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The Adoption of Digital Transformation in the Ministry of Education in Saudi Arabia

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Abstract

Countries have been adopting digital transformation to improve organisational performance and productivity. In Saudi Arabia, digital transformation is one of the key pillars of the Saudi Vision 2030. However, the adoption of digital transformation is in its early stages. Based on the responses to a survey of educational supervisors in the Department of Education in Dawadmi Province, this study used the technology-organization-environment (TOE) model to determine the factors impacting the adoption of digital transformation in the Ministry of Education in Saudi Arabia. The TOE has seven independent factors (relative advantages, compatibility, complexity, top management support, attitude toward change, organization readiness, and regulatory environment), all of which can impact digital transformation adoption. Correlation analysis was used to examine the relationship between these factors and digital transformation adoption. The results reveal that all seven factors had positive significant relationships with digital transformation adoption, with attitude toward change having the strongest relationship. The TOE model also successfully predicted the adoption of digital transformation in the Saudi context and can be applied to other sectors within Saudi Arabia.

Disciplinary: Digital Transformation, Information Systems.

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1 Introduction

Digital technologies have rapidly developed and they currently have had a significant impact on societies and business operations [1]. Because most countries worldwide are seeking to adopt digital transformation for the benefits it offers, this area is a focus of interest for many studies. Recent examples include the study exploring the factors influencing the intention of South African

retail organizations to adopt digital transformation [2] and the study by [3] which identified success factors fostering digital transformation in manufacturing companies in Germany.

The Ministry of Education in Saudi Arabia is currently seeking to adopt digital transformation in its departments. It has already established the Public Administration of Digital Transformation that is responsible for technological initiatives in the Ministry to achieve one goal of Saudi Arabia's Vision 2030 [4]. Some innovative systems and platforms, such as the Noor System, Future Gate, Rasel System, Fares System, and Safeer2, have already been launched by the Ministry of Education [4]. This study aimed to determine the factors that impact the adoption of digital transformation in the Saudi Ministry of Education, based on a survey conducted with educational supervisors in the Department of Education in Dawadmi Province. Using this case study approach will help provide a clear picture for decision-makers in the Ministry about digital transformation uptake by different departments.

2 Literature Review

2.1 Digital Transformation

Digitalization is a key trend causing rapid changes in businesses and societies [1]. According to [5], digital transformation is defined as "the changes associated with the application of digital technology in all aspects of human society". Digital transformation involves the merging of personal and corporate IT environments and transformation using new digital technologies, such as the Internet of Things [6]. Digital transformation is successful through its enhanced strategies and re-engineering of business processes and models [7-9]. Boneva [10] noted that adopting digital transformation by using new digital technologies leads to improved performance and productivity for organizations based on significant changes in organizational structures, processes, and systems. Digital technology has a role as a key enabler of innovation rather than being a driver of marginal efficiency [8].

Despite digital transformation being considered important for businesses, the implementation of digital transformation can be difficult [11]. Agushi [12] stated there are four challenges to implementing the digital transformation, namely, regulatory concerns, talent challenges, culture and mindset issues, and lack of vision and purpose. According to [8], there are nine managerial challenges to adopting digital transformation: managing the important roles and market positions of technical platforms; managing big data; coping with user-centric systems; go-to-market and scalability; managing digitalization and service transformation; shaping new cooperative business models; managing new digital entrepreneurs and their rapid processes of intermediating; creating new businesses across industry boundaries and industry logics and re-organization of digitalizing customers. According to some studies, digital transformation will have a bigger impact on organizations than the industrial revolution [13, 14]. Consequently, in the current digital era, digital transformation has become more important for business leaders and it

has received a lot of attention [15, 16]. For instance, publications on digital transformation increased from seven articles in 2003 to 319 articles in 2018 [17].

2.2 Digital Transformation in Saudi Arabia

Digital transformation is one of the key pillars of the Saudi Vision 2030, which aims to provide citizens with a set of opportunities in the digital age to achieve a better quality of life and economic sustainability [18]. Digital transformation is a key factor and enabler of Saudi Arabia's National Transformation Program to achieve Vision 2030. Consequently, there are 29 essential digital initiatives for key sectors, five common digital platforms, and a number of national digital assets which can be used to achieve digital transformation [19]. The Saudi government believes that embracing the next (fourth) industrial revolution, based on digitalization, is necessary for developmental success. Consequently, if Saudi organizations do not accept digital transformation, they will fail. In Saudi Arabia, therefore, the change to digitalization is inevitable and organizations in government or the private sector must meet consumers' needs, wants, and expectations by embracing digital transformation. However, most Saudi organizations have no plans and strategies to implement digital transformation because they feel threatened by it [20]. The recent study [21] found many challenges preventing the adoption of digital transformation in Saudi Arabia Usage experience, namely, awareness, cybersecurity, and trustworthiness.

