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Antecedents for Digital Transformation: Lessons from the Public Sector

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Completed Research Paper

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Abstract

Digital transformation, which refers to an organisation-wide change and adoption of emerging technologies, has become a mega trend capturing the attention of practitioners and researchers across disciplines. From practitioners' point of view, digital transformation has improved organisational performance, primarily due to increased efficiency and effectiveness. Even though private and commercial organisations seem to have embarked on the digital transformation journey early, evidence suggests that public organisations are catching up steadily. However, digital transformation research is still dominated by those investigating the phenomenon within the private sector. Given the contextual differences between the sectors and the dearth of literature covering the public organisations settings, this study explores the antecedents of digital transformation in the public sector. Based on the synthesis of a systematic literature review of 13 articles and 17 interviews from four public organisations, we proposed a theoretical model conceptualising a relationship between seven constructs (i.e., digital transformation, IT alignment, organisational agility, information security, organisational structure, organisational culture, and stakeholder relationships). PLS-SEM analysis was performed to test the theoretical model with data collected from 364 respondents using an online questionnaire. The contribution to research and practice is presented.

Keywords: Digital transformation, information security, IT alignment, organisational agility, public organisations.

Antecedents for Digital Transformation: Lessons from the Public Sector

Completed Research Paper

Introduction and Background

A quick look into the extant academic literature, mainstream media and practitioner outlets indicates that digital transformation has become one of the topics that dominate the practical and scientific discourse. This is no surprise given the profound effect and implication of the adoption of digital technologies in organisations across sectors and industries. Digital transformation, which refers to "…a set of complementary activities reshaping customer value propositions and transforming their operations using digital technologies for greater customer interaction and collaboration" (Berman 2012, p. 17), continued its momentum following the convergence of such emerging technologies as social media, mobile and cloud computing. According to Fischer et al (2020), organisations in various sectors and industries are under constant pressure to automate their business processes and integrate new digital technologies with their infrastructures.

Once considered a phenomenon relevant for private and commercial organisations, digital transformation has become a topic that has also engaged policymakers, governments and citizens as the phenomenon was found to affect how we run our daily lives (Agarwal et al. 2010). The continued allocation of substantial public expenditure on digital transformation initiatives by governments indicates that the sector has recognised the opportunities digital transformation brings to citizens (Jonathan 2019). As Hess et al. (2019) argue, there is a heightened expectation for new digital technologies to provide new opportunities, i.e., improve communications and collaborations among customers, suppliers, collaborators, and partners. Besides, digital technologies can also enable stakeholders to strengthen partnerships that foster innovations. For private and commercial organisations, digital transformation is a means that facilitates the collection and use of data that is invaluable for improving the production and delivery of products and services that can best meet individual customers' expectations. For the public sector, the primary benefits of digital transformation are expressed in terms of improved transparency and accountability. According to Jonathan (2019), the appropriate adoption of new digital technologies provides opportunities that encourage and facilitate the participation of stakeholders in the decision-making process in the interest of citizens.

Even though academics and practitioners agree on the various benefits of digital transformation, the extant literature also indicates that our understanding of the phenomenon is incomplete. One area of concern is the lack of knowledge on what is expected from organisations to realise the anticipated benefits of digital transformation. Specifically, researchers argue that only a few studies explored the antecedents of successful digital transformation in organisations with different contextual internal and external settings. For instance, according to Kretschmer and Khashabi (2020), current digital transformation research focuses on the technical aspects of the phenomenon, while the significance of organisational and managerial factors is overlooked. This contradicts findings that emphasise the critical role of organisational adjustments necessary to introduce new digital technologies into the existing processes and organisational arrangements. Based on the lessons learned from the technology-enabled changes in the 1970s, Vital (2019) found it is in organisations' best interest to be informed about existing IT infrastructures, organisational structure, business processes and human resources to succeed in their digital transformation journey. Similarly, adopting new digital technologies also requires consideration of organisational culture, communication between leaders and strategy formulation since it needs to be aligned with an organisation's overall strategy.

A related topic to digital transformation that has attracted the attention of practitioners and researchers in the Information Systems (IS) and cognate disciplines is IT alignment. IT alignment, defined as "…the application of Information Technology (IT) in an appropriate and timely way, in harmony with business strategies, goals and needs" (Luftman 2000, p. 3), has recently been associated with digital transformation as it was found to be one of the prerequisites for digital transformation (Jonathan 2019). The result of

empirical studies across sectors and industries indicates that organisations undertaking digital transformation struggle to align their IT and overall organisational strategies (Kahre 2017).

Even though the issue of IT alignment has been one of the top concerns of leaders for many decades in a row, the current proliferation of IT and its embeddedness with every aspect of today's organisations has made it even more important (Jonathan et al. 2020). The critical role of IT alignment is justified, given its association with related IT management issues that have implications for the successful completion of digital transformation, including organisational agility and information security management. While organisational agility refers to the ability of an organisation to manage unprecedented changes, information security management is concerned with protecting information and related systems. Within the context of digital transformation, the relationship IT alignment has with organisational agility and information security management is already established in the literature (Ifenedo 2014; Tallon and Pinsonneult 2011; Tu et al. 2018). Despite the continuous attention among researchers and practitioners, IT alignment studies investigating its implication on digital transformation have focused mainly on private and commercial organisations (Jonathan et al. 2020; Winkler 2013). Besides, Jonathan and Watat (2020) also found a lack of studies investigating the relationship between organisational agility and IT alignment in the public sector. This study explores the relationship IT alignment has with organisational agility and information security to address the gap in the literature. Thus, this study aims to establish how the various organisational and managerial factors affect digital transformation in the public sector. Particularly, the study examines how organisational culture and structure influence the three IT management issues—IT alignment, information security and organisational agility.

