' learning experiences, as they have become more dependent on these technologies and express their desire to pursue their studies in a hybrid educational style that combines traditional and digital learning. Seyama et al.(2021) concluded that using the Internet as a tool for digital transformation positively affects performance in higher education. The study also asserted that digital technology improves university performance, and that digital transformation supports accurate data analysis, which contributes to making rational decisions. Bui, T. T., & Nguyen, T. S (2023) showed that digital transformation significantly affects data collection, management, academic advising, and personalized education and technology, such as blended learning, video conferencing, and augmented reality technologies, contributes to improving educational outcomes, indicating a radical shift in teaching and learning methods. Giannoutsu et al.(2024) highlighted that digital technologies have an impact that goes beyond educational outcomes, including school activities such as teaching, management, and communication.
All of these studies have revealed the importance of understanding the relationships between the various elements of the impact of digital technologies on education, which supports the development of self-assessment tools to enhance digital capabilities in education.

RESEARCH GAP

1-6 Research Gap
Quality has received significant attention in both developed and developing countries. These institutions have realized the importance of developing and improving their service performance as a key approach to addressing the challenges of a changing environment, especially with rapid technological developments (Al-Salahi and Jaballah, 2016: 60-75). Despite the efforts made in previous studies on the role of digital transformation in improving the quality of higher education, there is still a need for further research on the relationship between the technical and human aspects. This study primarily aims to determine the long-term impact of digital transformation on the quality of educational services in Yemeni private universities. This study was designed to evaluate the role of digital transformation in enhancing service quality in Yemeni private universities by integrating various dimensions into a unified assessment tool.

COGNITIVE MODEL OF THE STUDY

By reviewing several references (previous studies and research) that addressed the subject of the current study, we found a number of studies that addressed one of the variables of the current study. To answer the study's questions and achieve its objectives, this model was developed based on previous studies that studied the variables of the current study or some of them, as well as the dimensions of the variables.

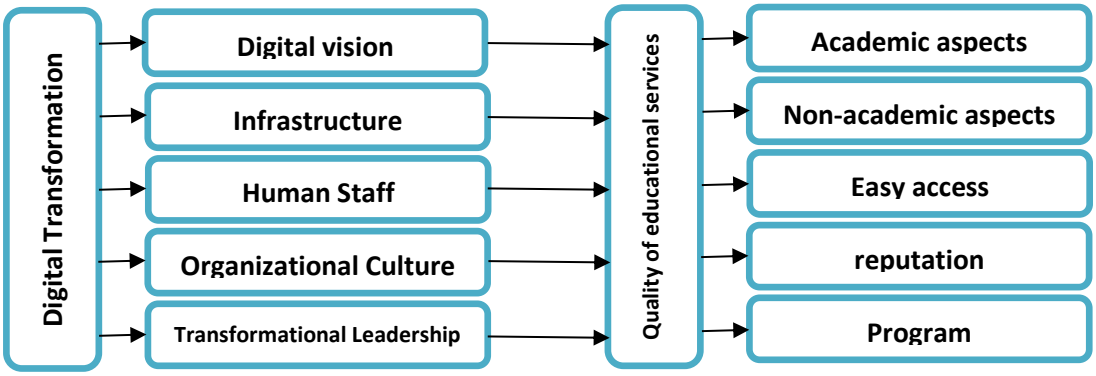


FIGURE (1) ILLUSTRATES THE COGNITIVE MODEL USED IN THIS STUDY.

STUDY HYPOTHESES

Considering the study problem and drawing on the hypotheses proposed by previous studies related to the topic, the study hypothesis was formulated as follows:
There is a statistically significant role for digital transformation in all its dimensions on service quality in Yemeni private universities Sub-hypotheses emerge from this:
Sub-hypothesis 1: Digital vision plays a statistically significant role in service quality in Yemeni private universities.
Sub-hypothesis 2: Infrastructure plays a statistically significant role in service quality in Yemeni private universities.
Sub-hypothesis 3: Organizational culture plays a statistically significant role in service quality in private Yemeni universities.
Sub-hypothesis 4: Transformational leadership plays a statistically significant role in service quality in Yemeni private universities.
Sub-hypothesis 5: Human resources play a statistically significant role in service quality at private Yemeni universities.

