

## The role of quality 4.0 in supporting digital transformation: Evidence from telecommunication industry

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### ABSTRACT

The current study aimed to shed light on the influence of quality 4.0 including Data, Analytics, Connectivity, Collaboration, App Development, Scalability, Management Systems, Compliance, Culture, Leadership, and Competency in supporting organizational efforts of digital transformation among Jordanian telecommunication organizations. A quantitative approach was adopted to achieve the previously mentioned aim. An online questionnaire was filled out by a convenient sample of 141 quality managers and employees within Jordanian telecommunication organizations: namely Zain, Umniah, and Orange. SPSS was used to screen and analyze primary data and AMOS version 23 was used to test the study hypotheses. The results of the study accepted the main hypothesis which indicated that quality 4.0 increases organizations seeking to accomplish digital transformation due to its ability to present better chances for the organization to develop and adhere to quality standards. The study recommended supporting organizational IT infrastructure to make a good environment for quality 4.0 adoption.

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## 1. Introduction

Since the emergence of quality as a concept, a revolution has appeared with it related to the quality of work and services provided to customers, not to mention the quality as an approach to smooth the way for organizational excellence and customer satisfaction (Carvalho et al., 2021). With the development of time and the abundance of research and studies on the concept of quality, quality 4.0 appeared, which in turn made major changes to the way organizations follow in manufacturing and improvement based on the idea of enabling quality 4.0 technologies (Frizzo-Barker et al., 2020). Ever since, Quality 4.0 became associated with many contemporary technology concepts such as the Internet of Things IoT, cloud computing, artificial intelligence AI and machine learning ML, and organizations realized at the time that their adoption of the concept of quality 4.0 is closely associated with the extent of their interest in advanced technology in the business world and accordingly smart factories were configured with devices that are connected to advanced sensors, embedded software, and bots collect and analyze data enabling better decision-making (Fonseca et al., 2021). It is interesting to note that many initiatives centered around quality that are part of Quality 4.0 are not driven by quality, but rather by IT, operations, engineering, or sales and marketing. Furthermore, many conversations with quality leaders show that a significant portion does not clearly understand the technologies of Quality 4.0, their application, and their importance. Because of this reason, the significance of this study in addressing the problem of the fourth generation of quality and the idea of digital transformation is connected to it.

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## 2. Study objectives

This study aimed to examine and identify the role of quality 4.0 (independent variable) in supporting organizational efforts to conduct a successful digital transformation.

## 3. Problem statement

The term Quality 4.0 was launched during the 4<sup>th</sup> Industrial Revolution, which led to the intensification of digitization processes in the business environment and the creation of shifts in the level of industry efficiency and performance of supply chains, not to mention the creation of completely new products and business models (de Bem Machado et al., 2022). Sony et al. (2020) and Broday (2022) indicated that Quality 4.0 in its modern sense was seen as a leap that led to harmonizing quality management with the industrial revolution to enhance the foundations of innovation and creativity and improve the quality of business models. Ghobakhloo and Iranmanesh (2021) stressed that it was interesting that the concept, basics, and objectives of Quality 4.0 are centered on quality through technology, information technology, and various engineering processes in the operational activities of the organization. However, adopting quality 4.0 to enhance and develop the sense and reach of better quality among organizations needs a technological environment that can present quality 4.0 in all its glory, support its activities, and uncover the potentials that are carried around with quality 4.0. From that point, researchers were intrigued to examine how quality 4.0 and its benefits can be a driver that supports organizational efforts to accomplish digital transformation. In other words, the current study seeks to determine the role of Quality 4.0 (Data, Analytics, Connectivity, Collaboration, App Development, Scalability, Management Systems, Compliance, Culture, Leadership, and Competency) in enhancing organizational efforts in the transition toward digital transformation.