Public sector organisations operate under a pluralistic context–characterised by multiple stakeholders with diverse or opposing objectives (Pittaway and Montazemi 2020; Plesner et al. 2018). The diverse interests will influence how various digital transformation initiatives are planned, financed and implemented. Thus, public organisations need to put in place adequate stakeholder relationship arrangements to manage their digital transformation to fruition seamlessly. Therefore, the study also assesses the influence of the three management elements and stakeholder relationships on the success of digital transformation.

The remainder of the paper is structured as follows. The next section discusses the results of related studies and the development of the hypotheses. In addition to the proposed research model and hypotheses underpinning the study, the items used to measure the seven constructs will also be presented. The research methodology section presents the research strategy adopted, as well as the data collection and data analysis methods. The subsequent section highlights the PLS-SEM results and a discussion of the analysis. Finally, the last section concludes with a brief discussion of the study's contributions and the implications for research and practice.

Related Studies and Hypotheses Development

Digital Transformation in the Public Sector

Digital transformation has gained the prominent attention of elected leaders and those who profoundly influence how the public is governed. This attention marks the recognition of the power of information technology to promote the transformation of governments at different levels (Luna-Reyes and Gil-Garcia 2014). Citizens and businesses are putting consideration pressure on public organisations to digitalise the provision of public services, citing the tremendous strides made in technology and services by private organisations. The emergence of affordable advanced technology, coupled with the dynamic social, technological and business landscapes, is also a push factor for public organisations to adopt digital technologies. However, there is also a recognition of the challenges associated with managing digital transformation and realising its benefits for private and public organisations (Mergel et al. 2018). The challenge, however, is more pronounced in public organisations as they plan and execute digital transformation to fruition (Jonathan 2019; Plesner et al. 2018).

We find three in recent IS literature often cited to conceptualise digital transformation and its purpose within the public sector context. These theories also inform us of the choices available towards managing the various critical factors and antecedents of digital transformation. The technology enactment theory (Fountain 2004), stakeholder theory (Freeman 2010), and public value theory (Moore 1995) help us better understand the context of the public sector and the adoption and use of technology.

The technology enactment theory underscores how meanings are assigned to technologies in organisations. In other words, deploying new technologies could result in conditions where their use is intended and perceived differently. Mainly, the recognition of the importance of managing fundamental change processes in various organisational settings was missing from the extant literature. Changes within a public organisation affect the design, production and delivery of public services (Mergel et al. 2018; Mu et al. 2022). In this regard, we highlight two fundamental differences between public and private organisations as we explore the approaches to successful digital transformation–the antecedents and the expected outcomes. Plesner et al (2018) argue that digital transformation can be best understood and managed when public organisations are studied with consideration for the internal processes, bureaucratic formal structure and accountability issues.

On the other hand, Mergel et al (2018) argue that in public organisations, digital transformation creates added public value—in the form of protection and management of public goods, emphasising accountability, the rule of law and fairness. The rationale is that public organisations are better positioned to make use of a variety of government, private and citizen data to create and deliver goods and services for citizens (Pittaway and Montazemi 2020). In the public sector context, the success of digital transformation is viewed as the extent of positive changes that constitute added public value (i.e., good for the "collective") rather than individual cost-benefit analysis, customer orientation- or rational model choices (Meynhardt 2009). This contrasts with the New Public Management (NPM) view, where transformation outcomes in public organisations are expected to be business-like enterprises (Di Mauro et al. 2021). Thus, public value theory (Moore 1995) provides another perspective on organisation-wide changes and the application of technologies to create value while maintaining stability and order. In the same vein, this study views digital transformation success as improvement measured in terms of (1) equal access to public services, (2) quality of these services, and (3) value for investment.

As indicated in the extant literature (e.g., Metcalfe 1993; Pollitt and Bouckarte 2017; Vander Elst and De Rynck 2014; Wamsley and Zald 1973), leading public organisations and delivering public value is a complex enterprise that calls for craft and negotiations between many. Particularly, the success of many digital transformation initiatives in public organisations requires important decisions affecting various stakeholders (with conflicting or diverging interests) to be made by appointed leaders. However, many major IT projects in the public sector are known to have a significant impact at a societal level. Thus, the decisions of leaders in public organisations often need to be scrutinised by citizens and those holding socio-economic, political, and administrative powers (i.e., stakeholders). This falls under the obligations of public organisations, i.e., to adhere to a transparent and democratic process recognising the interests of diverse groups when major digital transformation decisions are made (Pittaway and Montazemi 2020). Moreover, the active participation and involvement of internal and external stakeholders are necessary to fully exploit the benefits of digital transformation (Jonathan 2019; Legner et al. 2017; Vial 2019). This could come as input when digital transformation is planned to meet the three key objectives of public value creation, i.e., (1) the provision of high-quality services, (2) the realisation of anticipated favourable results, and (3) establishment and maintenance of a good quality relationship with citizens based on trust and mutual understanding (Moore 1995).