THEORETICAL BACKGROUND OF THE STUDY

DIGITAL TRANSFORMATION

UNESCO believes that technology has enabled all students to exercise their right to university education through more flexible and individual forms of learning, and the intensive uptake of online teaching and learning has emerged during the Corona pandemic, as digital platforms work to expand the possibility of internationalizing university education through virtual student mobility and international research cooperation (UNESCO).

The digital transformation of universities involves moving from a traditional system to a digital system based on information and communication technology in all areas of university work, from changing the pattern and style of dealing and interacting with faculty members, employees, students, and beneficiaries, organizing all different transactions and services, and restructuring them electronically through information technology and advanced communication technology (Amin, 2018:22).

Digital transformation is a set of digital methods and activities that are acquired from producing and publishing scientific content and receiving it in its various forms through electronic devices connected to the Internet in an interactive process between the sender and the receiver (Al-Badrani, 2017: 80).

Based on the above, digital transformation is: "A process associated with the intensive use of digital technologies and information technology, through which creative educational services are created, in addition to improving the efficiency of the quality of educational services at universities to reach the highest educational level." According to the nature of the university work environment, a set of requirements must be available to successfully implement the digital transformation process, which are: (Hajjar, 2020: 60):

a. Sufficient senior management support for digital transformation.
b. Appropriate strategic directions for digital transformation.
c. Technical infrastructure required for digital transformation.
d. Human and organizational resources required for digital transformation.

e. Appropriate administrative and financial environment for digital transformation.

QUALITY OF EDUCATIONAL SERVICES

2-2- Quality of Educational Services

Higher education institutions, both academic and technical, in both developed and developing countries, are among the most important state institutions for preparing human resources, conducting scientific research, and serving and developing society. Achieving quality of service is one of the goals that service-oriented universities strive to achieve, given that services have become an important sector that complements other sectors despite being a difficult concept to judge and evaluate. The quality of educational services in universities is defined as "the difference between what a student expects from services and what they actually receive" (Manshi, 2019:182). Al-Ayubi et al. (2020: 11) view it as the extent of an educational institution's success in creating an educational environment that enables students to achieve their educational goals according to academic standards. Accordingly, it can be said that the quality of educational services in universities is an integrated system of activities directed at the beneficiary, beginning with identifying their desires and requirements, and ending with working to meet them. This was consistent with the primary purpose of establishing universities. To measure the quality of university services, the HEdPERF Higher Education Performance Model (HEDPRM) was used, which was developed in a 2006 hazardous study. It is a specialized tool for measuring the quality of educational services, specifically developed to suit the context of higher education. The HEdPERF scale usually consists of several dimensions, and each dimension has a set of indicators or items that are measured to evaluate the quality of service, including five dimensions (academic aspects, non-academic aspects, access facilities, reputation and fame, and study programs) (Abdullah, 2006).

STUDY METHODOLOGY AND DESIGN

STUDY DESIGN AND METHOD

Descriptive and analytical methods were used in this study. A questionnaire was used to collect information related to the study, analyze the data, and determine the role of digital transformation in service quality at Yemeni private universities. SPSS and IAMOS were used to analyze the collected data to test the hypotheses.

STUDY COMMUNITY AND SAMPLE

The study community consisted of Yemeni private universities in the capital, Sana'a, comprising a total of (1311) academic and administrative leaders from (35) private universities. The researchers selected (eight) private universities based on the following criteria: seniority, use of technology, and having five or more colleges. The study sample was chosen using a simple random sampling method according to Thompson's equation. Applying this equation, the sample size reached (297) individuals. The research sample was determined using the proportional distribution of the study community.

The study sample was identified using stratified random sampling. The study sample was divided into strata (categories) from the selected universities, represented by the academic leader category (administrative leader category), which included academic leaders in various specializations and academic ranks and administrative leaders in various administrative positions, as they are among the university's most senior leadership personnel. Simple random sampling was then carried out on individuals within each stratum until the representative sample for each stratum was complete. The study sample was selected using a simple random sampling method according to the Stephen-Thompson equation, as shown below:

$$n = \frac{N \times p(1-p)}{\left[\left[N-1 \times \left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

STUDY TOOL

A questionnaire was used as the main instrument to collect data from the study sample.

