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Towards a Model on Digital Transformation within the Higher Education Sector – A South African Perspective

Olusegun A. Ajigini
Independent Institute of Education, oajigini@iie.ac.za

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ABSTRACT

Digital transformation is the application of technology to build new business models, processes, software and systems that result in more profitable revenue, greater competitive advantage and higher efficiency. The factors influencing digital transformation in the higher educational sector were examined in this study. Specifically, data was drawn from 400 respondents and the following variables: organizational IT application portfolio, organizational culture, organizational structure, leadership and ethics predict digital transformation in higher educational sector by using regression analysis. The researcher found that the organizational culture contribution was the highest by predicting 78.9% of digital transformation in the higher education sector.

Keywords

Digital transformation, Digitalization, Digital innovation, Digital disruption, Higher education institutions.

INTRODUCTION

Higher educational institutions (HEIs) have been overwhelmed with changes caused by technological and social trends towards digitalization (Abad-Segura et al., 2020). Digital transformation is revolutionizing the whole world at an alarming rate, and it can be viewed as a revolutionary process that affects both people and organizational aspects and dimensions (Alenezi, 2021). Digital transformation is giving much attention in both practice and research, and it has been regarded as the most relevant technology presently (Wessel et al., 2020). Moreover, many organizations have to implement digital transformation due to COVID-19 pandemic so as to manage the crisis and be able to perform their functions (Haslam et al., 2020).

Digital transformation has become an important process for HEIs in the second decade of the 21st century especially for organizations claiming to be the leaders of change and be competitive in their sphere of influence (Bernavides et al., 2020). It should be noted that higher education institutions have been using new technologies and transforming their business models, practices, and process. Digital transformation in the higher education can be viewed as the development of new more complex advanced and effective practices and process in pursuit of the higher education mission. Alenezi (2021) contends that digital transformation is no longer about incorporating technology in business processes, rather it is a process for assessing the needs and the demands of the stakeholders as well as ensuring the provision of education and research activities that are in accordance with the knowledge needs of the students. Moreover, the increase in the big data and the global implementation of digital technologies are causing significant and rapid transformations in the education sector (Almazova, 2020).

Many universities are implementing digital strategies in response to the immense shift towards digitalization, however, some of them do not possess the vision, capability or commitment to execute them effectively (The

Digital University, 2018). According to Abad-Segura et al. (2020), universities should have a comprehensive vision of the whole digital transformation in HEIs so that they can be able to implement them effectively. This paper identifies the factors contributing to digital transformation in the higher education sector. The sections of the paper are structured as follows: overview of data transformation, data transformation in higher education, the conceptual framework, data collection and data analysis.

The need for HEIs to adopt digital transformation stems from the fact that HEIs are learning and knowledge centers however, access to information and knowledge is not limited to HEIs only. Rather other various platforms such as open-source databases, web browsers applications and enclopaedias are also providing information for learners (Valdes & Cerda Suarez, 2021), thus," creating competition for HEIs. Moreover, there are concerns around how HEIs manage their position in the knowledge society (Alenezi, 2021) and also more digital tools and technologies have been developed specifically to support students in their learning journey, however, HEIs still have to do a lot in order to achieve digital transformation.

OVERVIEW OF DIGITAL TRANSFORMATION

Digitalization is regarded as the change of an array of data into digital form in order for them to be more consistent with new tools and technologies of the digital economy as well as the exchange of this data via electronic communication media (Ipatov et al., 2020). Many definitions of digital transformation exist in the literature. The European Commission (2019) defines it as "being characterized by a fusion of advanced technologies and the integration of physical and digital systems, the predominance of innovative business models and new processes, and the creation of smart products and services". According to OECD (2018), digital transformation refers "to the economic and societal effects of digitization and digitalization". Digital transformation is "the application of technology to build new business models, processes, software and systems that result in more profitable revenue, greater competitive advantage and higher efficiency" (Schwertner, 2017).

Digital transformation has been interpreted in many ways and some regard it as an application of information technology to business processes (Heilig et al., 2017) while others consider it to be disruptive and dramatic with the capability of causing chaos in the business world (Skog et al., 2018). Moreover, digital transformation is also considered as small continuous digital innovations within the organization (Rodriguez-Abitia & Bribiesca-Correa, 2021). Thus, digital transformation is the accumulation of digital innovations.

The COVID-19 pandemic brought about the increase in the priority for digital transformation (Wade et al., 2020). Consequently, during the COVID-19 era, organizations that performed better were the ones that have implemented digital transformation. Digital transformation is also about the changes brought by digital technologies in an organization's business model or organizational structures (Hess et al., 2016), thus making organizations to have skilled employees and executives so that its transformative power can be revealed (Nadkarni & Prugl, 2020). Consequently, digital transformation needs both people and technology.

DIGITAL TRANSFORMATION IN HIGHER EDUCATION

The rapid growth of information flows has caused researchers to study technologies for processing, systematizing, and storing information as well as understanding the problems of ensuring information completeness, reliability, and quality (Arnold et al., 2021; Benavides et al., 2020). There is a global challenge that higher education systems throughout the world are facing, and these are between the changing needs of the digital economy and the obsolete university operating model. Thus, universities are responding to changes in the economy and society by implementing digital transformation (Habib et al., 2021). Consequently, new requirements for universities and higher educational sector in general have been revealed due to the transition to a digital society and digital economy (Skiba et al., 2022).

According to Henderson et al. (2017), the roles and the relationship between students and teachers have changed within the digital society. Additionally, the state, business and society as external key stakeholders have also changed the requirements for the universities by requesting for more flexibility, transparency, openness, and rapid response to changing technologies (Sitnicki, 2018; Becker & Eube, 2018). Digitalization was about to create a digital educational environment prior to covid ("pre-COVID" era) (Rampelt et al., 2019; Siemens et al., 2015).

However, during the post-COVID era, the following concepts are now relevant: digital ethics, digital culture, digital competences, and digital technologies used for educational marketing (Bozhurt & Sharma, 2022; Garcia-Penalvo, 2021; Tsochev, 2021). Thus, the COVID-19 pandemic has enhanced the movement from the classic classroom model of learning to that of blended and digital models (Skiba et al., 2022). This has caused universities to urgently develop and implement digital transformation strategies (Garcia-Penalvo, 2021), thus ensuring the concept of "digital university".

According to Ipatov et al., (2020), digital transformation of higher education is the change of the entire model, including strategy, organizational structure, processes for effective utilization of the digital economy. Thus, the transition to digitalization in higher education must be done consciously and consistently. Digitalization is essential in HEIs since it can attract more and better students, improve the experience of courses, teaching materials as well as training in general (Han, 2016; Guring & Rutledge, 2014). Universities are competing globally, and this has led to increase in their selection of best students and researchers (Faria & Novoa, 2015). Consequently, HEIs have to establish new business models due to the disruptive scenario thus transforming their evolvement over time, actively connecting their internal and external clients and strengthening their experience in their institution (Serna et al., 2019).