Stakeholder theory (Freeman 2010) provides a perspective to appreciate and explore ways of managing relations to pursue the common goal. For instance, intra-governmental collaborations, cooperation with private businesses, and participation of citizens in public decision-making are essential (Luna-Reyes and Gil-Garcia 2014; Panagiotopoulos et al. 2019). On the other hand, Jonathan et al (2020) argue that the participation of stakeholders (i.e., in the IT decision-making process and the formulation of IT needs) plays a significant role in the success of digital transformation in the public sector. However, this study differentiates between *stakeholder participation* and *stakeholder relationships*. Stakeholder participation is concerned with the involvement of individuals and groups who will be impacted by or can influence the operations of public organisations in the decision-making processes and various activities.

On the other hand, the extant literature describes stakeholder relationships as strategies and activities by leaders that could encourage active participation (Belyaeva et al. 2020). Therefore, we argue that for successful digital transformation in the public sector, leaders need to be actively engaged in identifying key stakeholders, identifying and assessing their needs, establishing and maintaining communication channels, building trust, and encouraging partnerships. Moreover, favourable stakeholder relationships are also necessary to gain access to knowledge and a wide range of unique resources (including entrepreneurial and

innovative know-how of emerging technologies) from external actors (Chesbrough et al. 2006; Christofi et al. 2018). Thus, the following hypothesis is posited:

H1*: Stakeholder relationship is positively associated with digital transformation success in public organisations.*

IT Alignment in the Public Organisations

Since the proliferation of information technology in organisations, IS scholars have debated how organisations achieve and maintain IT alignment to create added value (Kahre et al. 2017). The rationale is that organisations that manage to fit their overall organisational strategy with their IT and related resources are in a better shape to succeed. Given the current mega trend of emerging technologies that could radically change business models, IT alignment has become the most critical management issue. In the public organisations' setting, IT alignment refers to *"…the degree to which the IT goals support the strategic goals of a public agency, and to which administration and IT stakeholders are committed to supporting these goals*" (Winkler 2013, p. 834). Empirical studies found that IT alignment determines whether digital transformation in the public sector succeeds (Jonathan, 2019). At the same time, studies suggest that the fast pace of technological changes has made it difficult for organisations to reach IT alignment (Jonathan et al. 2020). This challenge stems from the difficult task of making appropriate adjustments to enable an IT-aligned position. To facilitate the alignment between the IT goals supporting the strategic objective of a public agency during digital transformation, the strategic, tactical and operational plans need to be matched with the structural and cultural adaptations to accommodate the introduction of new digital technologies (Jonathan et al. 2020; Winkler 2013). Thus, the following hypothesis is posited:

H2*: IT alignment is positively associated with successful digital transformation in public organisations.*

Organisational Agility

As organisations operate under constant technological and market changes, researchers recognise the critical role of organisational agility. According to Bradley et al. (2011), organisational agility during digital transformation is a necessary organisational capability essential to prioritising and selecting IT projects effectively. Organisational agility allows for flexibility and adaptability that creates added value from the investment in IT. The results of empirical studies in private organisations suggest a positive relationship between organisational agility and IT alignment (Nijssen and Paauwe 2012; Seo and La Paz 2008).

Even though studies acknowledge the significance of organisational agility for organisations in turbulent times, recent findings also suggest a phenomenon referred to as the alignment-agility paradox. The alignment-agility paradox describes a situation that results from activities meant to improve IT alignment. In other words, it is a rigidity that debilitates organisations from reacting appropriately to changes related to technology and other environmental factors (Tallon and Pinsonneult 2011). However, according to Horlach et al (2016), the complex and rigid IT infrastructure, as well as hierarchical organisational silos, are the culprits for the lack of flexibility (organisational agility) hindering digital transformation success in modern organisations. The authors also suggest revisiting the approaches towards IT alignment in light of the current developments in the business and technological landscapes. This suggestion is shared by researchers recognising the significance of IT alignment in providing a roadmap for organisational agility in today's turbulent business environment (e.g., Zhou et al. 2018). The caution from scholars is that IT alignment should not be pursued in a way that creates organisational rigidity, preventing the appropriate deployment of resources (Reynolds and Yetton 2015).

On the other hand, the findings of prior studies (e.g., Jonathan et al. 2021; Jorfi et al. 2017) indicate that IT alignment helps organisations in designing and implementing organisational flexibility (i.e., IT infrastructure, organisational structure, and workforce), which is required for successful digital transformation. Thus, the following hypotheses are posited:

H3*: IT alignment improves organisational agility in public organisations.*

H4*: Organisational agility is positively associated with successful digital transformation in public organisations.*

Information Security

Managing information security in the public sector is considered an important task, given the vast amount of data collected, stored and managed to enable data-driven decision-making. Besides, public organisations often deal with sensitive information, including citizen data, financial records, and national security data. Thus, ensuring the security and privacy of this data is crucial to protect citizens, maintain trust, and prevent data breaches that could have severe consequences. To this end, the public sector's information security management practices comprise dealing with information, people, policies, and programmes to ensure the continuous operation of an organisation and the use of information technology while maintaining alignment with the overall organisational objectives.