In Saudi Arabia, there is demand for new technologies and most of the population uses smartphones and technologies. According to the latest report from [22], there were 46.35 million subscriptions to mobile telecommunications services by the end of 2020, representing about 135.5% of the population. There were also a total of 29.7 million mobile broadband services representing approximately 93.5% of the population. The total number of current internet users in the Kingdom is estimated to be over 26 million [23]. Therefore, the Ministry of Education is seeking to build an educational digital society and smart environment for effective digital transformation by providing ICT infrastructure, solutions, and innovative technology services that facilitate services ministry operations and enable its staff to provide good services for beneficiaries [4].

In 2019, the Minister of Education established the Public Administration of Digital Transformation which is responsible for digital transformation in the Ministry. It has several strategic goals such as (i) rationalization of financial spending; (ii) enhancing and increasing costumers' satisfaction; (iii) providing innovative electronic channels; (iv) providing safe and sustainable ICT infrastructure; (v) increasing the efficiency and quality of electronic solutions and services [4].

2.3 Research Model and Hypotheses

This study adopted a Technology-Organization-Environment (TOE) Framework to achieve its aims. TOE was proposed in 1990 by Tomatzky and Fleischer to explain organizational constructs that impact the adoption decisions of firms [24]. TOE is a common model used to examine the adoption of innovative and modern technologies in an organization by classifying the factors that impact the adoption of new technology into three categories: technology context, organization

context, and environment context [25]. TOE is considered a suitable model to study decision-making in relation to the adoption of innovation in organizations at an organizational level rather than at the user level. The technological context refers "to the existing as well as new technologies relevant to the firm" and the organizational context refers to "the internal factors in an organization, influencing an innovation adoption and implementation." The environmental context "is the arena surrounding a firm, consists of its industry, technology support infrastructure and government regulation" [25]. In addition, future planning and strategies are formulated by decision-makers, so the adoption of the TOE is supported theoretical and empirically and is widely used in the IS domain [26]. TOE has been used in many previous studies in the field of information and communication technology (ICT) to study the adoption of technological innovation [25, 27-33]. The proposed research model used in this study is presented in Figure 1.