## 4. Literature review

### 4.1 Quality 4.0 (Fourth Generation of Quality)

Linguistically, the concept of quality refers to the attainment of something of a high degree of quality and excellent value; it is one of the criteria used to measure the excellence of business, products, and services from others. In addition to that, it is based on measuring a service or a product in terms of being free from defects or any reasons to criticize it negatively (Kumar et al., 2021). We live today in a digital stage based on modern technologies, big data, cloud computing, and e-learning; this is what prompted the launch of what is known today as the fourth generation of Quality (Quality 4.0). This term appeared as a reference to the blending of traditional and modern trends in production by focusing on operational efficiency, creativity, and access to innovative ideas to meet the desires of customers. It is worth mentioning here that quality 4.0 is based on the fact that quality transitioned from being an option, into being a requirement (Sony et al., 2020). Escobar et al. (2021) and Nenadál (2021) looked at quality 4.0 as a case of developing the concept of quality and integrating it with modern technology along with various techniques in line with the fourth industrial revolution, which called for the automation of quality practices to achieve institutional excellence in organizations. Sony et al. (2021) saw that quality 4.0 is the use of modern digital tools and means and their application to quality practices to achieve performance excellence and create new strategies to ensure access to quality.

#### 4.1.1 Axes of Quality 4.0

Specialists referred to quality 4.0 as the fourth industrial revolution on the grounds that it emerged as a push towards digital manufacturing that aimed at making significant improvements to the activities of organizations (Zonnenshain & Kenett, 2020). Such improvements included operational, manufacturing, and administrative processes, in addition to production efficiency and profits (Seo et al., 2021). Adopting quality 4.0 means that the organization digitizes its physical assets to add a higher quality value to the activities of the organization (Efimova & Briš, 2021). In general, the academic and industrial community has relied on the quality of 11 pillars which included (LNS research, 2022):

#### *Data Axe*

Data-based decisions have always been one of the essential things related to quality, it means adopting evidence-based decision-making (data); this axis emphasizes the key role of big data in influencing the quality of decisions that are taken and directing them in the interest of the organization (Escobar et al., 2021). In general, data is the key to making the right and informed decision (Sedar et al., 2021, Hashem, 2016). While many organizations still rely on fragmented data, there are other organizations that rely on big data by adopting its main components which are size, diversity, transparency, honesty, and speed (Armani et al., 2021).

#### *Analytics Axe*

Analysis in quality 4.0 helps uncover ideas in big data by relying on the right metrics to detect patterns in the data and how to solve them and arrive at meaningful information (Javaid et al., 2021). Machine learning (ML) and artificial intelligence (AI) are among the most important tools used in big data analysis (Javaid et al., 2021).

### *Connectivity Axe*

Connectivity includes links and connections between information technologies and quality management systems in all their forms including organization quality management, product life cycle management, and organization resource planning (Saihi et al., 2021). Here, the connectivity hub is adopted by relying on inexpensive sensors that provide feedback in real-time callers related to products and operational activities (Armani et al., 2021).

### *Collaboration Axe*

Collaboration is one of the most important concepts in the field of quality management, it is mainly focused on adopting various technological tools such as e-mail, social media, and many others to assess the quality and draw their attention to things that may have been absent from them during the manufacturing process (Alzahrani et al., 2021). Social media contributes greatly to deepening the communication with the factory and criticizing the quality in the interest of the organization and greater value for the customer. One of the most important collaboration tools is the Enterprise Quality Management System (EQMS), which works to increase the efficiency and better synthesis of quality processes (Javaid et al., 2021).

### *App Development Axe*

An organization that depends in its transactions with its customers through an application is considered to have a higher market value compared to those that do not have an application of its own (Tambare et al., 2021). Applications are one of the main tools that enable organizations to communicate with their customers; the principle of applications greatly helps in creating a customer base by storing, classifying, and collecting data related to customers from phone numbers, names, email, traits, and different purchasing desires (Belaud et al., 2019). Such applications include augmented reality (AR) or virtual reality (VR), both of which contribute to hindering communication and connectivity with customers through the application platform (Armani et al., 2021).