DIGITAL TRANSFORMATION IN DEVELOPING COUNTRIES

The digital transformation offers developing economies new opportunities to accelerate their old age infrastructure, to draw on knowledge obtained from the internet, to take advantage of new markets offered by digital platforms and to utilize production possibilities brought about by digital technologies (Ciuriak & Ptashkina, 2019). For example, in Africa, many new youthful 'digital natives" are growing which will accelerate the growth and adoption of new digital technologies services that will impact all African society areas, empowering lives, and increasing equitability and well-being (Kazim, 2021).

In developing countries, digital transformation is important in the public sector since it provides the platform for governments (Lamid et al., 2021). Thus, the adoption of digital transformation in public and private sectors is a necessity in order to improve digital economy (Schallmo & Williams, 2018). Digital transformation in developing countries will contribute to efficiency, productivity, and innovation so that limited resources can be optimized, and new business models can be created. The developing countries are plagued with challenges such as lower internet access and connectivity, limited access with technology and less access to banking and electronic payment services (Conde & Wasiq, 2021).

Digital technologies are important for the economic survival and international competitiveness of individual economies since they can increase material prosperity and combat poverty on one hand while they can also cause some countries to be left behind, thus making them uncompetitive internationally (Petersen, 2019).

THE STATE OF DIGITAL TRANSFORMATION IN SOUTH AFRICAN CONTEXT

South Africa is one of the African countries on the forefront of ICT adoption in government, business, and society (United Nations, 2016). The South African government like other governments is responding to opportunities and challenges created by the 4th industrial revolution by developing policies and strategies on digital transformation (Manda & Backhouse, 2017). South African government has recognized ICT as a tool for tackling the country's human development challenges such as unemployment, poverty, and socio-economic inequality (South Africa, 2012).

South Africa commenced working on digital transformation in 1998 as a result of the presidential review commission identifying digital transformation as important in transforming the public service. Since then, the South African government policy and legislative decisions have reflected government's goal of using ICT as a tool for inclusive growth as can be seen in the National Development Plan (NDP) of 2012, the National Broadband Policy of 2013 and the Integrated ICT Policy white paper of 2016. South Africa adopted three key

pillars: (a) digital access (b) digital transformation of government and (c) digital inclusion to bring South Africa into an inclusive society (South Africa, 2016).

According to Cicchiello (2020), Covid-19 has exponentially increased the digital transformation process in South Africa highlighting the importance to remove impediments to digital transformation and promote growth. The question is no longer if not to implement new technologies, but rather to expound strategic plans that can be used to define the number of resources to develop to this end.

Andreoni et al. (2021) have stated that in South Africa, digitalization occurs in a prematurely deindustrialized economy involving wide gaps in infrastructure and skills. South Africa did not diversify her economy and step to higher productivity (Bell et al., 2018; Andreoni & Tregenna, 2020). There is a high level of unemployment and high levels of societal inequality. However, despite these challenges some firms in South Africa are able to seize the opportunities provided by digitalization in order for them to achieve innovation, greater efficiency and supply chain integration.

THE CONCEPTUAL FRAMEWORK

The conceptual framework is displayed below (see Figure 1). The conceptual framework was previously used in a similar study on digitalization and it is relevant to this study due to the digital transformation process that is being addressed in both studies. The independent variables are: Organizational IT application portfolios, Organizational culture, Organizational structure, Organizational dynamic capabilities, Leadership, Employee roles and Skills and Ethics. The dependent variable is: Digital transformation in the higher educational sector.

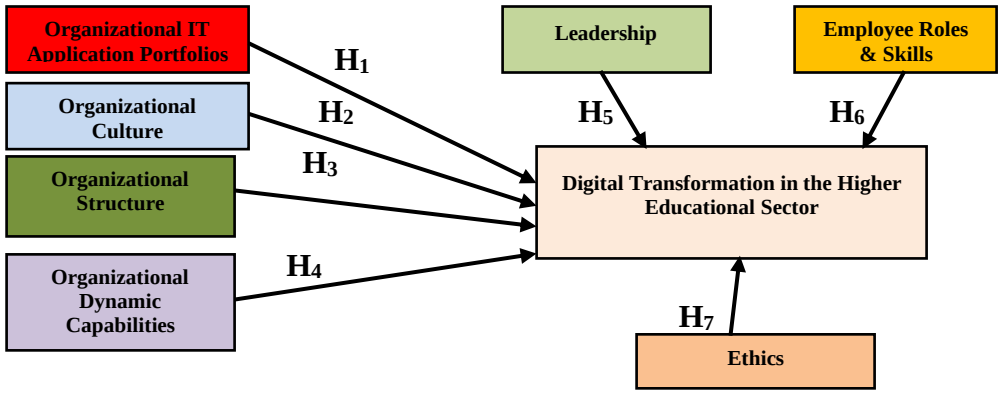

Figure 1: The Conceptual Framework
(Source: Adapted from Tahirkheli & Ajigini, 2022).

Vial (2019) states that the following variables have an effect on digital transformation in organizations: organizational structure, organizational culture, leadership, employee roles and skills and ethics. Seven hypotheses were postulated from the conceptual framework that will be used to develop the model and they are as follows:

Organizational IT Application Portfolio

Technology is one of the most frequently mentioned components in digital transformation (Verina & Titko, 2019). Organizations that have IT resources are able to implement specific digital technologies like big data analytics, and social media (Singh et al., 2021). Organizations that have state of art IT infrastructure are placed in an advantaged position since they can easily redesign the business models and revamp the existing products and offer digitally enabled solutions (Nwankpa & Roumani, 2016). Thus, it is postulated that:

H_1: Organizational IT application portfolios positively influence the digital transformation in the higher educational sector.

Organization Culture

Organizational culture is defined as "set of shared assumptions and understanding about organization functioning" (Deshpande & Webster, 1989). Organizational culture is regarded as acquired patterns and hidden rules approved by groups within the organization (Weritz et al., 2020). Organizational culture can accelerate or impede digital transformation process (Ke & Wei, 2008; Hogan & Coote, 2014). It can also enable goals and objectives alignment between stakeholders and organizations. Organizations need to investigate new cultural aspects that are more digitally applicable and transform their values, structures, and assumptions during digital transformation (Kane et al., 2017; Mikalef et al., 2019; Vial, 2019). Thus, this hypothesis is postulated:
H_2: Organizational culture positively influences the digital transformation in the higher educational sector.