VALIDITY AND RELIABILITY OF THE QUESTIONNAIRE

A. Validity of the questionnaire: The validity of the questionnaire was confirmed by calculating its internal consistency validity (the correlation coefficient between the questionnaire items and the total score of the dimensions), as shown in Table 1. The correlation was statistically significant at a significance level of 0.05 ≥α.

TABLE (1) MEASURING THE INTERNAL CONSISTENCY VALIDITY OF THE INDEPENDENT VARIABLE (DIGITAL TRANSFORMATION) AND THE DEPENDENT VARIABLE (QUALITY OF EDUCATIONAL SERVICES)

Dimensions of digital transformation	Pearson correlation coefficient	Significance level	Dimensions of educational services quality	Pearson correlation coefficient	Significance level
Digital Vision	**.940**	**0.00**	**Academic aspects**	**.953**	**0.00**
Infrastructure	**.935**	**0.00**	**Non-academic aspects**	**.946**	**0.00**
Human cadre	**.934**	**0.00**	**Ease of access**	**.967**	**0.00**
Organizational culture	**.948**	**0.00**	**reputation**	**.954**	**0.00**
Transformational Leadership	**.944**	**0.00**	**Programs**	**.957**	**0.00**

B. As Table (1) shows, the correlation coefficients between each item of the dimensions of the independent variable (digital vision, infrastructure, human cadres, organizational culture, organizational culture), and the dimension to which it belongs, as well as the correlation coefficients of each dimension and the total score of the axis. It is clear that all the correlation coefficients presented are statistically significant at a significance level (0.05 ≥ α), indicating that the axis is considered a valid measure of what it was designed to assess. The table also displays the correlation coefficients between each item of the dimensions of the dependent variable (academic aspects, non-academic aspects, ease of access, reputation, and programs) and their respective dimensions, along with the correlation coefficients of each dimension with the total score of the axis (degree of the dependent variable). Again, all the correlation coefficients shown are statistically significant at a significance level (0.05 ≥ α) 0.05, confirming that the axis is a valid measure of what it was designed to measure.

C. **Instrument stability:** The stability of the questionnaire means that it provides the same results if it is redistributed more than once under the same conditions and circumstances. The researchers verified the stability of the research questionnaire using the Cronbach's alpha coefficient. It should be noted that the stability coefficients of the standardized scales must not be less than (0.70). The results of instrument stability tests are presented in Table 2.

D.

TABLE (2) SHOWS THE CRONBACH'S ALPHA COEFFICIENTS FOR MEASURING RELIABILITY.

Digital transformation	Paragraphs	Cronbach's Alpha	Quality of educational services	Paragraphs	Cronbach's Alpha
Digital Vision	5	.951	**Academic aspects**	5	.940
Infrastructure	5	.934	**Non-academic aspects**	5	.950
Human cadre	5	.937	**Ease of access**	5	.957
Organizational culture	5	.960	**reputation**	5	.962
Transformational Leadership	5	.964	**Programs**	5	.955

The results for the (Alpha Cornbrash's) scale shown in Table No. (2) shows that all the study axes are characterized by stability, as the scale value for the paragraphs of the questionnaire axes ranged between (93.4% and 96.4%), while it was a very high value for a scale for the stability of the questionnaire. Therefore, the study tool is acceptable and highly efficient for the purposes of this study and analysis. The closer the value of the Cronbach's alpha scale is to the correct value, the higher is the level of stability and internal consistency of the tool.

HYPOTHESIS ANALYSIS AND TESTING

DISPLAYING THE RESULTS OF THE DESCRIPTIVE ANALYSIS

Descriptive analysis helps to identify the level of application of the study dimensions represented by digital transformation and the quality of educational services using arithmetic averages, standard deviations, and levels of application. If each dimension of the study variables received an arithmetic average of less than (3) or a relative importance of less than (0.6), it was rejected.