### *Scalability Axe*

Scalability can expand the idea of quality by coordinating better and more valuable internal processes and activities, as well as ensuring quality practices and behaviors that change the culture of the organization by moving it to a higher and more valuable level (Gohane et al., 2020). Cloud computing is one of the most important scalability tools, which was able to provide scalability in the concept of quality by providing programs that help in this such as Software as a service (SaaS), Infrastructure as a service (IaaS), Platform as a service (PaaS) and various databases (Alzahrani et al., 2021).

### *Management Systems Axe*

The adoption of different management systems is important and reinforces the concept of quality 4.0, as there are many different management systems that can be adopted to ensure stronger scalability, analytics, connectivity, and access to higher quality such as EQMS systems, through this software, organizational work can be accomplished, thus directing the efforts and capabilities of working individuals towards improvement, innovation, and creativity (Isaac, 2020).

### *Compliance Axe*

Compliance here refers to the techniques and tools that the organization adopts to automate its activities; it is an important aspect within the quality practices as compliance ensures that the processes, products, and services are compatible with the regulatory and industrial requirements (Ali & Johl, 2021).

### *Culture Axe*

Many organizations adopt the culture of quality on the grounds that it contributes to the overall strategic success by relying on linking data, processes, and analytics, and thus access to views that serve in improvement and development regarding vision and communication, and quality 4.0 becomes more applicable (Jordan, 2020).

### *Leadership Axe*

Many advocates of quality stress the importance of leadership, as leadership with a deep and sufficient understanding of the concept of quality has an active role in bringing the organization to a stage where quality is an integral part of its culture and not only associated with senior management (Sureshchandar et al., 2022). On the other hand, leadership plays a vital role in the management of quality by facilitating the implementation of these programs and focusing the orientations of the working individuals toward achieving quality in their work (Tambare et al., 2021). Leadership is one of the most crucial elements that are relied upon in the implementation of total quality strategies, as the leadership role is transformed from a mere mental duty to a multifunctional role related to quality and its achievement (Ali and Johl, 2021).

Quality 4.0 is rich in many technologies that will ensure continuous improvement and development, such as artificial intelligence tools and virtual reality, which are tools that enable the organization to achieve outputs capable of helping employees and developing their level of performance in addition to improving development and training (Broday, 2022). Through such tools and techniques, there would be a chance for the organization to support their employees in all chances that are able to increase and develop their competencies (Issac, 2020).

#### 4.2 Digital Transformation DT

Most organizations seek to demonstrate how to remain competitive and maintain a higher market share than their competitors (Zaoui and Souissi, 2020). Many organizations even see that the term digital transformation is widely used today (Vial, 2021). It has contributed to organizations re-engineering the jobs available in them, rethinking many old and traditional business models, and adopting new business models that fit the digital age in which they operate (Nadkarni and Prügl, 2021). Verhoef et al. (2021) indicate that technology has an important and leading role in influencing the organization's ability to develop and raise the value of customers launching from the fact that information technology managers and specialists in organizations have a significant impact in increasing the organization's orientation towards digital transformation and adopting the foundations of modern digitization. Hilbert (2022) defines digital transformation as the introduction of digital technology into the activities of organizations in the business environment to bring about a fundamental change in the way the organization is managed and provide higher value to customers. Gong and Ribiere (2021) defined it as an organizational culture change that 'forces' the organization to challenge the work environment and move towards business automation to ensure better performance, higher quality, and lower costs. Llopis-Albert et al. (2021) and Fletcher and Griffiths (2021) pointed out that due to the fact that digital transformation differs from one organization to another, it is difficult to provide a unified definition of the concept of digital transformation that applies to all organizations, but in general, it can be said that digital transformation is changing how managing the organization by integrating technology in its work and making changes to its culture that push it towards trial, failure or success based on different data and challenges.