Organizational Structure
It is important for organizations to set up organizational structures that facilitate digital innovation (Wiesbock & Hess, 2020). According to Sommerfield and Moise-Cheung (2016), there are four organizational models in organizations that use digital transformation: (a) Tactical model – where digital transformation is used in an effective and efficient manner in order to achieve the business units' target (b) Central model – which is the management of digital strategies and funds at the enterprise/corporate level (c) Champion model – in which business units have their own budgets, operational teams and strategies while emphasizing on education and knowledge (Ismail et al., 2017) (d) Business As Usual Model – in which each employee uses digital technologies in their every daily activities. The integration of digital technologies into organizational structures can steer a change from decentralized resources and actions towards a more networked and centralized platform (Alt & Zimmermann, 2018). The incorporation of digital technologies into organizational structures can also stimulate a shift towards decentralization (Alt, 2018). Thus, it is hypothesized that:
H_3: Organizational structure positively influences the digital transformation in the higher educational sector.

Organizational Capabilities
Organizational capabilities are the abilities to manage all resources that are important for the organization to obtain high performance (Grant, 1996). They include internal and external skills, organizational resources, and competences (Teece et al., 1997). Moreover, Herterich et al. (2016) also state that organizational capabilities are the available talents in the organization to enable digital transformation and it includes expertise at the strategic and technical levels as well as the skills set to execute its digital strategy.
The goal of organizational capability is the coordination and communication of new knowledge obtained and the development of missing resources while integrating them into the organizations' norms and routines so as to be innovative and competitive (Kane et al., 2017; Vial, 2019; Nwankpa & Roumani, 2016). Thus, it is hypothesized that:
H_4: Organizational capabilities positively influences the digital transformation in the higher educational sector.

Leadership
Leadership is a key success factor for digital transformation (Promsri, 2019). Digital leadership is defined by Oberer and Erkollar (2018) as "a way of leading which is characterized by fast, cross-hierarchical, team-oriented and cooperative structure, with a strong focus on innovation" The role of leadership is important when implementing and supporting an organization going through the digital transformation process (Larjovuori et al., 2018). Digital transformation relies on leaders that create platforms and drive stakeholders toward action (Sainger, 2018). Digital leaders are leaders with digital transformation beliefs, and they can build networked organizations that are collaborative and obtain competencies (Frankowska & Rzeczycki, 2020; Bresciani et al., 2021). The digital transformation process as a basis for transformation depend on strategic leadership and the creation of an environment for using and generating dynamic capabilities and organizational learning (Peter et al., 2020). Thus, it is hypothesized that:
H_5: Leadership positively influences the digital transformation in the higher educational sector.

Employee Roles and Skills

Organizations need to provide their workforce with digital skills to realize their objectives in order to benefit from their ICT investments (Kane et al., 2019; Blount et al., 2016). Digital literacy is the skills, knowledge and abilities of an employee while using digital technologies (Stordy, 2015). Also, understanding the role of employees in digital transformation is important since it can cause organizational changes (Henderson & Venkatraman, 1993). Digital literacy of employees is part of the dynamic capability of firms during their digital transformation (Vial, 2019; Warner & Wager, 2019). Mathrani et al. (2013) state that the strategic benefits of enterprise systems implementation include the planning and using factors such as people and process management and also skills and competency development. Thus, it is hypothesized that:

H_6: Employee roles and skills positively influences the digital transformation in the higher educational sector

Ethics

Ethics is defined as "abstract and theoretical reflection on moral statements that asks for the grounds on which moral statements are made" (Stahl, 2012). Consequently, ethics can be used as a reference discipline to challenge the impacts of digital transformation (Vial, 2019). Galliers et al. (2012) have stated that theories of ethics can assist with understanding the objectives of strategic IS in order to stay abreast in the world. The ethical implications of ethics are far from beyond the organization's strategy and can influence the society (Ganju et al., 2016; Majchrzak et al., 2016). The role of ethics in digital transformation remain consistent at higher levels (Vial, 2019). Thus, it is postulated that:

H_7: Ethics positively influences the digital transformation in the higher educational sector.

SAMPLE SIZE AND DATA COLLECTION

A web-based platform was used to distribute the questionnaires in order to test the seven hypotheses. A measuring instrument was developed based on a five-point Likert scale as shown in Appendix 1. A pilot test was performed in order to perform item analysis (validity and reliability testing) on the constructs of the measuring instrument by using fifty (50) respondents (Brace, 2013). After the pilot test, the questionnaire was modified according to the results of the test. At the end of the questionnaire deadline, four hundred (400) participants had completed the questionnaire, and these were captured in an Excel spreadsheet for data analysis. The SPSSv25.0 software was used to perform the data analysis with the Excel data input.

PROFILE OF THE PARTICIPANTS

A total of 400 respondents participated in the study. The vast majority 36.0% (n=144) were middle managers, 32.0% (n=128) were lower managers while 32.0% (n=128) were employees. The mean age of the respondents was 36 years (SD = 1.182) while majority were males 82.8% (n=331). Most of the respondents were permanently employed 81.8% (n=327), 12.5% (n=50) were temporary employed while 5.0% (n=20) were on contract. Most of the respondents 33.5% (n=134) have worked in their organizations for more than two years while 11.0% (n=44) have worked for more than 10 years in their organizations. Majority of the respondents (57.5%, n=230) have adequate experience in digital technologies, while 42.5% (n=170) do not have adequate experience in digital technologies.

VALIDITY AND RELIABILITY

The exploratory factor analysis (EFA) was used to perform construct validity, and discriminant validity (Wang et al., 2010). Cronbach alpha (σ) was used to measure the reliability of the constructs (see Table 1). The construct with the highest Cronbach alpha (σ = 0.828) is Organizational IT application portfolios while Organizational culture with Cronbach value (σ = 0.460) is having the lowest Cronbach value. According to Hair et al. (2010), the lowest acceptable value for Cronbach's alpha for a construct is 0.60. Therefore, since the Cronbach alpha values of these constructs: Organizational IT application portfolios, Organizational structure, Organizational capabilities and Ethics are all above 0.6, then they are reliable and consistent. However, the constructs having lower values

less than 0.6 (that is, organizational culture [σ = 0.460], digital transformation [σ = 0.474] and employee roles and skills [σ = 0.472]) need a relook at the items used to construct the questionnaire so as to make the items reliable and this process was performed in this study to ensure reliable constructs.

Construct	Construct Name	Cronbach Alpha (σ)
B	Organizational IT application portfolios	0.828
C	Organizational culture	0.460
D	Organizational structure	0.678
E	Organizational capabilities	0.668
F	Leadership	0.556
G	Employee roles and skills	0.472
H	Ethics	0.702
I	Digital Transformation	0.474

Table 1: Cronbach alpha values of the Constructs

In order to assess the validity and reliability of the constructs, the average variance entreated (AVE), the composite reliability (CR), and the maximum shared variance (MSV) of each construct were all estimated and the results shown in Table 2. The lowest permissible value of Average variance (AVE) is 0.5 (Fornell & Larker, 1981). The lowest permissible value of Composite reliability (CR) is 0.5 (Hair et al., 2011). The value of the Maximum shared variance (MSV) should be less than its corresponding value of AVE. Therefore, in Table 2, the estimated values of CR and MSV are within the acceptable range, but the values of AVE are lower than 0.5, thus, this confirms that the constructs are valid and reliable based on the CR and MSV values.