RESULTS OF DIGITAL TRANSFORMATION ANALYSIS

TABLE (3): LEVEL OF APPLICATION OF THE DIMENSIONS OF THE DIGITAL TRANSFORMATION VARIABLE IN YEMENI UNIVERSITIES

M	Distance	Dimensions arrangement	Arithmetic mean	Standard deviation	percentage	coefficient of variation	Application level
1	Digital Vision	4	5.486	1.343	78.37	24.48	High
2	Infrastructure	2	5.639	1.251	80.56	22.18	High
3	Human cadre	1	5.692	1.211	81.31	21.27	High
4	Organizational culture	3	5.588	1.328	79.82	23.77	High
5	Transformational Leadership	5	5,480	1.407	78.29	25.68	High
Digital Transformation : Average			5.577	1.230	79.67	22.06	High

Table (3) shows that the highest level of application of the dimensions of digital transformation in the Yemeni private universities under study is represented by the human cadre dimension, which obtained an arithmetic mean of (5.692) with a standard deviation of (1.211) and a percentage of (81.31%) indicating a high level. The infrastructure dimension ranked second, with an arithmetic mean of (5.639), a standard deviation of (1.251) and a high percentage of (80.56%), at a high level. The organizational culture dimension comes in the third place, achieving an arithmetic mean of (5.588), a standard deviation of (1.328), and a percentage of (79.82%), also reflecting at a high level. The digital vision dimension is fourth, reaching an arithmetic mean of (5.486), standard deviation of (1.343), and a percentage of (78.37%). The transformational leadership dimension ranked fifth, with an arithmetic mean of (5.480), a standard deviation of (1.407), and a high percentage of (78.29%).
Generally, the results indicate that the level of application of digital transformation in Yemeni private universities, from the point of view of the sample individuals, is high, with an arithmetic mean of (5.577), a standard deviation of (1.230), and percentage of (79.67%). The researchers attribute this to the educational maturity that Yemeni private universities are striving to meet the challenges and rapid changes in the technological field and engage with the digital world.

RESULTS OF THE ANALYSIS OF THE QUALITY OF EDUCATIONAL SERVICES

TABLE (4): LEVEL OF APPLICATION OF THE DIMENSIONS OF EDUCATIONAL SERVICES QUALITY IN YEMENI UNIVERSITIES

M	Distance	Dimensions arrangement	Arithmetic mean	Standard deviation	percentage	coefficient of variation	Application level
1	Academic aspects	1	5.635	1.253	80.49	22,237	High

M	Distance	Dimensions arrangement	Arithmetic mean	Standard deviation	percentage	coefficient of variation	Application level
2	Non-academic aspects	5	5.516	1.360	78.80	24,660	High
3	Ease of access	2	5.603	1.365	80.05	24.353	High
4	reputation	4	5.616	1.383	80.22	24.631	High
5	Programs	3	5.605	1.379	80.07	24,597	High
Quality of :Overall average educational services			5.595	1.288	79.93	23,023	High

Table (4) shows that the highest level of application of the dimensions of the educational services quality in the Yemeni private universities under study is represented by the academic aspects dimension, which achieved an arithmetic mean of (5.635) with a standard deviation of (1.253) and a percentage of (80.49%), indicating a high level. The reputation dimension ranked second, with an arithmetic mean of (5.616), a standard deviation of (1.383), and a percentage of (80.22%), reflecting a high level. The programs dimension comes third, with an arithmetic mean of (5.605), a standard deviation of (1.379), and a percentage of (80.07%), also showing a high level. The ease of access dimension is fourth, achieving an arithmetic mean of (5.603) with a standard deviation of (1.365), and a percentage of (80.05%). The non-academic aspects dimension ranks fifth, with an arithmetic mean of (5.516), a standard deviation of (1.360), and a percentage of (78.80%), which is still considered a high level.
The results further indicated that the level of application of the quality of educational services in Yemeni private universities is high, with an arithmetic mean of (5.595), a standard deviation of (1.288), and a percentage of (79.93%). This result indicates that Yemeni private universities are committed to providing all their services with high quality and are working to fulfill all the necessary requirements to achieve the desired level of quality, enabling them to compete effectively in their field of work. The level of application of quality improvement procedures reinforces this commitment.

DISPLAYING HYPOTHESIS TESTING RESULTS

A Multiple Linear Regression Model was used to determine the impact of the dimensions of digital transformation on the quality of educational services in Yemeni private universities. Table 5 presents the results.