Prior studies indicate that organisations embarking on the digital transformation journey face the daunting task of meeting the information security challenges necessary for digital transformation to succeed (Tu et al. 2018). This is consistent with what researchers claim—leaders are expected to put in place measures helpful to tackle both intended and unintended outcomes of the digital-enabled transformation. Maintaining privacy and security are among these issues that have become critical since organisations have increased the gathering, storing and usage of a large amount of data (Raza 2018; Tu et al. 2018). According to the authors, the risk of information security breaches has implications for how organisations use the data they maintain. Unfortunately, researchers and practitioners seem to overlook the influence of information security on the success of digital transformation (Chang and Lean 2007; Ifenedo 2014).

On the other hand, the security measures in place have an implication on how IT alignment is pursued in an organisation. For instance, according to Tu et al (2018), information security management needs to be aligned with the current information security risks as well as the overall organisational strategy, IT strategy, and business processes. Thus, the following hypotheses are posited:

H5*: IT alignment is positively associated with information security management in public organisations.*

H6*: Information security management is positively associated with successful digital transformation in public organisations.*

Organisational- Culture and Structure

Researchers in the IS and cognate disciplines have recognised the daunting task of managing digital transformation in pursuit of improved organisational performance. However, these studies often focus on the technological issues related to digital transformation, while other organisational factors are overlooked (Hess 2016; Jonathan 2019). On the other hand, studies have found that it is in organisations' interest to identify the various internal and external factors critical to successful digital transformation. Among these factors, the influence of organisational culture and organisational structure is acknowledged in the extant literature (Gil-García and Pardo 2005).

Even though the extant literature provides a long list of definitions of organisational culture, the common theme is that it describes a particular set of norms and values, including management styles, reward systems, communication styles, and manners of decision-making (Tang et al. 2015). In other words, organisational culture is the manifestation of both observable and unexpressed behaviours as well as actions and activities of doing things in an organisation based on shared values. In this study, organisational culture concerns how employees and leaders view digital transformation and related activities. Our focus is on the influence of organisational culture on organisational agility, IT alignment and information security management. The justification lies in the result of our literature review, which is consistent with what Leidner and Kayworth (2006) found. For instance, resistance to change was found to have a significant role in adopting, managing and using new digital technologies. Regardless of the reason, a culture that does not support the flexibility of structures or departure from habits and routines can hinder organisational agility and IT alignment (Jonathan and Kuika Watat 2020; Nijssen and Paauwe 2012). The influence of organisational culture on information security is also established in the literature. For instance, Tang et al (2015) argue that organisational culture determines the risk-taking behaviours and leaders' involvement in information security formulation. Besides, information security is often referred to as a management issue that cannot be handled through technical solutions unless organisations instil a culture where employees' behaviour is built on respecting confidentiality, integrity, and availability. We also argue that cultural issues,

including digital commitment and willingness to learn, affect information security, IT alignment and organisational agility. Thus, the following hypotheses are formulated:

H7a*: Organisational culture influences organisational agility in public organisations.*

H7b*: Organisational culture influences IT alignment in public organisations.*

H7c*: Organisational culture influences information security in public organisations.*

An organisational structure is one of the determinant factors influencing the success of digital transformation. According to prior IS studies, organisational structure plays a role in how organisational-wide IT strategies are formulated and managed to achieve the overall organisational goals (Jonathan et al. 2019). For instance, information security practices and measures are better implemented when the organisational structure in place facilitates a smooth relationship between departments (Tu et al. 2018). The influence of both formal and informal organisational structures on IT alignment is also recognised in the literature (Jonathan et al. 2020). Organisational hierarchy, or formalisation, also influences the level of flexibility when new technologies are introduced. The influence of the degree of centralisation and formalisation on IT alignment could be revealed by looking into the various dimensions of IT alignment. For instance, according to the strategic IT alignment maturity model (Luftman et al. 2017), the organisational structure is critical for communications, IT governance as well as dynamic IT scope. Similarly, empirical studies have shown that the level of formality of coordination and hierarchy has implications on organisational agility (Nijssen and Paauwe 2012). Thus, the following hypotheses are formulated:

H8a*: Organisational structure influences organisational agility in public organisations.*

H8b*: Organisational structure influences IT alignment in public organisations.*

H8c*: Organisational structure influences the deployment of information security measures in public organisations.*