Constructs/ Items	AVE	CR	MSV
Organizational IT Application Portfolio (B)	0.471	0.780	0.527
Organizational Culture (C)	0.352	0.684	0.070
Organizational Structure (D)	0.306	0.632	0.230
Organizational Dynamic Capabilities (E)	0.356	0.686	0.287
Leadership (F)	0.235	0.544	0.128
Employee Roles & Skills (G)	0.152	0.411	0.059
Ethics (H)	0.340	0.672	0.216
Digital Transformation (I)	0.336	0.668	0.075

Table 2: Estimation of LF, AVE, CR, and MSV

The estimation of the Cronbach alpha (σ), variance factor (VIF) and AV is illustrated in Table 3. Multicollinearity defect results when the inner meanings of the constructs become very close to each other. Because of this, the variance inflation factor (VIF) of each construct needs to be estimated (James et al., 2013). The maximum acceptable value of VIF is 5.000 (Ringle et al., 2015). Discriminant validity is tested by computing the AV of each construct which is the square root of AVE of each construct. Then the discriminant is established if the AV of each construct is more than the correlation coefficient of that construct with other constructs (Gefen & Straub, 2005). From Table 3, the values of all the AVs of the constructs in the ninth column is greater than the corresponding correlation coefficients shown in off-diagonal places. The values of VIF for all the constructs lie between 1.377 and 2.598 thus confirming that the data is free from multicollinearity defects.

	TransB	TransC	TransD	TransE	TransF	TransG	TransH	AV	σ	VIF
TransB	**0.075**							0.686	0.828	1.429
TransC	0.296	**0.395**						0.593	0.460	2.598
TransD	0.129	0.705	**0.431**					0.553	0.678	1.377
TransE	0.053	0.538	0.222	**0.480**				0.597	0.668	2.176
TransF	0.072	0.620	0.311	0.495	**0.518**			0.485	0.556	1.567
TransG	0.518	0.147	0.272	0.179	0.048	**0.100**		0.390	0.472	1.779
TransH	0.878	0.878	0.302	0.652	0.540	0.576	**0.148**	0.583	0.702	1.413

Table 3: Estimation of Cronbach's Alpha, VIF, and AV
(Discriminant Validity Test)

Variables	1	2	3	4	5	6	7	8
1. Digital Transformation	1.000							
2. Organizational IT Application Portfolio	0.075	1.000						
3. Organizational Culture	0.296	0.395	1.000					
4. Organizational Structure	0.129	0.705	0.431	1.000				
5. Organizational Dynamic Capabilities	0.053	0.538	0.222	0.480	1.000			
6. Leadership	0.072	0.620	0.311	0.495	0.518	1.000		
7. Employee Roles & Skills	0.518	0.147	0.272	0.179	0.048	0.100	1.000	
8. Ethics	0.878	0.878	0.302	0.652	0.540	0.576	0.148	1.000

Table 4: Correlation Matrix

FACTOR ANALYSIS

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity were conducted in order to assess the suitability of the respondent data for factor analysis. The KMO value of 0.5 is suitable for factor analysis (Hair et al., 1995; Tabachnick & Fidell, 2007). Additionally, the Bartlett's Test of Sphericity should be significant ($p < 0.05$) for factor analysis to be suitable (Hair et al., 1995; Tabachnick & Fidell, 2007). Table 5 illustrates the KMO and Bartlett's test of sphericity values for this study. From Table 5, the KMO value is 0.782 (i.e., KMO > 0.50), thus indicating the data suitability for factor analysis. Additionally, the Bartlett's test of sphericity $\chi 2\ (496) = 3893.806$, $\rho < 0.05$ [$\rho = 0.000$] showed that there were patterned relationships between the items.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**0.782**
Bartlett's Test of Sphericity	Approx. Chi-Square	**3893.806**
	df	**496**
	Sig.	.000

Table 5: KMO and Bartlett's Test of Sphericity

Principal component analysis (PCA) was performed to simplify the factor structure of the group items, that is, high item loading on one factor and smaller item loading on the remaining factor solutions (Costello & Osborne, 2005). Table 6 illustrates the principal component analysis. The Kaiser's criteria (eigenvalue > 1) and the cumulative percent of the variance extracted were employed in order to obtain scale unidirectionality and simplify

the factor solutions (Kaiser, 1960; Cattel, 1966; Horn, 1965). Eight components have their eigenvalues greater than 1.00, thus, only two components contribute to a cumulative variance of 55.49%.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.465	20.205	20.205	6.465	20.205	20.205
2	3.635	11.360	31.564	3.635	11.360	31.564
3	1.605	5.017	36.581	1.605	5.017	36.581
4	1.438	4.493	41.074	1.438	4.493	41.074
5	1.291	4.035	45.108	1.291	4.035	45.108
6	1.182	3.693	48.801	1.182	3.693	48.801
7	1.089	3.404	52.205	1.089	3.404	52.205
8	1.050	3.280	55.485	1.050	3.280	55.485

Table 6: Principal Component Analysis

MULTIPLE LINEAR REGRESSION

The summary of the regression model is illustrated in Table 7. The adjusted R square is 0.786, which means that the following variables: Organizational IT application portfolio, Organizational culture, Organizational structure, Leadership and Ethics collectively predict 78.6% for Digital Transformation in the higher educational sector.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.886[a]	.786	.782	.13409	.786	205.407	7	392	.000

a. Predictors: (Constant), Organizational IT Application Portfolio, Organizational Culture, Organizational Structure, Organizational Dynamic Capabilities, Leadership, Employee Roles & Skills, Ethics

b. Dependent Variable: Digital Transformation

Table 7. Summary of the Regression Model.

The contribution of individual constructs in the regression model is shown in Table 8. The *P*-value (or the calculated probability) is the probability of the event occurring by chance if the null hypothesis is true (Anaesth, 2016) and have values between 0 and 1. According to Anaesth (2016), if the *P*-value < 0.01, then the result is highly significant and the null hypothesis should be rejected. If the *P*-value ≥ 0.01 but *P*-value < 0.05, then the result is significant and the null hypothesis should be rejected. If *P*-value ≥ 0.05, then the result is not significant and null hypothesis should not be rejected.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.426	.135		3.148	.002
	Organizational IT Application Portfolio	-.031	.014	-.064	-2.285	.023
	Organizational Culture	.788	.038	.789	20.951	.000
	Organizational Structure	-.036	.016	-.064	-2.347	.019
	Organizational Dynamic Capabilities	.049	.026	.066	1.913	.056
	Leadership	.076	.027	.083	2.842	.005
	Employee Roles & Skills	.029	.031	.029	.925	.355
	Ethics	.036	.016	.064	2.303	.022

Table 8: Contribution of Individual Constructs in the Regression Model

In Table 8, the variables having their P-values less than 0.05 are as follows: Organizational IT application portfolio (.023), Organizational culture (0.000), Organizational structure (0.019), Leadership (0.005) and Ethics (0.022). These results indicate that all of the five variables meaningfully contribute to the prediction of digital transformation in the higher educational sector. From the standardized coefficients of the individual constructs, the beta value of organizational culture is 78.9%, which contributes to the highest prediction of digital transformation in the higher educational sector. Thus, the variable with the highest contribution towards the prediction of digital transformation is organizational culture. The P-values of the following variables: Organizational dynamic capabilities (0.056), Employee roles & skills and (0.355) are all above 0.05, therefore, these variables do not contribute significantly to digital transformation in the higher educational sector.