### 5. Hypotheses Development

A study by Thekkoote (2022) aimed to identify quality 4.0 and its role in identifying the digital technologies necessary for the organization to improve its digital and organizational capabilities. It involves digital transformation by creating an environment conducive to hosting the quality 4.0 hubs which include (data, analytics, connectivity, collaboration, development of APP, scalability, compliance, organization culture, leadership, and training for Q4.0.). Thekkoote (2022) proved that to manage the adoption of quality 4.0, the organization must take an extra mile to support its IT infrastructure and arm itself with the needed technological advancements. Fonseca et al. (2021) through their study, they aimed to identify the requirements and rationale for the European Foundation for Quality Management (EFQM) 2020 model and indicated that this model constitutes an integrated business model aimed at quality, sustainability, and access to continuous improvement coupled with high organizational performance. By examining the relationship between the EFQM model and quality 4.0, the researchers came to the conclusion that adopting the EFQM model is one of the most important data that the organization can make for organizational excellence in performance, but it is fully linked to the transformation Successful digital and upgrading towards business automation in an updated technological way that is capable of bringing the organization to the full adoption of the EFQM model.

### 5. Research Model

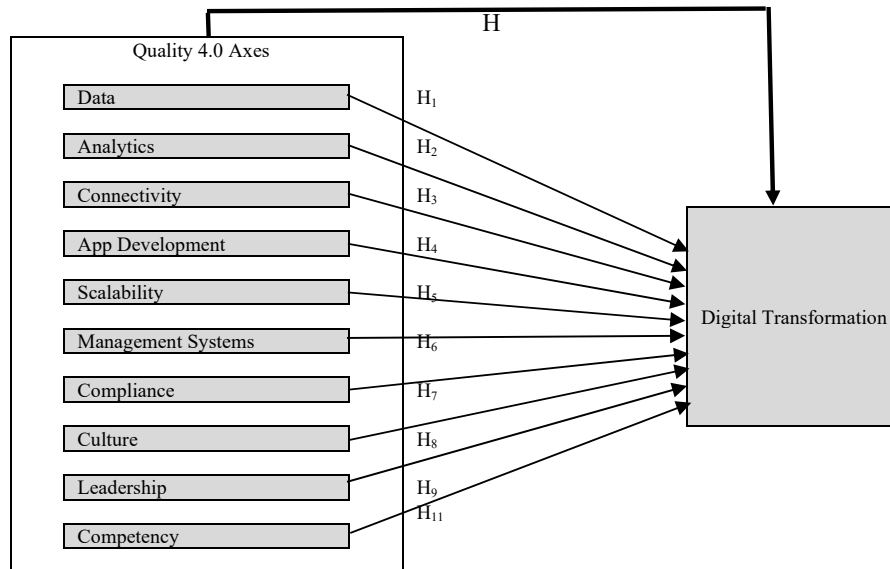
The current study proceeded from the Kaizen concept of quality, which by its nature is a philosophy that aspires to enhance organizations' pursuit of continuous improvement through the adoption of tools, mindsets, and the right attitude (Supriyanto and Benty, 2019). Kaizen is a Japanese word for continuous improvement, where 'Kai' means change and 'Zen' means good "good change." This good change occurs through improving operational practices and adopting higher standards to achieve quality (Tesfay, 2021). Also, the current research is built on the theory of the Technology Acceptance Model (TAM), which is a theory that revolves around the extent to which individuals accept technology and their intention to use it, in addition to their ability to perceive the usefulness of the technology used, the ease of use of the technological tools, and programs that are applied (Assaker, 2020). Furthermore, the researcher also adopted a situational theory, which is based on the attitude and behavior of individuals towards a specific task, which is usually entrusted leadership in that it is usually assigned to individuals with specific tasks to be carried out by the leadership, and they are studying the tasks, skills, and abilities required of them to complete these tasks, but sometimes, the leader needs to delegate new tasks to individuals that they may not have experience with, and may not have been exposed to them previously. Here comes the role of the situational theory in the leader's attempt to provide support, guidance, and provide the necessary information to individuals to improve their behavior and attitude towards these tasks and then move towards achieving the desired goal (Zheng, 2020). The previously presented model explained the relationship between variables as sought by the current study's aim.