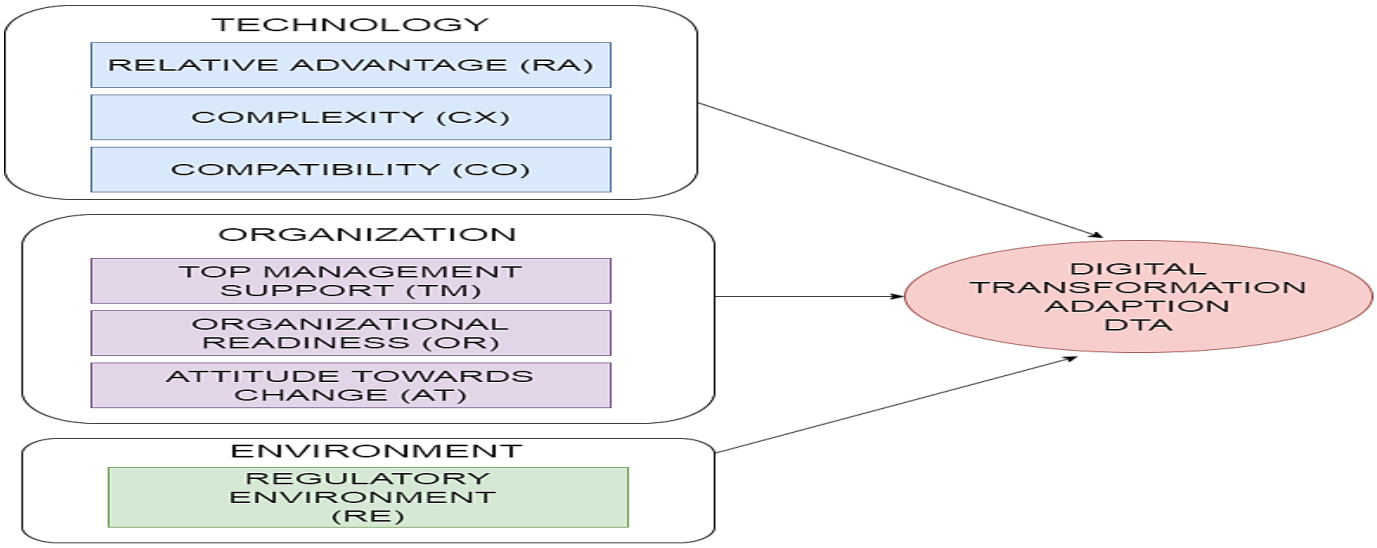

Figure 1: The proposed TOE research model examining Digital Transformation adoption in the Saudi Ministry of Education.

2.4 Relative Advantage (RA)

Relative advantage is a key indicator of new technological innovation adoption in the Information Systems (IS) field [28] because it is considered to be a factor that is widely used to facilitate the adoption of such systems [34]. It is defined as the degree of technological innovation perceived as providing better benefits for organizations [28]. In this study, relative advantage indicates the extent to which digital transformation is perceived as providing more benefits to the Ministry of Education than the current system. The prospect of such adoption will increase for new innovations in organizations when organizations are aware of the relative advantage of the innovation [35]. The results of a previous study by San-Martín, Jiménez [36] revealed that perceived benefits (advantages) influenced mobile CRM systems adoption. [37, 38] found that relative advantage has a significant positive impact on cloud computing adoption. Relative advantage has also been significantly positively related to Artificial Intelligence (AI) adoption [39]. Consequently, the following is hypothesized:

H1: Relative advantage will have a significant impact on digital transformation adoption.

2.5 Complexity (CX)

Complexity refers to the extent that the new innovation is difficult to use and understand [25]. The adoption rate will increase if the new technologies are easy to use, understandable and manageable [28]. Organizations will be hesitant to adopt a new innovation if they consider it to be complex and if they do not understand it [30]. In the same way, if a new innovation is easier to use and understand, it will be adopted faster than complex innovations [25]. A recent study found that complexity has a significant impact on cloud computing adoption [38]. Complexity is also significantly related to Artificial Intelligence (AI) adoption [39]. Consequently, the following is hypothesized:

H2: complexity will have a significant impact on Digital transformation adoption.

2.6 Compatibility (CO)

Compatibility is considered a core element in the adoption of new innovative technologies in the IS field. It refers to the extent that the new innovation is consistent with the organization's needs and values [28]. The probability of the adoption of new innovation will be increased if it is compatible with organizational needs and values [40]. Rahayu and Day [41] found a significant positive correlation between compatibility and e-commerce adoption. Other recent studies have found that compatibility has a significant positive impact on cloud computing adoption [37, 38] and Artificial Intelligence (AI) adoption [39]. Consequently, the following is hypothesized:

H3: Compatibility will have a significant impact on Digital transformation adoption.

2.7 Top Management Support (TM)

Top management support is considered a core factor to adopting new technologies and new innovations in the IS field [29]. It plays a key role in adopting and implementing new technologies by sponsoring the initiatives and diffusion within organizations [40]. Top management support is defined as a set of managerial beliefs that seek to adopt new innovative technologies and support initiatives in organizations [42]. A strong significant relationship between top management support and e-government assimilation was found in [29]. Top management support also has significant impacts on e-commerce adoption by SMEs [43], cloud computing adoption [37], and Artificial Intelligence (AI) adoption [39]. Consequently, the following is hypothesized:

H4: Top management support will have a significant impact on Digital transformation adoption.

2.8 Organizational Readiness (OR)

Organizational readiness indicates that an organization has the required resources to adopt a new innovation successfully [44]. In this study, the readiness of organizations refers to the readiness of schools in terms of technological infrastructure, human resources, information technology, and finances that are required to successfully adopt digital transformation. In [45] a significant relationship between organization readiness and IT decision makers' intent to adopt cloud computing was reported. Organizational readiness has also had a significant impact on smart city adoption decisions [46]. Consequently, the following is hypothesized:

H5: Organizational readiness will have a significant impact on Digital transformation adoption.