THE RESULTING MODEL

Table 9 illustrates the hypothesis testing outline from the regression model.

Hypothesis Symbols	Hypothesis	Beta(β)	P -Values	Is P < 0.05?	Remarks
H1	OIPP → DT	-.064	.023	Yes	Supported
H2	OC → DT	.789	.000	Yes	Supported
H3	OS → DT	-.064	.019	Yes	Supported
H4	ODC → DT	.066	.056	No	Not Supported
H5	LE → DT	.083	.005	Yes	Supported
H6	ERS → DT	.029	.355	No	Not Supported
H7	ET → DT	.064	.022	Yes	Supported

OIPP: Organizational IT Application Portfolio; OC: Organizational Culture; OS: Organizational Structure; ODC: Organizational Dynamic Capabilities: Leadership; ERS: Employee Roles & Skills; ET: Ethics; DT: Digital Transformation

Table 9: Hypothesis Testing Outline

The resulting model is shown in Figure 2, and it is based on the five hypotheses (H1, H2, H3, H5 and H_7).

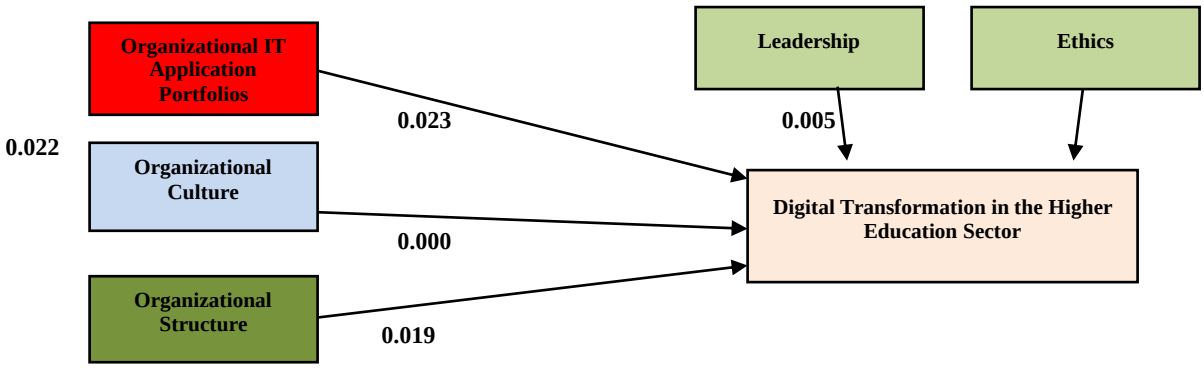

Figure 2: The Resulting Model

DISCUSSION AND CONCLUSION

A model that can be used to develop digital transformation in the higher education sector was developed in this study. Digital transformation has been interpreted in many ways and some regard it as an application of information technology to business processes (Heilig et al., 2017) while others consider it to be disruptive and dramatic with the capability of causing chaos in the business world (Skog et al., 2018). A measuring instrument was developed and distributed to participants out of which 400 respondents completed the questionnaire. Construct and discriminant validity were satisfied and the result confirmed the adequacy of the model. The results indicated that Organizational IT application portfolio, Organizational culture, Organizational structure, Leadership and Ethics were the predictors of digital transformation in the higher education sector.

The contributions of the study include analyzing the determinants to implement digital transformation in HEIs by finding empirical evidence of relationships between the determinants. The research will be useful for practitioners and academia who are involved in digital transformation. The study provides the foundation to building strategy and designing a complete roadmap for HEIs for successful digital transformation. The study led to hypotheses development and identified the relationship between them. The method used to collect data during the investigation of the research was based on cross-sectional method and not on longitudinal method, therefore it is possible that the temporal effects were not considered. Therefore, future studies could use the longitudinal method to collect data and validate the model. Another limitation was that the study was conducted by a single researcher but the researcher overcome this limitation by engaging with other scholars and professionals working on digital transformation to evaluate the validity of the findings. Organizational culture issues could also be hidden or are difficult to see by the people who are already part of them, therefore future research should look into such issues.

REFERENCES

1. Abad-Segura, E., Gonzalez-Zamar, M., Infante-Moro, J., and Garcia, G. R. 2020. "Sustainable management of digital transformation in higher education: Global research trends," *Sustainability*, (12:2107), pp. 1-24.
2. Alenezi, M. 2021. "Deep dive into digital transformation in higher Education institutions," *Educ. Sci*., 11, 770.
3. Almazova, N. 2020." Interactive learning technology for overcoming academic adaptation barriers," *Proceedings of the Conference Integrating Engineering Education and Humanities for Global Intercultural Perspectives*. – Springer, Cham, pp. 786-794.
4. Alt, R. 2018. "Electronic markets and current general research." *Electronic Markets*, (28:2), pp. 123–128.
5. Alt, R., and Zimmermann, H. D. 2018. "Electronic markets on networked media." *Electronic Markets*, (28:1), pp, 1–6.
6. Anaesth, I. J. 2016. "Basic statistical tools in research and data analysis," *Indian Journal of Anesthesia*, (60:9), pp. 662–669. doi:10.4103/0019-5049.190623 PMID:27729694
7. Andreoni, A., Barnes, J., Black, A., and Sturgeon, T. 2021. "Digitalization, industrialization and skills development: Opportunities and challenges for middle-income countries. In: Structural transformation in South Africa: The challenges of inclusive industrial development in a middle-income country. Edited by: Andreoni, A., Mondiwa, P., Roberts, S. and Tregenna, F. Oxford University Press. Doi: 10.1093/oso/9780192894311.003.0012.
8. Andreoni, A., and Tregenna, F. 2020. "Escaping the middle-income technology trap: A comparative analysis of industrial policies in China, Brazil and South Africa"' *Structural Change and Economic Dynamics*, 54, pp. 324–40
9. Arnold, M. G., Vogel, A., and Ulber, M. 2021. "Digitalizing higher education in light of sustainability and rebound effects surveys in times of the COVID-19 pandemic," *Sustainability*, (13:22), pp. 12912.
10. Becker, B. A., and Eube, C. 2018. "Open innovation concept: Integrating universities and business in digital age," *Journal of Open Innovation: Technology, Market, and Complexity*, (4:1), pp. 12191.
11. Bell, J., Goga,S., Mondliwa, P., and Roberts, S. 2018. "Structural transformation in South Africa: Moving towards a smart open economic for all." CCRED Working Paper. Johannesburg: CCRED.
12. Benavides, L. M. C., Tamayo A. J. A., Arango S. M. D., Bedoya, B. J. W., and Burgos, D. 2020. "Digital transformation in higher education institutions: A systematic literature review," *Sensors*, (20:3291), pp. 1-22.