#### Main Hypothesis:

**H:** *Quality 4.0 has a significant role in supporting organizational shifting toward digital transformation.*

## Sub-Hypotheses:

- H<sub>1</sub>:** Data has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>2</sub>:** Analytics has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>3</sub>:** Connectivity has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>4</sub>:** Collaboration has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>5</sub>:** App development has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>6</sub>:** Scalability has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>7</sub>:** Management system has a significant role in supporting organizational shifting towards digital transformation.  
**H<sub>8</sub>:** Compliance has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>9</sub>:** Culture has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>10</sub>:** Leadership has a significant role in supporting organizational shifting toward digital transformation.  
**H<sub>11</sub>:** Competency has a significant role in supporting organizational shifting toward digital transformation.



**Fig. 1.** Study Model (Sony et al., 2020; de Bem Machado, 2022; Ghobakhloo and Iranmanesh, 2021)

## 6. Method

### 6.1 Research Design

The current study adopted the quantitative approach to access the primary data, which in turn contributes to the researcher's delivery of statistics and figures capable of explaining the phenomenon and identifying its merits. It is worth noting that the current research is deductive in nature, that is, it follows the logical deductive approach in arriving at the results by starting with specific observations and reaching general conclusions.

### 6.2 Measurements

The questionnaire was used as a measurement tool to collect the primary data, where the researcher built the questionnaire using previous studies, which included Broday (2022), Sony et al. (2020), and de Bem Machado et al. (2022). The questionnaire consisted of two main parts, the first being the demographic factors of the study sample, while the second part represented paragraphs related to the independent study variables (Quality 4.0) with its dimensions (Data (6 items), Analytics (6 items), Connectivity (5 items), Collaboration (5 items), App Development (5 items), Scalability (6 items), Management Systems (6 items), Compliance (4 items), Culture (5 items), Leadership (5 items) and Competency (5 items), and the dependent variable (digital transformation 7 items). The questionnaire was built based on the five-point Likert scale (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree.

For the purposes of arbitration, the questionnaire was presented to a sample of specialists and academics in the field where they reviewed the questionnaire's axes and its variables, and in agreement with the researcher, the most appropriate paragraphs were selected for the nature of the study.

In line with the laws and regulations of COVID-19 that recommend social distancing, the questionnaire was uploaded to the Google Forms platform, and distributing the link to the study sample members for the purposes of responding electronically,

where the questionnaire was left on the platform for 6 consecutive weeks to collect the largest number of questionnaires valid for analysis.

### 6.3 Population and Sampling of Study

The study population was represented by the total quality managers in Jordanian telecom companies counted (350) managers according to the annual reports of telecommunication organizations in Jordan (Orange, Zain, and Umniah) (2019). A nonprobability sample was determined by the researcher as the possibility for collecting the responses. The sample size was (183) Individuals of quality managers, selected to represent the study population. After 6 weeks of electronically distributing the questionnaire, an Excel file was obtained from Google Forms, which indicated the existence of (141) valid questionnaires for statistical analysis. This confirmed that the response rate reached (76.6%), which is statistically acceptable.

### 6.4 Data Analysis

The data was sorted and processed by using SPSS version 23 for statistical tests including frequencies, means, percentages, and standard deviation. Whereas AMOS version 23 was used to test the study hypotheses by using multiple regression, and correlation analysis.

## 7. Analysis and results

### 7.1 Demographic Results

Demographics of the study sample were analyzed; frequencies and percentages were calculated; it appeared that the majority of respondents (55.3%) were males with the frequency of 78 individuals who were older than 43 years old forming 40.4% of the total sample. In addition to that, it appeared that most of the sample individuals had an educational level of BA forming 48.2% and an experience of more than 14 years in the field forming 46.8% of the total sample.