2.9 Attitude Toward Change (AT)

Attitude is defined as "an individual's positive or negative feelings (evaluative effect) about performing the target behaviour" [31]. [47] found that attitude towards using had a positive impact on intention to use a Learning Management System LMS. Attitude toward change also had significant impacts on the decision to adopt Cloud Computing in Saudi healthcare organizations [27] and behavioral intention to use m-government applications in Saudi Arabia [48]. Consequently, the following is hypothesized:

H6: Attitude toward change will have a significant impact on Digital transformation adoption.

2.10 Regulatory Environment (RE)

Regulatory environment refers to "an environment comprised of government regulations, policies, and laws that organizations must comply with" [29]. Hart and Saunders [49] found that the regulatory environment is a significant factor in adopting new innovations. It has been claimed that government policies and legislation may impact decisions to adopt innovative technologies in a healthcare organization [50]. The regulatory environment is also a strong factor in the preliminary adoption of e-commerce [51] and on organizational intention to adopt big data [52]. Consequently, the following is hypothesized:

H7: The regulatory environment will have a significant impact on Digital transformation adoption.

3 Methodology

The questionnaire used in this study was distributed among educational supervisors in the Department of Education in Dawadmi Province. To distribute the questionnaire link, this study used a snowballing technique, which is defined as being "based on social network logic whereby people are linked by a set of social relationships and contacts" [53]. The questionnaire used in this study had been validated as it had been used in many previous studies [27-29, 37-39, 45, 51]. The researcher sent the link to the questionnaire in Whatsapp to some educational supervisors and asked them to distribute the questionnaire to their colleagues.

The questionnaire was translated into the Arabic language by expert translators as the target participants were native Arabic speakers. The target population was educational supervisors in the Department of Education in Dawadmi Province with a population size of approximately 350 persons. The questionnaire had three sections. Section 1 included general information about the research, its goals, instructions for participating in the study and information about ethical concerns to obtain consent approval from participants. Section 2 aimed to collect demographic data while section 3 listed items related to the factors in the TOE model. All factors in the TOE model were measured at five levels using a Likert-type scale (5 = strongly Agree, 4 = Agree, 3 = Neutral, 2 = Disagree and 1 = Strongly Disagree). In this study, correlation analysis was used to examine relationships between the seven independent factors and the digital transformation adoption because correlation aims to explore the degree of relationship between two variables. The Correlation Coefficient (R) ranges from -1 to +1 (from -1 to -0.5 is a strong negative correlation, -

0.5 to 0 is a weak negative correlation, 0 to 0.5 is a weak positive correlation and 0.5 to 1 is a strong positive correlation) [54].

4 Results

4.1 Demographic Data

The majority of the participants were male (62%, n=93) (Table 1). Participants aged 22-40 comprised 37.3% (n=56) of the respondents while those aged 41–60 comprised 62.7% (n=94) of the sample. In addition, 98% of respondents (n=147) had experience using digital transformation.

Table 1: Demographic information

Information		Number of participants	Percentage of sample
Gender	Male	93	62%
	Female	57	38%
	Total	150	100%
Age	22-40	56	37.3%
	41-60	94	62.7%
	Total	150	100%
Experience with using digital transformation	Yes	147	98%
	No	3	2%
	Total	150	100%

4.2 Reliability

According to [55], Cronbach's alpha values above 0.90 represent excellent reliability, 0.70 to 0.90 represent high reliability, 0.50 to 0.70 represent moderate reliability, and 0.50 and below represent low reliability. All values for each group were greater than 0.50 and the overall reliability for this instrument was 0.936, which is considered excellent (Table 2). Therefore, the results of this study can be considered reliable.

Table 2 Reliability

Section	Number of items	Cronbach alpha reliability
Relative advantages	3	0.714
Complexity	3	0.561
Compatibility	4	0.646
Top management support	5	0.904
Organization readiness	4	0.840
Attitude towards change	2	0.699
Regulatory environment	3	0.731
Digital Transformation Adoption	2	0.922
Total	26	0.936

4.3 Assessment of the Hypotheses

H1: Relative advantage will have a significant impact on Digital transformation adoption:

From the correlation analysis result, there was a significant positive relationship between Relative advantage (RA) and Digital transformation adoption (DTA) ($R = 0.330$, $p < 0.0001$). Therefore, H1 is supported.