13. Blount, Y., Abedin, B., Vatanasakdakul, S., and Erfani, S. 2016. "Integrating enterprise resource planning (SAP) in the accounting curriculum: A systematic literature review and case study," *Accounting Education*, (25:2), pp. 185-202.
14. Brace, I. 2013. *Questionnaire design: How to plan, structure and write survey material for effective market research* (3rd ed.). Kogan Page Limited.
15. Bresciani, S., Ferraris, A., Romano, M., and Santoro, G. 2021. "Building a digital transformation strategy." In S. Bresciani, A. Ferraris, M. Romano, & G. Santoro (Eds.), Digital transformation management for agile organizations: A compass to sail the digital world, pp. 5–27. Emerald Publishing Limited.
16. Cattell, R. B. 1966. "The Scree test for the number of factors," *Multivariate Behavioral Research*, (1:2), pp. 245–276. PMID:26828106
17. Cicchiello, A. F. 2020. "Digital transformation in South Africa: Opportunities and challenges during Covid-19 pandemic." *The International EFAL-IT blog, Information Technology Innovations in Economics, Finance, Accounting, and Law*, (1:7).
18. Ciuriak, D. and Prashkina, M. 2019. "Leveraging the digital transformation for development: A global strategy for the data-driven economy." Centre for International Governance Innovation.
19. Conde, M. A., and Wasiq, S. 2021. "Digital transformation of business challenges and issues in developing countries." *Journal of Information Systems and Digital Technology*, (3:1), pp. 65-73.
20. Costello, A. B., and Osborne, J. W. 2005. "Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis," *Practical Assessment, Research & Evaluation*, (10:7), pp. 1–9.
21. Deshpande, R., and Webster Jr F. E. 1989. "Organizational culture and marketing: Defining the research agenda." *Journal Market*. 53, pp. 3–15
22. European Commission. 2019. *Digital transformation*. Retrieved from: https://ec.europa.eu/growth/industry/policy/digitaltransformation_en.
23. Faria, J., and Nóvoa, H. 2015. "Digital transformation at the University of Porto," In *Proceedings of the Annual Conference of the Global Innovation and Knowledge Academy*, Valencia, Spain, 14–16 July.
24. Fornell, C., and Larcker, D. F. 1981. "Evaluating structural equation models with unobservable variables and measurement error," *JMR, Journal of Marketing Research*, (18:1), pp. 39–50. doi:10.2307/3151312
25. Frankowska, M., and Rzeczycki, A. 2020. "In reshaping supply chain collaboration - The role of digital leadership in a networked organization." Springer, pp. 353–364.
26. Galliers, R. D., Jarvenpaa, S. L., Chan, Y. E., and Lyytinen, K. 2012. "Strategic information systems: Reflections and prospectives," *Journal of Strategic Information Systems*, (21:2), pp. 85-90.
27. Ganju, K. K., Pavlou, P. A., and Banker, R. D. 2016. "Does information and communication technology lead to the well-being of nations? A country-level empirical investigation," *MIS Quarterly*, (40:2), pp. 417-430.
28. Garcia-Penalvo, F. J. 2021. "Digital transformation in the universities: Implications of the COVID-19 pandemic," *Education in the Knowledge Society*, 22.
29. Gefen, D., and Straub, D. 2005. "A practical guide to factorial validity using pls-graph: Tutorial and annotated example," *Communications of the Association for Information Systems*, (16:2), pp. 91–109. https://aisel.aisnet.org/ cgi/viewcontent.cgi?article=3020&context=cais
30. Grant, R. M. 1996. "Prospering as in integration environments: Organizational capability knowledge," *Organization Science* (7:4), pp. 375–387.
31. Gurung, B. and Rutledge, D. 2014. "Digital learners and the overlapping of their personal and educational digital engagement," *Comput. Educ.*, 77, pp. 91–100.
32. Habib, M. N., Jamal, W., Khalil, U, and Khan, Z. 2021. "Transforming universities in interactive digital platform: Case of city university of science and information technology," *Education and Information Technologies*, (2:1), pp. 517 – 541.
33. Hair, J., Anderson, R. E., Tatham, R. L., and Black, W. C. 1995. *Multivariate data analysis* (4th ed.). Prentice- Hall Inc.
34. Hair, J. F. Jr, Black, W. C., Babin, B. J., and Anderson, R. E. 2010. *Multivariate data analysis: A global perspective* (7th ed.). Pearson Education International.
35. Hair, J. F., Ringle, C. M., and Sarstedt, M. 2011. "PLS-SEM: Indeed, a silver bullet," *Journal of Marketing Theory and Practice*, (19:2), pp. 139–152. doi:10.2753/MTP1069-6679190202