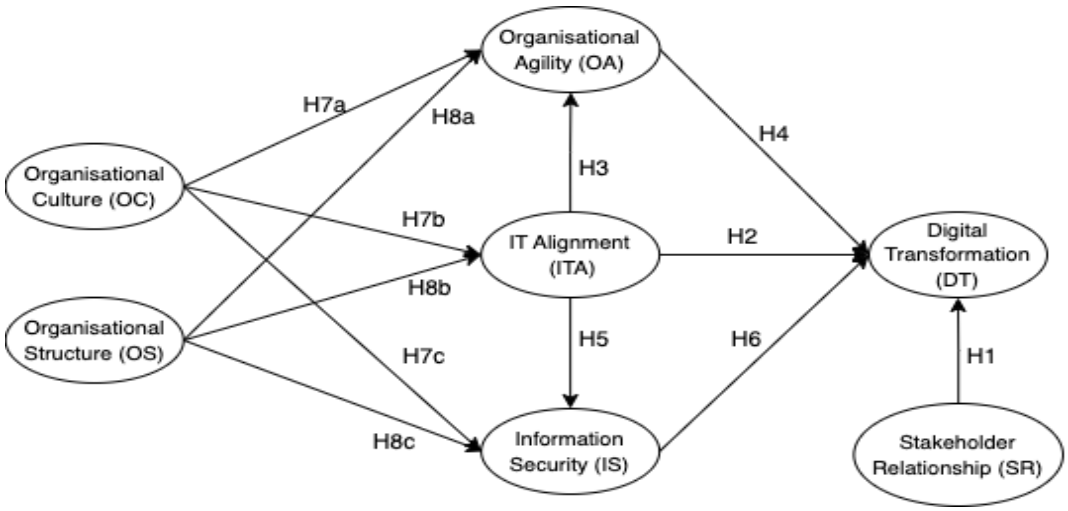

Figure 1. Theoretical Model

The research model shown in Figure 1 demonstrates the conceptualisation of the study. The model depicts the seven constructs. The review of prior studies on IT alignment, organisational studies as well as the findings of studies on digital transformation (for instance, Luftman et al. 2017; Mergel et al. 2018; Nijssen and Paauwe 2012) are the basis for the development of the model as well as the measurement items shown in Table 1.

Construct	Measurement Item	Sources
Digital transformation (DT)	DT1: Equal access	Førsund (2017), Andersen et al (2016), Mergel et al (2018)
	DT2: Service quality	
	DT3: Value for investment	
IT Alignment (ITA)	ITA1: Communications	Luftman et al (2017)
	ITA2: Dynamic IT scope	
	ITA3:IT governance	
	ITA4: Partnering	
	ITA5: Skills development	
	ITA6: Value analytics	
Information security (IS)	IS1: Accountability	Chang and Lin (2007)
	IS2: Availability	
	IS3: Confidentiality	
	IS4: Integrity	
Organisational agility (OA)	OA1: Flexible IT infrastructure	Tallon and Pinsonneault (2011), Seo and La Paz (2008), Nijssen and Paauwe (2012)
	OA2: Rapid organisational learning	
	OA3: Scalable workforce	
Organisational Culture (OC)	OC1: Acceptance of failure	Legner et al (2017), Ifinedo (2014)
	OC2: Exploratory character	
	OC3: Readiness for change	
	OC4: Role orientation	
Organisational Structure (OS)	OS1: Centralisation	Nijssen and Paauwe (2012), Liang et al (2017)
	OS2: Formalisation	
	OS3: Hierarchy	
Stakeholder Relationships (SR)	SR1: Citizens' involvement	Gil-García and Pardo (2005), Winkler (2013), Seo and La Paz (2008)
	SR2: Inter-governmental relations	
	SR3: Collaboration with suppliers	

Table 1. Operationalisation of Constructs and the Research Model

Research Methodology

Exploratory and confirmatory research approaches were chosen for this study. The choice of a mixed research approach is justified as it improves the rigour of our study, which is recognised among researchers (Koufteros 1999). While exploratory studies in the form of case studies are invaluable in revealing an in-depth insight into a phenomenon, surveys are appropriate for establishing the influence of various organisational and managerial factors on IT alignment in organisations undertaking digital transformation. In contrast with other research strategies, surveys are best suited to test hypothesised relationships and theoretical models using a large amount of quantitative data (Denscombe 2017; Newsted et al. 1998). IT alignment and digital transformation studies (e.g., Câmara et al. 2018; Schmidt et al. 2017) have also been conducted using a survey research strategy. Thus, a mixed-method research approach was chosen for the study. However, the presentation of the paper focuses on the quantitative part of the study.

Data Collection Methods

This study is conducted in three stages. First, two literature reviews were conducted to establish a theoretical base and provide the state-of-the-art. In the first literature review, we identified 94 articles investigating IT alignment—the evolution of the construct over time, antecedents, and research approaches. The second literature review of 13 articles examined the factors influencing IT alignment and organisational agility in public organisations—organisational structure, organisational culture, and stakeholder relationships. The last review identified 29 relevant articles. Premier journals and conference proceedings were searched in databases using combinations of keywords (Webster and Watson 2002). The analysis of the literature reviews is the basis for the development of our research model and hypotheses posited.

In the second data collection stage, we conducted interviews in multiple organisations. The first set of interviews was conducted in a municipality with ten respondents. The interviews, which focused on the relationship between organisational structure and IT alignment, lasted between 60 and 85 minutes. The next set of interviews targeted 17 leaders in four public organisations. These interviews focused on information security and organisational agility. Organisational factors (organisational structure, organisational culture, and stakeholder relationships) were also included in the interviews. These interviews lasted between 85 and 110 minutes. Sampling strategies for interview participants followed the recommendations of prior IT alignment studies (e.g., Luftman et al. 2017). Accordingly, leaders from the IT and administration sides expected to possess the information relevant to the aim of the studies were approached. Probability sampling was deemed inappropriate for the studies since our objective was to provide in-depth insight, not generalisation, of a phenomenon in the wider population (Ritchie et al. 2013). Thus, as a starting point for purposive sampling, we adopted a criterion of selection of what Bogner et al (2009) defined as "experts". According to Ritchie et al (2013), the non-probability sampling strategy ensures that only respondents with the experience and position to have relevant information were selected for the study. The responses to the interviews were essential to customise the measurement items of our constructs to public organisations' context.

The confirmatory part of our study requires the collection of quantitative data. As shown in Table 1, the operationalisation of the constructs and research model was used to prepare the survey questionnaire. The survey questionnaire was distributed in similar public organisations in addition to those where interviews were conducted.