H2: complexity will have a significant impact on Digital transformation adoption:

From the correlation analysis result, there was a significant positive relationship between complexity (CX) and DTA ($R = 0.338$, $p < 0.0001$). Therefore, H2 is supported.

H3: compatibility will have a significant impact on Digital transformation adoption:

The correlation analysis showed a significant positive relationship between compatibility (CO) and DTA ($R = 0.401$, $p < 0.0001$). Therefore, H3 is supported.

H4: Top management support will have a significant impact on Digital transformation adoption:

From the correlation analysis result, there was a significant positive relationship between top management support (TM) and DTA ($R = 0.451$, $p < 0.0001$). Therefore, H4 is supported.

H5: Organizational readiness will have a significant impact on Digital transformation adoption:

From the correlation analysis result, there was a significant positive relationship between Organization readiness (OR) and DTA ($R = 0.386$, $p < 0.0001$). Therefore, H5 is supported.

H6: Attitude toward change will have a significant impact on Digital transformation adoption:

From the correlation analysis result, there was a significant positive relationship between Attitude toward change (AT) and DTA ($R = 0.690$, $p < 0.0001$). In fact, the relationship between AT and DTA had the strongest relationship. Therefore, H6 is supported.

H7: Regulatory environment will have a significant impact on Digital transformation adoption:

From the correlation analysis result, there was a significant positive relationship between the Regulatory environment (RE) and DTA ($R = 0.456$, $p < 0.0001$). Therefore, H7 is supported.

5 Discussion

Based on a survey of educational supervisors in the Department of Education in Dawadmi Province, this study adopted a modified TOE model to determine the factors that impact the adoption of digital transformation in the Ministry of Education in Saudi Arabia as a case study. The current results are consistent with previous studies [25, 27-33].

The results show that technological factors had a significant positive relationship with digital transformation adoption. This is consistent with the results of other studies [37, 38, 41]. As expected, when users in the Ministry of Education believe that the adoption of digital transformation has some advantages, they will adopt it and have a positive relationship with it. Similarly, when they believe that digital transformation is not complex and compatible with existing systems, they will have a positive relationship with it. These results indicate that users had enough awareness to adopt innovative technology. One reason for these results is that the Ministry of Education has already launched some workshops and training events for users about digital transformation. It has also advertised it in the media and created a section, the Public Administration of Digital Transformation unit, in all branches. Subsequently, awareness has increased among users in the Ministry and they believe that adoption of digital transformation has advantages, is easy to use, and is compatible with the Ministry's vision and current systems and processes.

Attitude towards change had the strongest relationship with digital transformation adoption and this is consistent with the results of other studies [27]. These results indicate that users in the Ministry of Education had a positive attitude toward change, that is, to the adoption of digital transformation without any resistance. In other words, we can state that they consider digital transformation adoption to be a good idea and they will use it. Top management support and organizational readiness also had a significant positive relationship with digital transformation adoption. These results are also consistent with previous studies [39, 46]. The results indicate that

the Ministry of Education is ready (has IT infrastructure, qualified users, and sufficient financial resources) to adopt digital transformation and top management supports these activities because they realize that digital transformation adoption is the best choice to provide their services. As expected, the results show that the Environment factor (Regulatory environment) is significantly related to digital transformation adoption, which is consistent with previous studies [51]. This indicates that Saudi government regulations, policies, and laws support the adoption of digital transformation to achieve one of the key pillars of the Saudi Vision 2030.

6 Conclusion

This study adopted a modified TOE model to identify factors that impact the adoption of digital transformation in the Ministry of Education in Saudi Arabia. The results were based on the responses to a survey of educational supervisors in the Department of Education in Dawadmi Province. The results were consistent with previous studies demonstrating positive significant relationships between relative advantages, compatibility, complexity, top management support, attitude toward change, organization readiness and regulatory environment, and digital transformation adoption. These factors will need to be included in future adoption processes for digital transformation in Saudi Arabia. These results also confirmed that the TOE model is applied to digital transformation adoption in the Saudi context.

This study could be conducted in other areas within the Ministry of Education/other provinces, or other industries/sectors. This study focused on managerial level participants, suggesting that it could be expanded to other levels. For example, future studies could use other research models, such as Diffusion of Innovation (DOI), to focus on individual perspectives. Future studies could also use other analyses to measure validity, such as exploratory factor analysis and structural equation modelling to rank factors in order of importance.

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