36. Han, D. 2016. "University education and contents in the fourth industrial revolution," *Humanit. Contens,* 42, pp. 9.
37. Haslam, C. R., Madsen, S., and Nielsen, J. A. 2020. "Crisis-driven digital transformation: Examining the online university triggered by COVID-19," *The ISPIM Innovation Conference*, 7 – 10 June.
38. Heilig, L., Schwarze, S., and Voß, S. 2017. "An analysis of digital transformation in the history and future of modern ports," In *Proceedings of the 50th Hawaii International Conference on System Sciences*, Hilton Waikoloa Village, HI, USA, 4–7 January.
39. Henderson, M., Selwyn, N., & Aston, R. 2017. "What works and why? Student perceptions of 'useful' digital technology in university teaching and learning," *Studies in Higher Education*, (4:8), pp. 1567 – 1579.
40. Henderson, J. C., and Venkatraman, N. 1993. "Strategic alignment: Leveraging information technology for transforming organizations," *IBM System Journal,* (32:1), pp. 472–484.
41. Herterich, M. M., Uebernickel, F., and Brenner, W.2016. "Stepwise evolution of capabilities for harnessing digital data streams in data-driven industrial service.," *MIS Quarterly Executive,* (15:4), pp. 299-320.
42. Hess, T., Matt, C., Benlian, A., and Wiesböck, F. 2016. "Options for formulating a digital transformation strategy," *MIS Quarterly Executive,* (15:2), pp. 123–139.
43. Hogan, S. J., and Coote, L. V. 2014. "Organizational culture, innovation, and performance: A test of Schein's model." *Journal Business Research,* (67:8), pp. 1609–1621.
44. Horn, J. L. 1965. "A rationale and test for the number of factors in factor analysis," *Psychometrika,* (30:2), pp. 179–185. PMID:14306381
45. Ipatov, O., Barinova, D., Odinokaya, M, Rubtsova, A., and Pyatnitsky, A. 2020. "The impact of digital transformation process of the Russian university," *Proceedings of the 31st DAAAM International Symposium on Intelligent Manufacturing and Automation*, Vienna, Ausria.
46. Ismail, M. H., Khater, M., and Zaki, M. 2017. "Digital business transformation and strategy: What do we know so far?" Cambridge Service Alliance, University of Cambridge.
47. James, G., Witten, D., Hastie, T., and Tibshirani, R. 2013. *An introduction to statistical learning*. Springer, New York.
48. Kaiser, H. F. 1960. "The application of electronic computers to factor analysis," *Educational and Psychological Measurement,* 20, pp. 141–151.
49. Kazim, F. A. 2021. "Digital transformation in communities of Africa." *International Journal of Digital Strategy Governance and Business Transformation*, (11:1), pp. 1-23.
50. Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., and Buckley, N. 2017. "Achieving digital maturity," *MIT Sloan Management Review,* (59:1), pp. 1–29.
51. Kane, G. C., Phillips, A. N., Copulsky, J. R., and Andrus, G. R. 2019. "The technology fallacy: How people are the real key to digital transformation," MIT Press, Boston, MA.
52. Ke, W., and Wei, K. K. 2008. "Organizational culture and leadership in ERP implementation," *Decision Support System*, (45:2), pp. 208–218.
53. Lamid, L. I., Ibrahim, I. A., Abdullahi, K. I., and Abdullahi, U. G. 2021. "A framework for digital government transformation performance assessment and toolkit for developing countries." *ICEGOV Conference,* Oct 06 – 08, Athens, Greece.
54. Larjovuori, R. L., Bordi, L., and Heikkilä-Tammi, K. 2018. "Leadership in the digital business transformation," October 10–11, *Association for Computing Machinery*.
55. Manda, M. I., and Backhouse, J. 2017. "Digital transformation for inclusive growth in South Africa: Challenges and opportunities in the 4th industrial revolution. *African Conference on Information Systems & Technology (ACIST)*, Cape Town, South Africa, 10th – 11th July.
56. Majchrzak, A., Markus, M. L., and Wareham, J. 2016. "Designing for digital transformation: Lessons for information systems research from the study of ICT and societal challenges," *MIS Quarterly,* (40:2), pp. 267-277.
57. Mathrani, S., Mathrani, A., and Viehland, D. 2013. "Using enterprise systems to realize digital business strategies," *Journal of Enterprise Information Management*, (26:4), pp. 363-386.
58. Mikalef, P., Boura, M., Lekakos, G., and Krogstie, J. 2019. "Big data analytics and firm performance: Findings from a mixed-method approach," *Journal of Business Research*, 98, pp. 261–276
59. Nadkarni, S., and Prugl, R 2020. "Digital transformation: A review, synthesis and opportunities for future research," *Management Review Quarterly*, 71, pp. 233-341.

60. Nwankpa, J. K.,and Roumani, Y. 2016. "IT capability and digital transformation: A firm performance perspective."*37th International Conference on Information Systems (ICIS)*, Dublin, Ireland.
61. Oberer, B., Erkollar, A. 2018. "Leadership 4.0: Digital leaders in the age of Industry 4.0," *International Journal of Organizational Leadership*.
62. OECD. 2018. *Going digital in a multilateral world*. Retrieved from https://www.oecd.org/going-digital/C-MIN-2018-6-EN.pdf
63. Petersen, T. 2019. "*Digitalization: Curse or blessing for developing economies?*" Retrieved from https://blog.bti-project.org/2019/09/18/digitalization-curse-blessing-developing-economies/
64. Promsri, C. 2019. "The developing model of digital leadership for a successful digital transformation," *GPH - IJBM*, (2:08), pp. 01-08
65. Rampelt, F., Orr, D., and Knoth, A., 2019. *Bologna Digital 2020*. White Paper on digitalization in the European higher education area.
66. Rodriguez-Abitia, G., and Bribiesca-Correa, G. 2021. "Assessing digital transformation in universities," *Future Internet*, (13:52), pp. 1-16.
67. Sainger, G. 2018. "Leadership in digital age: A study on the role of leader in this era of digital transformation." *International Journal on Leadership*, (6:1), pp. 1–6.
68. Schallmo, D., Williams, C., and Boardman, L. (2018). "Digital transformation of business models. *Foundations of Management*, (10:1), pp. 123–142. Received from https://doi.org/10.2478/fman-2018-0011
69. Schwertner, K. 2017. "Digital transformation of business," *Trakia Journal of Sciences*, (15:1), pp. 388-393. https://doi.org/10.15547/tjs.2017.s.01.065.
70. Serna, M. D. A., Branch, J. W., Benavides, L. M. C, and Burgos, D. 2019. "Un modelo conceptual de transformación digital, Openergy y el caso de la Universidad Nacional de Colombia," *Educ. Knowl. Soc.*, 19, pp. 95–107.
71. Skiba, M., Bektemessov, M., and Turganbayeva, A. 2022. "Digital universities: Features and key characteristics," *Pedagogika – Pedagogy*, (91:3), pp. 53-63.
72. Skog, D. A., Wimelius, H., and Sandberg, J. 2018. "Digital Disruption," *Bus. Inf. Syst. Eng.*, 60, pp. 431–437.
73. Siemens, G., Gasevic, D., and Dawson, S. 2015. *Preparing for the digital university: A review of the history and current state of distance, blended, and online learning.*
74. Singh, S. Sharma, M., and Dhir, S. 2021. "Modelling the effects of digital transformation in Indian manufacturing industry." *Technology in Society*, 67, 101763. Doi: 10.1016/j.techsoc.2021.101763.
75. Sitnicki, M. 2018. "Development of a model of digital research universities," *Baltic Journal of Economic Studies*, (4:1), pp. 311 – 318.
76. Sommerfeld, B., and Moise-Cheung, R. 2016. "The digitally-fit organization." *Inside magazine* (12 - Part 01 - From a digital perspective), pp. 42-53.
77. South Africa. 2012. "*National development plan*." Retrieved from: www.gov.za/documents/national-development-plan-vision-2030.
78. South Africa. 2016. "*Integrated ICT policy*." White paper. Retrieved from: www.dtps.gov.za
79. Stahl, B. C., Eden, G., Jirotka, M., and Coeckelbergh, M. 2014. "From computer ethics to responsible research and innovation in ICT: The transition of reference discourses informing ethics-related research in information systems," *Information & Management* (51:6), pp. 810-818.
80. Stordy, P. H. 2015. "*Taxonomy of literacies*," *Journal of Documentation*, (71:3), pp. 456-476.
81. Tabachnick, B. G., and Fidell, L. S. 2007. *Using multivariate statistics*. Pearson Education Inc.
82. Tahirkheli, S. K., and Ajigini, O. A. 2022. "Factors influencing digital innovation strategy in organizations: An empirical analysis," *Information Resources Management Journal*, (35:1), pp. 1-22.
83. Teece, D. J., Pisano, G., and Shuen, A. 1997. "Dynamic capabilities and strategic management," *Strategic Management Journal*, (18:7), pp. 509–533.
84. The Digital University, 2018. "Staying relevant in the digital age," PwC: Leeds, UK. Available online: https://www.pwc.co.uk/assets/pdf/the-2018-digital-university-staying-relevant-in-the-digital-age.pdf.
85. Tsochev, G. 2021. "Some problems in engineering education with computer science profile during COVID-19," *Mathematics and Computer science*, (64:3), pp. 255 – 263.
86. United Nations 2016. "*E-government survey 2016*." Retrieved from https://publicadministration.un.org/
87. Valdés, K. N., and Cerdá Suárez, L. M. 2021. "An institutional perspective for evaluating digital transformation in higher education: Insights from the Chilean case." *Sustainability*, 13, pp. 9850.