TABLE (5): RESULTS OF MULTIPLE LINEAR REGRESSION ANALYSIS OF THE DIMENSIONS OF DIGITAL TRANSFORMATION IN THE QUALITY OF EDUCATIONAL SERVICES

Dependent variable : Quality of educational services							
Dimensions of digital transformation	Indicators of the relationship of variables		ANOVA analysis		Regression coefficients and t test -		
	R	R^2	Value (F)	Sig.	β	(T)	Sig.
Digital Vision Dimension	.922	.851	343.217	0.00	.183	3.561	0.00
Infrastructure dimension					.015	.277	.782
after Human cadre					.216	3.790	0.00
Organizational culture dimension					.144	2.624	0.00
Transformational Leadership Dimension					.379	7.551	0.00

As illustrated in Table (5), the five independent variables (comprising digital transformation dimensions) digital vision, infrastructure, human cadres, organizational culture, and transformational leadership) have an impact on the dependent variable (quality of educational services) in the Yemeni private universities under study, although the proportions of the impact may vary. The effects of these variables differ when the model includes only one variable, revealing that the individual impact of each variable is much greater than that when placed in a multiple (joint) model. This discrepancy may be attributed to the correlation between the variables and their influence on each other, as well as a reduction in the error rate of the estimated model and an increase in the explanatory ratio of the independent variables.

The results show that the values of the regression coefficients (〖b_5, b〗 _4,b_3,b_2,b_1) and the degree of impact of the variables are (.183, .015, .216, .144, and .379), respectively. This indicates that a change in each variable or an increase in its level by one unit (one level) leads to a corresponding change in the quality of educational services in the private Yemeni universities under study, with an impact value (b) for each variable. The multiple linear regression model can be expressed using the following formula:

$$\hat{Y} = 0.385 + 0.183\,X_1 + 0.015\,X_2 + 0.216X_3 + 0.144X_4 + 0.379\,X_5$$

Although the estimated value of (b2) from the data appears insignificant at the significance level ($0.05 \geq \alpha$), as the calculated value of (t) is smaller than the tabular value and the probability value (Sig.) was greater than (0.05), the entire multiple model with all variables appeared significant at this level of significance. The value of (F) calculated from the data is equal to (343.217), which is greater than the tabular value, while and the probability value (Sig. = 0.00) was smaller than that in (0.05).

Furthermore, the multiple correlation coefficient between the dependent variable (quality of educational services) and the independent variables (digital vision, infrastructure, human cadres, organizational culture, transformational leadership) combined (R) reached (0.922), indicating a very strong correlation and a high indicator of the quality of the relationship between the dependent variable and the independent variables. The impact of the combined independent variables on the dependent variable was further confirmed by the value of the coefficient of determination (R2), which reached (0.851). This means that the explanatory variables (digital vision, infrastructure, human resources, organizational culture, transformational leadership) together explain (85.1%) of the variance in the dependent variable (quality of educational services), which is a high explanatory ratio, indicating the significant impact of these explanatory (independent) variables on the dependent variable (quality of educational services).

It is worth noting that the estimator for the variable (X_2) (infrastructure dimension) is not significant according to the (t) test in the multiple model, while it is significant in the simple model. This does not imply that it is unimportant in the overall model; rather, its impact is weak compared to the other variables included in the model. This situation often occurs due to a linear overlap between the independent variables (the problem of multicollinearity) or due to the relatively strong correlation between some independent variables that may exceed (0.70).

Based on the above results, it is confirmed that there is a statistically significant effect at a significance level of (0.05) for the independent variable (digital transformation) with its dimensions (digital vision, infrastructure, human cadres, organizational culture, transformational leadership) combined, on the dependent variable (quality of educational services) in the Yemeni private universities under study.

IMPROVING THE MULTIPLE LINEAR REGRESSION MODEL:

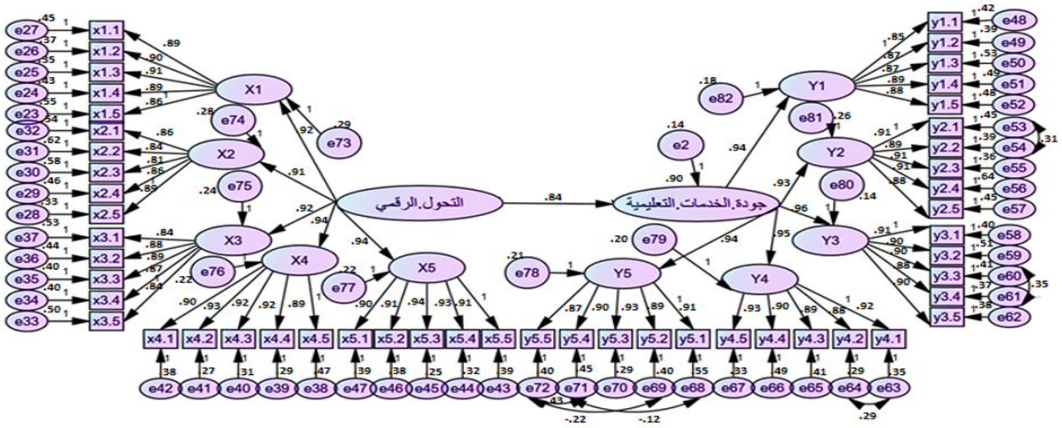
To improve the model and identify the variables (dimensions) that had the greatest impact on the dependent variable and were most relevant to the study, the researchers employed the backward exclusion method for the variables included in the model. The results are presented in Table 6.

TABLE NO. (6) RESULTS OF IMPROVING THE MODEL FOR THE IMPACT OF THE DIMENSIONS OF DIGITAL TRANSFORMATION ON THE QUALITY OF EDUCATIONAL SERVICES

Dimensions	Dependent variable : Quality of educational services						
	Indicators of the relationship of variables		ANOVA analysis		Regression coefficients and t test -		
	R	R^2	Value (F)	Sig.	B	(T)	Sig.
Digital Vision Dimension	.922	.851	430.318	0.00	.188	3.920	0.00
after Human cadre					.224	4.385	0.00
Organizational culture dimension					.146	2.661	.008
Transformational Leadership Dimension					.380	7.595	0.00

As Table (6) shows, the first, third, fourth, and fifth variables (dimensions) (digital vision, human cadres, organizational culture, and transformational leadership) were the most influential dimensions in the dependent variable (quality of educational services). The values of the regression coefficients (〖b_5, b〗 _4, b_3, b_1)

indicate the degree of influence of the variables, reaching (.188, .224, .146 and .380), respectively. This means that changing any of these variables by one unit (one level) leads to a corresponding change in the level of quality



of educational services in the Yemeni private universities under study, quantified by the impact value (b) for each variable.

It is noted that the influence of the variables on the dependent variable increases compared with that in the multiple models. Although the amount of change is slight, this indicates an improvement in the linear model, highlighting the superiority of these variables in explaining and interpreting part of the change that occurs in the dependent variable. The multiple linear regression model can be expressed as follows:

$$\hat{\mathbf{Y}} = \mathbf{0.391} + \mathbf{0.183}\,\mathbf{X_1} + \mathbf{0.216}\mathbf{X_3} + \mathbf{0.144}\mathbf{X_4} + \mathbf{0.379}\,\mathbf{X_5}$$

The multiple correlation coefficient (R) reaches (0.922), indicating a very strong correlation. This indicates the stability of the value of the correlation coefficient for the remaining explanatory variables in the model—digital vision, human cadres, organizational culture, and transformational leadership—with respect to the variable of quality of educational services in the Yemeni private universities under study. Additionally, the stability of the coefficient of determination (R2) was (0.851). Thus, the independent variables included in the improved model (digital vision, human cadres, organizational culture, and transformational leadership) explained (85.1%) of the variance in the quality of educational services. The remaining change is attributed to other variables that are not included in the model as well as the potential random error. In short, (85.1%) of the change in the quality of educational services in the Yemeni private universities under study can be explained by variations in the variables of digital vision, human cadres, organizational culture, and transformational leadership, whereas (14.9%) of that change is due to other factors.

The significant improvement in the multiple linear regression model for the independent variables related to the dependent variable is evident from the results of the analysis of variance (ANOVA). The calculated test statistic (F) is (430.318), which is greater than that in the previous model, which included all variables. Additionally, the probability value (Sig.) is (0.00), which is less than (0.05). This indicates that the improved multiple linear regression model is significant, and the influence of the variables (digital vision, human cadres, organizational culture, and transformational leadership) on the quality of educational services is statistically significant at this level. Accordingly, the model that incorporates the dimensions of digital vision, human cadres, organizational culture, and transformational leadership can be considered the best for studying the quality of educational services in the Yemeni private universities examined in this study.