Role (Positions)	***n***	**%**	**Organisational Size (Number of employees)**	***n***	**%**	**Age**	***n***	**%**
Executive	76	20.9	100-250	37	10.2	<30	121	33.2
Middle management	192	52.7	251-1000	192	52.7	30-40	83	22.8
Team leader	96	26.4	1001-5000	63	17.3	41-50	117	32.2
			>5000	72	19.8	>50	43	11.8
Organisation Type	***n***	**%**	**Sex**	***n***	**%**			
Regional government	81	22.3	Male	219	60.2			
City administration	76	20.8	Female	145	39.8			
Ministry	55	15.1						
Public University	56	15.4						
Justice	47	12.9						
Other	49	13.5						

Table 2. Demography of our respondents, their role and organisational affiliation.

Based on the number of contacts we established, we expected to collect about 500 complete responses. However, the final number of respondents to the survey questionnaire stands at 364 (see Table 2). Consistent with the research model and the hypotheses posited, the 26 measurement items listed in Table 1 were used to test the seven constructs. For all measurement items, 7-point Likert Scales were adopted. The unit of analysis for the study is the public sector. Thus, the questionnaires are formulated so that

respondents answer how the various organisational and managerial factors influence digital transformation in public organisations.

The online survey questionnaire was pre-tested with a sample of 15 leaders randomly selected from three public organisations. Minor revisions were made to address identified issues with the questionnaire before the active link of the survey was sent to 675 selected experts. In addition to the demographic questions, we included a dummy question to exclude unserious responses. The online survey, active for 35 days, resulted in 364 complete questionnaires with a response rate of 54 per cent.

Data Analysis Methods

This study set out to explore the various organisational and managerial factors that are relevant to the successful digital transformation in the public sector. Particularly, the main focus is to reveal how organisational factors (organisational culture and organisational structure) influence organisational agility, information security and IT alignment. Thus, the thematic data analysis method was chosen for the qualitative part of the study. The thematic analysis method has gained popularity among IS researchers since it is not tied to particular theoretical or epistemological stances (Boyatzis 1998). For this study, the choice was justified since we aimed to categorise the impact of specific organisational and managerial factors relevant to the phenomenon we set out to investigate. Regarding the literature reviews, the selected articles were analysed using a concept matrix, as suggested by Webster and Watson (2002). On the other hand, the analysis of the interview data was according to the six-step thematic analysis procedure by Clarke et al (2015)—transcribing and familiarising with the data, generating initial codes, sorting codes and grouping them into potential sub-themes, reviewing the sub-themes, defining, grouping and naming the sub-themes into themes, and producing the report.

On the other hand, the analysis of the quantitative data from the online survey questionnaire was the last step in the data analysis. To test the hypotheses posited and the proposed theoretical model shown in Figure 1, Partial Least Structural Equation Modelling (PLS-SEM) was adopted. Considered to be the second-generation multivariate data analysis method (Fornell and Larcker, 1981), PLS-SEM has become a popular analysis method among researchers in the IS and cognate areas (Hair et al. 2017). Recent IT alignment and digital transformation studies have also used this technique (e.g., Jonathan et al. 2020; Luftman et al. 2017). For this study, however, the method was deemed appropriate since the aim of the study was to assess the influence (i.e., casual prediction) of various organisational and managerial factors on IT alignment and digital transformation. On the other hand, since the sampling strategy was purposive, the number of potential respondents at the public organisations was relatively small (n=364). Thus, PLS-SEM was a better choice among comparable SEM techniques. Besides, Hair et al (2017) also argue that PLS-SEM is better suited for studies where a large sample size is not available but suggests a sample size of not less than ten times the number of independent variables. This study met this requirement.

In addition to the small sample size in this study, the dearth of IT alignment and digital transformation studies theorising the relationship between various organisational structure forms, IT alignment and digital transformation justifies the use of PLS-SEM. Authors argue that PLS is a better choice when established theories about the relationship between constructs under investigation are not available (Hair et al. 2017). The operationalisation of our constructs with formative measures. In contrast with reflective measures (i.e., unidimensional), our choice of formative measures was justified since we are interested in capturing the different aspects of the organisational and managerial factors (Petter et al. 2007).

As suggested in the literature (Hair et al. 2019), the data analysis was conducted in two steps—evaluation of the measurement model followed by an assessment of the structural model. Since our constructs are all formative, we evaluated convergent validity, indicator collinearity, statistical significance, and relevance of the indicator weights. In the second step, we assessed the structural model by applying three criteria—collinearity, the model's predictive power, statistical significance and relevance of path coefficients. Version 3.3.9 of SmartPLS software was used to run the analysis (Ringle et al. 2015).

Results

To begin the analysis, we first started by estimating the path coefficients and assessing the collinearity statistics. As we ran the PLS-SEM algorithm, we selected a path-weighing option with maximum iterations

of 10000. In the next step, a bootstrapping was performed with the same maximum iterations to calculate significance. The result of the PLS-SEM analysis is shown in Figure 2.

Measurement Model

We started examining the measurement models by computing the collinearity statistics of the items. As suggested in the literature (Hair et al. 2019), the variance inflation factor (VIF) was used to measure collinearity. Our aim is to determine whether the other formative indicators related to the same construct may affect any formative indicator. The VIF value was calculated for each of the indicators. We note that a VIF value of 5 or higher indicates a potential collinearity issue. Since none of the VIF values of our indicators is over 5, we are satisfied that there is no collinearity issue.