88. Verina, N., and Titko, J. 2019. "Contemporary issues in business, management and economics engineering." *International Scientific Conference*, 9-10 May, Vilnius, Lithuania.
89. Vial, G. 2019. "Understanding digital transformation: A review and a research agenda," *Journal of Strategic Information Systems*, (28:2), Elsevier, pp. 118–144.
90. Wade, M., and Shan, J. 2020. "Covid-19 has accelerated digital transformation, but may have made it harder not easier," *MIS Q. Exec.*, 19, pp. 213–220.
91. Wang, Y. Wang, Y., and Yang, Y. 2010. "Understanding the determinants of RFID adoption in the manufacturing industry," *Technological Forecasting and Social Change*, (77:5), pp. 803-815.
92. Warner, K. S. R. and Wager, W. 2019. "Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal," *Long Range Planning*, 52, pp. 326-349.
93. Wiesbock, F., and Hess, T. 2020. "Digital innovations." *Electronic Markets*, 30, pp. 75–86. doi:10.1007
94. /s/12525-019-00364-9
95. Weritz, P., Braojos, J., and Matute, J. 2020. "Exploring the antecedents of digital transformation: Dynamic capabilities and digital culture aspects to achieve digital maturity." *Americas Conference on Information Systems (AMCIS 2020)*, 22.
96. Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., and Jensen, T. 2020. "Unpacking the difference between digital transformation and IT-enabled organizational transformation," *Journal of Association of Information Systems*.

APPENDIX 1: QUESTIONNAIRE ITEMS

Factors/Authors	Question Identifiers	Questions
Organizational IT Application Portfolio (Bygstad (2017); Wiesbock and Hess (2020))	**B1**	Do you think that there is a need for organizations to set up IT infrastructures that present adequate levels of centralization?
	B2	Will digital technologies produce IS infrastructures that bring about data replication and processes in organizations?
	B3	Will the changes initiated by digital transformation be adapted by the organizational IT application portfolio and its IT system?
	B4	Do you think that IT application portfolios facilitate digital transformation in organizations?
Organizational Culture (Hartl and Hess (2017); Wiesbick and Hess (2020))	**C1**	Do you think that organizations should amend their organizational culture in order to adapt to digital innovations?
	C2	Should the organizational culture govern how employees agree with the many changes caused by digital innovations?
	C3	Is culture accountable to general attitude of the organization toward digital technologies?
	C4	Do you think that organizational culture facilitates digital transformation in organizations?
Organizational Structure (Wiesbock and Hess (2020); Alt and Zimmermann (2018); Alt (2018))	**D1**	Do you think that organizations should set up organizational structures that facilitate digital innovation?
	D2	Will integrating digital technologies into organizational structures steer a change from decentralized resources towards more networked and centralized platforms?
	D3	Will the usage of human capital resources assist organizations to improve the quality of large-scale system implementation?
	D4	Do you think that organizational agility is crucial for

		organizations to effectively utilize the benefits of digital technologies?
Organizational Dynamic Capabilities (Li et al. (2018); Wiesbock (2018); Stoeckli et al. (2018))	**E1**	Do you think that organizations should develop their organizational capabilities in order to achieve and entrench digital innovations?
	E2	Should organizations require reserved digital capabilities after possessing the necessary IT capabilities that allow them to manage digital technologies?
	E3	Should organizations use different ways to develop capabilities either by building the necessary capabilities organically or inorganically?
	E4	Do you think that organizational capabilities facilitate digital transformation in organizations?
Leadership (Vial (2019); Benlian and Haffke (2016); Hansen et al. (2011))	**F1**	Do you believe that organizational leaders should ensure that their organizations cultivate a digital mentality?
	F2	Should organizational leaders facilitate digital transformation in their organizations?
	F3	Do you believe that the position of Chief Digital Officer be established in organizations in order to signify the strategic disposition of digital transformation?
	F4	Do you think that leadership facilitate digital transformation in organizations?
Employee Roles & Skills (Vial (2019); Yeow et al. (2017); Watson (2017))	**G1**	Do you believe that employees are steered to assume roles that were traditional outside their functions due to changes to the structure and culture of the organization?
	G2	Do digital technologies nurture situations where employees from other departments except IT department lead in the management of technology-intensive projects in organizations?
	G3	Can digital transformation compel employees to depend more deeply on their analytical skills so that they can resolve difficult business problems?
	G4	Do you think that employee roles and skills facilitate digital transformation in organizations?
Ethics (Galliers et al. (2012); Ganju et al. (2016); Majchrzak et al. (2016))	**H1**	Should ethical consequences of digital transformation remain outside the level of an organization's strategy?
	H2	Do you believe that ethical consequences of digital transformation can cause harm to the society itself?
	H3	Should traditional theories that entrench ethical contemplation be re-examined on the development of the digital transformation process?
	H4	Do you think that ethics facilitate digital innovation and strategy in organizations?
Digital Transformation (Vial (2019); Abedin et al. (2014); Warner and Wager (2019); Galati and Bigliardi (2019); Yoo et al. (2012))	**I1**	Do you think that digital transformation is achieved through IT Application Portfolios/ Organizational Culture in organizations?
	I2	Do you think that digital transformation is achieved through Organizational Dynamic Capabilities/ Leadership in organizations?
	I3	Do you think that digital transformation is achieved through Employee Roles and Skills/Ethics in organizations?
	I4	Do you think that digital transformation is achieved through Organizational Structure in organizations?