It is worth noting that this result is consistent with the findings of the multiple regression analysis that includes all dimensions of the digital transformation application, as shown in Table 5. The analysis indicates that the impact of the infrastructure dimension on the quality of educational services is weak when considered alongside the other dimensions combined. Consequently, it appears logical to exclude this dimension from the model and to suffice the variables that have the most influence on the dependent variable, namely, digital vision, human cadres, organizational culture, and transformational leadership. This may be ascribed to the fact that the quality of educational services based on the application of digital transformation does not prioritize infrastructure to the same extent as the digital, human, organizational, and transformational leadership aspects.

Although the significance of the role of the digital transformation variable in the quality of educational services has been previously tested, it is necessary to retest it by considering the impact of the latent variables as follows:

Figure (2) The integrated model of the influential role of the independent variable (digital transformation) in the quality of educational services

TABLE (7): QUALITY OF CONFORMITY INDICATORS FOR THE MODEL OF THE ROLE OF DIGITAL TRANSFORMATION IN THE QUALITY OF EDUCATIONAL SERVICES

Indicators	Perfect Match Values	Acceptable matching values	Values of indicators in the model
Standard chi-square(CMIN/ df)	< 2	< 5	3.622
Goodness of Fit Index(GFI).	> 0.90	0 to 1	.935
Adjusted Good Fit Index(AGFI)	> 0.80	0 to 1	.888
Comparative Fit Index(CFI).	> 0.90	0 to 1	.983
Twicker and Lewis Index(TLI)	> 0.95	0 to 1	.976
Normalized Fit Index(NFI)	> 0.95	0 to 1	.976
Root mean square error of approach(RMSEA)	≥ 0.05	0.05 to 0.08	.063

From the results in Table (7) and Figure (2), it appears that the degree of achievement of the quality of conformity indicators for the model of the impact of the independent variable (digital transformation) on the dependent variable (quality of educational services) falls within the acceptable limits for the indicator (CMIN/df) and is ideal for the indicators (CFI), (GFI), (RMSEA), (AGFI), and (TLI). This indicates a high level of model conformity and reliability.

TABLE (8) SHOWS THE PATH OF THE ROLE OF DIGITAL TRANSFORMATION IN THE QUALITY OF EDUCATIONAL SERVICES

The path	Impact factor β (Estimate)	Standard error SE	Critical ratio CR	P value -
.Digital transformation< Quality of educational services	.843	.031	27.545	0.00

Table (8) shows that the digital transformation variable has a positive role in the quality of educational services in Yemeni private universities, with a standard impact coefficient value (β=0.843) that is statistically significant at a significance level of less than (0.05).

FINDINGS

Based on the results of the data analysis, the following conclusions were drawn:

1) The level of digital transformation in Yemeni private universities is high, with the highest dimensions of this variable being the human cadre and infrastructure dimensions, both of which have also been shown to be high in Yemeni private universities.
2) The level of quality of educational services in Yemeni private universities is high, with the highest dimensions of this variable (application/availability) being the academic aspect and organizational values dimensions, which have also been high in Yemeni private universities.
3) Digital transformation and its dimensions (digital vision, infrastructure, human cadres, organizational culture, transformational leadership) play a positive role in enhancing the quality of educational services in Yemeni private universities.
4) Transformational leadership has been found to be the highest dimension of digital transformation, with the greatest impact on the quality of educational services in Yemeni private universities.
5) The model containing the dimensions of digital vision, human cadres, organizational culture, and transformational leadership has been found to be the best for measuring the impact of digital transformation on the quality of educational services in Yemeni private universities.

RECOMMENDATIONS

The following recommendations were made based on the findings of this study:

1) Preparing a strategic plan for private universities that includes priorities for developing digital infrastructure and training human resources.
2) Specific technologies such as learning management systems and cloud computing are used to improve the quality of educational services.

3) Studying the feasibility of using artificial intelligence technologies to analyze academic performance and guide students.
4) Promoting a digital culture among employees and students through training courses and workshops.
5) Strengthening digital leadership at the university administration level to encourage digital transformation.
6) Increasing investment in training employees to effectively use digital tools.
7) Supporting academic leadership preparation programs to effectively implement digital transformation strategies.
8) Clarifying the digital goals of private universities and enhancing their integration into general strategic plans.

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