The next step in our analysis was to examine the statistical significance and relevance of the indicator weights. This was done by examining the *t*-values for the indicator weights. The study showed that the weight in 22 of the 26 items seemed to be significant at 1%, standing above the threshold of 2.576. Heir et al. (2019) suggest that an indicator weight that is not significant should not necessarily be considered to exhibit evidence of poor quality. Accordingly, we assessed the four formative indicators' absolute contribution to their respective constructs. Since the outer loadings of these indicators were above .50, we are satisfied that they sufficiently contribute to the construct. Thus, we retained all the indicators, and no collinearity issues were encountered.

Structural Model

Since the measurements of our constructs seemed to be valid, we continued assessing the structural model. The first step in the analysis is to assess collinearity by looking into the computed value of VIF. VIF values of the predictor constructs over 5 indicate collinearity issues. Since all values are lower than the threshold of 5, we are satisfied that no further measure is necessary. In the second step, we tested the predictive power of our model.

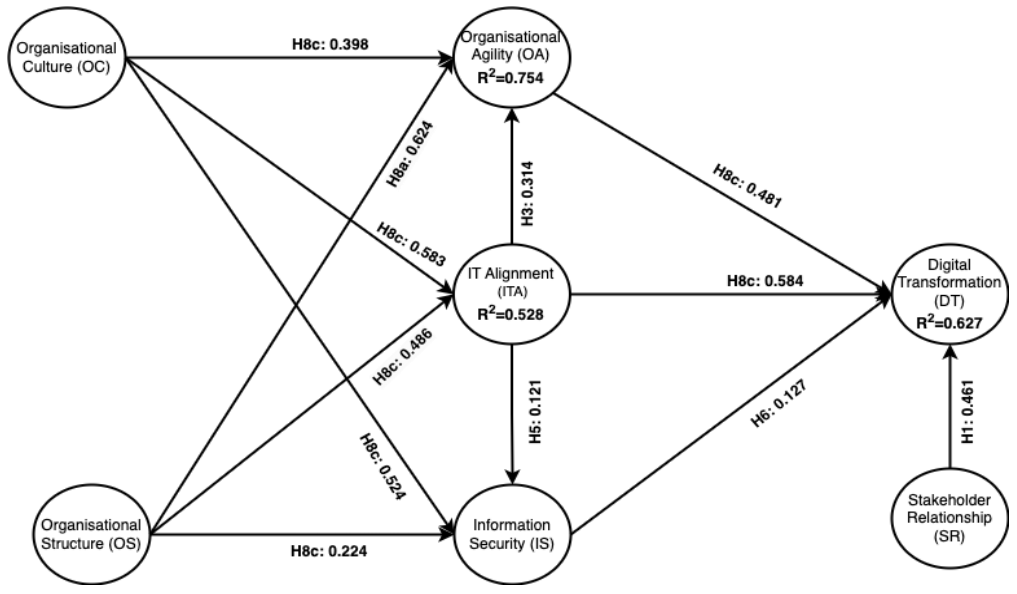

Figure 2. Results of the theoretical model evaluation.

In contrast with other structural equation modelling techniques, PLS estimates are based on the variance explained (Wong 2013). We assessed R^2 to test the hypothesised relationships of the theoretical model (Figure 1). According to Heir et al (2019), R^2 values range from 0 to 1, indicating the model's explanatory power (i.e., 0.75 = substantial, 0.5 = moderate, and 0.25 = weak). As shown in Figure 2, the model seems to substantially explain the variances of one of the constructs (i.e., organisational agility = 75.4%). The variance for IT alignment and digital transformation (i.e., 52.8% and 62.7%) seems moderate.

We evaluated path coefficients' statistical significance and relevance in the third step. Path relationships explain the strength of the effect one variable has on another. According to Cohen (2013), the power of the prediction as measured by path coefficients might be strong (0.5 or higher), moderate (higher than 0.3, but less than 0.5), or small (higher than 0.1 but less than 0.3).

As shown in Figure 2 and Table 2, all paths in our theoretical model were found to be strong, moderate or small. A close evaluation of the p-values indicates that all but two of our hypotheses are accepted. Thus, our theoretical model is partially supported. However, we also note that the degree of influence between our constructs varies. For instance, organisational structure strongly influences organisational agility, followed by the degree of influence of IT alignment on digital transformation.

Hypotheses and Path	**Path Coef. (β)**	**P-Value**	**Decision**
H1: SR→DT	0.461	0.010	Accepted
H2: ITA→DT	0.584	0.021	Accepted
H3: ITA→OA	0.314	0.005	Accepted
H4: OA→DT	0.481	0.000	Accepted
H5: ITA→IS	0.121	0.103	Rejected
H6: IS→DT	0.127	0.061	Rejected
H7a: OC→OA	0.398	0.000	Accepted
H7b: OC→ITA	0.583	0.002	Accepted
H7c: OC→IS	0.524	0.000	Accepted
H8a: OS→OA	0.754	0.002	Accepted
H8b: OS→ITA	0.528	0.000	Accepted
H8c: OS→IS	0.224	0.020	Accepted

Table 2. Outcomes of structural equation model analysis.

According to Cohen (2013), the degree of influence of organisational structure on organisational was strong, while the causal relationship between *stakeholder relationships and digital transformation* (1), *IT alignment and organisational agility* (2), *organisational agility and digital transformation* (3), *organisational culture and organisational agility* (4) were moderate. On the other hand, the analysis suggests that the influence of IT alignment on information security, information security on digital transformation, and organisational structure on information security were small.