### 7.2 Descriptive Statistics

Mean and standard deviation are used to determine the level of importance of the variables. The study depends on the following scale to determine the level of importance (Gujarati & Porter, 2009):

Range	Level of importance
1-2.33	low
2.33-3.66	medium
3.67	high

The following results were found:

**Table 1**  
Descriptive Statistics

Variable	# of Statement	Mean	Std. Deviation	Level of Importance
Data	6	3.7139	.63036	high
Analytics	6	3.9078	.84807	high
Connectivity	5	3.9801	.75264	high
Collaboration	5	3.9645	.55099	high
App Development	5	4.1645	.65652	high
Scalability	6	3.7790	.84127	high
Management Systems	5	3.8823	.91591	high
Compliance	4	3.7589	.95497	high
Culture	5	3.8014	.92597	high
Leadership	5	4.2340	1.00796	high
Competency	5	3.8326	.96351	high
Digital Transformation	7	4.0253	.91046	high

As seen in Table 1 above, all variables scored a high level of importance since their means ranged between (3.67-5) higher than the mean of the scale of 3.00 which indicate that respondents had positive attitudes towards the variables as they were able to respond to each one in a positive approach indicating that all variables were well-received. It can also be seen through the table that the highest variable scored a mean of 4.23/5.00 which was leadership compared to the least mean 3.75/5.00 which was scored by compliance. This indicated that all variables scored a positive relationship to the dependent variable as they all scored higher than the mean of the scale; however, leadership presented a strong relationship compared to the weakest relationship which was presented by compliance.

### 7.3 Reliability Analysis

Cronbach's alpha was a measure of a scale's reliability and consistency, and as demonstrated in the following Table 2, alpha values appeared to be greater than 0.60 which implies that the study tool was dependable and consistent (Gujarati & Porter, 2009).

**Table 2**  
Reliability Test

variable	Alpha value
Data	0.728
Analytics	0.914
Connectivity	0.94
Collaboration	0.737
App Development	0.701
Scalability	0.874
Management Systems	0.911
Compliance	0.934
Culture	0.933
Leadership	0.92
Competency	0.951
Digital Transformation	0.924

### 7.4 Multicollinearity analysis

To determine whether there is multicollinearity between the variables, the VIF and Tolerance for the independent variables were determined, and the following outcomes were obtained:

**Table 3**  
Multicollinearity Test

Variable	Tolerance	VIF
Data	.238	4.199
Analytics	.361	2.772
Connectivity	.200	5.003
Collaboration	.172	5.806
App Development	.210	4.771
Scalability	.215	4.643
Management Systems	.140	7.132
Compliance	.192	5.213
Culture	.143	7.007
Leadership	.257	3.891
Competency	.158	6.311

As seen in above table 3, the VIF values were less than 10, and the Tolerance values were more than 0.10, suggesting the absence of multicollinearity (Gujarati & Porter, 2009).

### 7.5 Hypotheses Testing

Before beginning structural analysis, the recommended research model has to be evaluated by employing a set of indicators so that it can be determined whether or not it is appropriate for this study. , more specifically:

**Table 4**  
Fit model

Indicator	AGFI	$\frac{X^2}{df}$	GFI	RMSEA	CFI	NFI
<b>Value Recommended</b>	<b>&gt; 0.8</b>	<b>&lt; 5</b>	<b>&gt; 0.90</b>	<b>≤ 0.10</b>	<b>&gt; 0.9</b>	<b>&gt; 0.9</b>
<b>References</b>	(Miles and Shevlin, 1998).	(Tabachnick and Fidell, 2007)	(Miles and Shevlin, 1998).	(MacCallum et al., 1996)	(Hu and Bentler, 1999).	(Hu and Bentler, 1999).
<b>Value of Model</b>	0.856	4.073	0.962	0.062	0.972	0.956

According to the facts presented in Table, all of the aforementioned indicators have reached both the minimum and maximum values indicated by the relevant references. As a direct consequence of these findings, the following hypothesis may be tested:

**Table 5**  
Hypotheses Testing

			Path Coefficients ( $\beta$ )	T-value	P	R <sup>2</sup>	Decision
Digital Transformation	←	Data	-.387	-12.604	***	0.868	accept
Digital Transformation	←	Analytics	.152	4.959	***		accept
Digital Transformation	←	Connectivity	-.384	-12.499	***		accept
Digital Transformation	←	Collaboration	.361	11.757	***		accept
Digital Transformation	←	App Development	.269	8.753	***		accept
Digital Transformation	←	Scalability	.193	6.300	***		accept
Digital Transformation	←	Management Systems	.178	5.790	***		accept
Digital Transformation	←	Compliance	.16	5.213	***		accept
Digital Transformation	←	Culture	.272	8.850	***		accept
Digital Transformation	←	Leadership	.284	9.240	***		accept
Digital Transformation	←	Competency	.31	10.098	***	accept	

When the aforementioned hypothesis was tested, it was discovered that the  $R^2 = 0.868$  was statistically significant at the 0.05 level, which means independent variables explain 86.8% of the variance in the dependent variable this indicated that the hypothesis was accepted, and "Quality 4.0 has a significant role in supporting organizational shifting towards digital transformation". This has led to realizing that the t value of each variable was significant at level 0.05 reaching what follows:

**H<sub>1</sub>:** Data has a significant role in supporting organizational shifting toward digital transformation.

This hypothesis is accepted ( $\beta = -0.387$ ;  $P < 0.05$ ; = 0.000). This means that Data has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>2</sub>:** Analytics has a significant role in supporting organizational shifting toward digital transformation.

This hypothesis is accepted ( $\beta = 0.152$ ;  $P < 0.05$ ; = 0.000). This means that Analytics has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>3</sub>:** Connectivity has a significant role in supporting organizational shifting toward digital transformation.

This hypothesis is accepted ( $\beta = -0.384$ ;  $P < 0.05$ ; = 0.000). This means that Connectivity has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>4</sub>:** Collaboration has a significant role in supporting organizational shifting toward digital transformation.

This hypothesis is accepted ( $\beta = 0.361$ ;  $P < 0.05$ ; = 0.000). This means that Collaboration has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>5</sub>:** App development has a significant role in supporting organizational shifting toward digital transformation.

This hypothesis is accepted ( $\beta = 0.269$ ;  $P < 0.05$ ; = 0.000). This means that App development has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>6</sub>:** Scalability has a significant role in supporting organizational shifting towards digital transformation.

This hypothesis is accepted ( $\beta = 0.193$ ;  $P < 0.05$ ; = 0.000). This means that Scalability has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>7</sub>:** Management system has a significant role in supporting organizational shifting towards digital transformation.

This hypothesis is accepted ( $\beta = 0.178$ ;  $P < 0.05$ ; = 0.000). This means that the Management system has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>8</sub>:** Compliance has a significant role in supporting organizational shifting towards digital transformation.

This hypothesis is accepted ( $\beta = 0.16$ ;  $P < 0.05$ ; = 0.000). This means that Compliance has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>9</sub>:** Culture has a significant role in supporting organizational shifting toward digital transformation.



This hypothesis is accepted ( $\beta = 0.272$ ;  $P < 0.05$ ; = 0.000). This means that Culture has a significant role in supporting organizational shifting toward digital transformation.

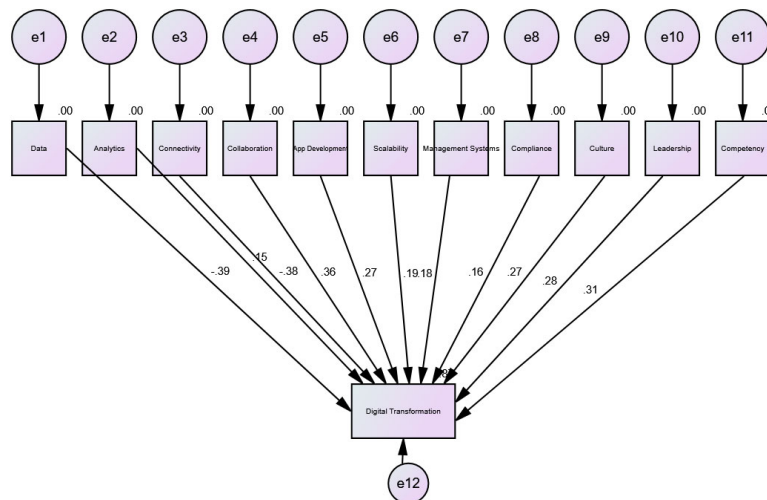
**H<sub>10</sub>:** Leadership has a significant role in supporting organizational shifting towards digital transformation.