Discussions and Concluding Remarks

This study aimed to contribute to the scant literature on digital transformation and IT alignment in the public sector. Even though the two topics have garnered the attention of many, there seems to be a lack of appreciation for the sectoral and various organisational differences in prior studies (Plesner et al. 2018). On the other hand, a close look into the extant literature indicates a lack of overlap of studies on the two topics. For instance, even though IT alignment and digital transformation have been recognised as related topics, to the best of our knowledge, no studies have explored how public organisations should approach IT

alignment while undertaking digital transformation. To address this gap in the literature, we used multiple data collection and analysis methods to further our understanding. The point of departure for our quantitative study was the six constructs related to digital transformation in the public sector (i.e., organisational agility, organisational culture, organisational structure, information security, stakeholder relationship, and IT alignment), which were identified from the systematic literature reviews and interviews.

Similar to organisations in the private sector, many public organisations struggle to meet the demands of their customers. A critical area of concern for modern organisations is how to reach and maintain IT alignment. As Luftman et al. (2017) put it, the question for leaders is not where IT alignment is necessary but how to maintain mature IT alignment during the current dynamic financial, political, and technological landscape. As one area of research is to explore and identify the various organisational and managerial factors relevant to IT alignment, there are also calls to explore the relationship between IT alignment and digital transformation. To this end, our systematic literature review (e.g., Kahre et al. 2017, Jonathan et al. 2020) and interviews with leaders in public organisations have revealed various vital factors that could determine IT alignment maturity in organisations undertaking digital transformation. Among those, our respondents argue that organisational structure and organisational factors are critical for public organisations. The PLS-SEM analysis also suggests that both organisational culture and organisational structure influence IT alignment, albeit in varying degrees (i.e., β*=0.583 and* β*=0.528,* respectively). While the influence of organisational structure was stronger on organisational agility (β*=0.754*), the most profound influence of organisational culture was on information security (β*=0.787*). Organisational culture also seems to influence organisational agility moderately (β=0.398). The level of influence of organisational structure on information security was small (β*=0.224*).

A closer look into IT alignment, our respondents agree that it has various antecedents. They also argue that public organisations do not have the flexibility required to make adjustments supporting the continuous alignment of IT and overall organisational objectives. In this regard, the extant literature adds the issue of organisational agility to the IT alignment debate (e.g., Nijssen and Paauwe 2012; Tallon and Pinsonneult 2011; Seo and La Paz 2008). The quantitive analysis result suggests that the influence of IT alignment on organisational agility is moderate (β*=0.314*). However, IT alignment was found to strongly influence digital transformation within the public organisation context (β*=0.584*). This finding is consistent with prior studies identifying IT alignment as a prerequisite for digital transformation (e.g., Kahre et al. 2017; Jonathan 2019). On the other hand, the causal relationship between IT alignment and information security was weak (β*=0.121*). This finding contradicts what we found in the extant literature, where information security in this digitalisation era was considered paramount for digital transformation success (e.g., Raza 2018; Tu et al. 2018). This finding was not surprising given the lack of appreciation for information security and its influence on digital transformation among researchers and practitioners (Chang and Lean 2007; Ifenedo 2014). Our interview respondents recognise that information security is an important element of digital transformation initiatives. However, the issue could only attract their organisation's attention as the level of digitalisation, as well as the collection and utilisation of data reaches the next level. Currently, organisations in our study have not reached such a level of information (data) dependency to run their operations.

The last construct investigated in this study was stakeholder relationships. The literature review suggested that stakeholder relationships are an important management issue for organisations across industries and sectors. The significance of stakeholder relationships for public organisations is recognised (Jonathan 2019; Legner et al. 2017; Vial 2019). Our interviewees also recognise that public service providers are bound by the mandate to consult and interact with multiple stakeholders to serve or co-create value for citizens. When it comes to undertaking digital transformation, our analysis indicates a moderate influence from stakeholder relationships (β*=0.461*).

Our findings contribute to the IT alignment and digital transformation studies in the public sector. With regard to research, our findings could be a starting point for further studies. A possible point of departure could be investigating the factors that strongly influence IT alignment. For instance, how can public organisations design and implement favourable organisational structures or adopt HR management practices to improve IT alignment? From the list of hypotheses we posited, two of them were rejected (H5 and H6) despite the literature suggesting otherwise. We propose future exploratory and confirmatory

studies investigating the relationship between information security, IT alignment and digital transformation.

The managerial implications of this research might be an appreciation for the various factors that influence IT alignment. Given the strong positive causal relationship between IT alignment and digital transformation, leaders need to allocate their resources to pursue IT alignment. Thus, the level of strengths of the influences we established can be informative.

The findings of our study should be interpreted with caution, considering the limitations. Our evaluation is based on cross-sectional survey data on how various factors influence IT alignment. Applying the same analysis method, longitudinal data might have resulted in a different observation. Managing the activities related to IT alignment and digital transformation in the current dynamic environment can be challenging. Thus, evaluating these factors as internal and external environments change could provide invaluable insights. The other limitations are related to our sampling strategies. As respondents were selected non-randomly, the final list might be based on bias affecting the result of our study. Besides, since the data was collected in Kenya, the responses might be culturally biased. Future studies might be conducted in similar public organisations in other countries.

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