This hypothesis is accepted ( $\beta = 0.284$ ;  $P < 0.05$ ; = 0.000). This means that Leadership has a significant role in supporting organizational shifting toward digital transformation.

**H<sub>11</sub>:** Competency has a significant role in supporting organizational shifting toward digital transformation.

This hypothesis is accepted ( $\beta = 0.31$ ;  $P < 0.05$ ; = 0.000). This means that Competency has a significant role in supporting organizational shifting toward digital transformation.

The above results are summarized in the following Graph of the Structural Model:



## 7.6 Discussion

The current study aimed to examine the role of quality 4.0 in supporting digital transformation. The results indicated that the main hypothesis of the study was accepted, and it appeared that quality 4.0 increases the organization's seeking to accomplish digital transformation due to its ability to present better chances for the organization to develop and adhere to quality standards. The main aim of the study was reached, and it appeared that adopting quality 4.0 and adapting to its axes can facilitate digital transformation. In other words, the organization endeavors to reach excellence in operations, and quality can be supported through quality 4.0 based on its needs, when the organization realizes the kind of changes that are needed to adopt quality 4.0; it will be more aware of the need to digitize its practices, support its IT infrastructure and become more vigilant towards its digitalization needs. Quality 4.0, according to the study and its results, contributed to a qualitative leap in the introduction of value to manufacturing and production processes, in addition to increasing the value of the customer, and this agrees with Broday (2022). In addition, the trend towards quality 4.0 and the benefits that the organization can obtain emphasized the importance of digital transformation (digitization), which is based on reinventing processes and organizational activities and qualifying a workforce capable of understanding quality and realizing its importance, in addition, the study found that the transformation of organizations from traditional quality to quality 4.0 had a major role in the organizations realizing that quality 4.0 is an inevitable reality and that organizations that are slow in digital transformation expose themselves to the risk of marginalization more quickly compared to those organizations that are moving towards digitization from in order to reach higher quality and lower cost. The study proved its previously presented hypotheses, and its results indicated that the concept of Quality 4.0 has a significant impact in pushing organizations towards adopting digital transformation by transforming the adoption of technology to increase the level of cooperation and efficiency and enhance the technological culture in the organization, in addition to enabling information technology and its positive impact. Based on the previous argument, all constructs of quality 4.0 and mainly management systems have a significant impact on the internal processes of the organization, which includes internal processes, financial performance, customer value, learning and growth, environmental, and social performance. By adopting the positive impact of Quality 4.0 on digital transformation, it can be said that this impact returns and positively affects the aforementioned variables on the grounds that the trend towards digital transformation and digitization of processes and organizational activities will be able to add more value to the products and services of the organization All the way to customer satisfaction and then better organizational performance.

## 8. Conclusion and recommendations

The study proved through the analysis of the collected primary data that digital transformation is inevitable for organizations. After reviewing the idea of quality 4.0 and its impact on organizational performance, digital transformation appears as one of the crucial factors in maintaining the competitive capabilities of organizations, this can be attributed to the fact that digital transformation today is no longer just an attractive idea for organizations to show that they are advanced and keep pace with the changes of the times. On the contrary, digital transformation and moving to the cloud is necessary for organizations to take full advantage of technological developments and reach a stage in which the culture of the organization is closely related to quality that will lead the organization to customer satisfaction, higher market share, and stronger competitiveness based on outstanding and solid performance. From the results and conclusion, the current study recommended the following:

- I. Increase individuals' awareness of quality 4.0 and its role in attaining organizational excellence.
- II. Support organizational IT infrastructure to make a good environment for quality 4.0 adoption.

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