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Abstract

The widespread adoption of new digital technologies to revamp how organisations run their operations and processes—referred to as digital transformation—has resulted in improved organisational performance, primarily due to improved efficiency and effectiveness. In the public sector, digital transformation facilitates the participation of various stakeholders in public decision making. However, despite the anticipated benefits, the introduction of new technologies requires making adjustments to their business processes, organisational structures as well as to human resources. These changes, in turn, have implications on how leaders manage the alignment between new digital technologies as well as the overall organisational factors that are critical to successful digital transformation. This study, adopting a mixed-research approach with interviews and surveys as a data collection method, explores the relationship IT alignment has with organisational agility and information security. Besides examining the relationships, the study reveals the degree of significance of the various factors critical to digital transformation.

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

1   Introduction

Digital transformation has recently dominated the practical and scientific discourse, given its implications for organisations in all sectors. Defined as "*...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), the prominence of digital transformation follows 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 pressure to automate their business processes and integrate new digital technologies with their infrastructures. Even though digital transformation has been considered as a phenomenon relevant for private and commercial organisations, the topic has also engaged policymakers, governments and citizens as the phenomenon were found to affect the way we run our daily lives (Agarwal et al. l.2010). The expenditure on digital transformation initiatives by public organisations indicates that the sector has recognised the opportunities it brings to citizens (Jonathan 2019).

Hess et al. (2019) argue that organisations expect the introduction of new digital technologies to provide new opportunities for improving communications and collaborations among customers, suppliers, collaborators and partners. The technologies enable stakeholders to improve collaborations 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 the 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 facilitates the participation of stakeholders in the decision-making process in the interest of citizens.

Despite the various benefits for many organisations, previous studies indicate that understanding many organisations have on digital transformation is not complete. For instance, Kretschmer and Khashabi (2020) argue that emerging research on digital transformation focuses on the technical aspects while downplaying the relevance of organisational and managerial factors. However, according to Vital (2019), what we learned about the technology-enabled changes in the 1970s informs us that organisations undertaking digital transformation need to explore the necessary adjustments that need to be made to their IT infrastructures, organisational structure, business processes and to their human resources. Similarly, the adoption of new digital technologies also requires due consideration since it needs to be aligned with the overall strategy of an organisation.

While publications in the practitioner and academic outlets widely praise the opportunities created by the digital transformation in many public organisations, several challenges have been identified as obstacles preventing the realisation of the anticipated results. Among the challenges, the significance of IT alignment has been recognised in the literature (Kahre 2017; Legner et al. 2017). 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), is found to be one of the prerequisites for digital transformation (Jonathan 2019). According to recent empirical studies, 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—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 the protection of information as well as 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 (Tallon and Pinsonneult 2011). 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 (Winkler 2013).

Similarly, Jonathan and Watat (2020) also found a lack of studies investigating the relationship between organisational agility and IT alignment in the public sector. To address the gap in the literature, this study explores the relationship IT alignment has with organisational agility and information security. Thus, this study aims to establish how the various organisational and managerial factors affect digital transformation in the public sector. Particularly, the study examines the influence of organisational

culture and organisational structure on the three IT management issues—IT alignment, information security and organisational agility.

The remainder of the paper is structured as follows. The next section discusses the research model and hypotheses development. In addition to the research model and hypotheses underpinning the study, the items used to measure the seven constructs will also be presented. The research methodology outlining the research strategy as well as the data collection and data analysis methods, will be described in the subsequent section. Finally, the last section concludes the paper by highlighting the expected contributions and the implications of the study for research and practice.

2   Research Model and Hypotheses Development

2.1   IT Alignment in public organisations

For over three decades, information systems scholars debated on how organisations go about achieving and maintaining IT alignment with the aim of creating added value from IT (Kahre et al. 2017). The current trend of digital transformation has brought IT alignment to be one of the most important IT management issues relevant to digital transformation. In the public organisational settings, IT alignment which is defined as *"…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), is found to be a determinant factor for digital transformation (Jonathan, 2019). According to Jonathan et al. (2020), the fast pace of technological changes over the years has made it difficult for organisations to reach IT alignment. The reason for this challenge emanates from the difficult task of making appropriate adjustments enabling 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:

H1: IT alignment enables successful digital transformation in public organisations.

Among the various factors that determine the success of the public sector, digital transformation is the level of communication and collaboration between various stakeholders. According to Gil-García and Pardo (2005), digitalisation initiatives in most public organisations require the go-ahead from those holding political and administrative powers. On the other hand, Jonatha et al. (2020) argue that the participation of stakeholders not only in the IT decision-making process but also in the formulation of IT needs plays a role on whether IT alignment is achieved in a public organisation. Thus, the following hypothesis is posited:

H2: Stakeholder relationship improves IT alignment in public organisations.

2.2   Organisational Agility

The critical role of organisational agility in today's dynamic business environment is established in the extant literature. According to Bradley et al. (2011), organisational agility in the face of digital transformation is a necessary organisational capability important to make effective prioritisation and selection of IT projects. Organisational agility allows for flexibility and adaptability that creates added value from the investment in IT. Even though studies acknowledge the significance of organisational agility for organisations in turbulent times, recent findings mention the alignment-agility paradox. The alignment-agility paradox refers to the unfortunate outcome of IT alignment—a rigidity which debilitates organisations from reacting appropriately to changes related to technology as well as other environmental factors (Tallon and Pinsonneult 2011). Even though the results of empirical studies in the private organisations seem to gravitate towards a positive relationship between organisational agility and IT alignment (Nijssen and Paauwe 2012; Seo and La Paz 2008), there is a call for a study in the public organisational settings. Thus, the following hypotheses are posited:

H3: IT alignment improves organisational agility in public organisations.

H4: Organisational agility facilitates digital transformation in public organisations.

2.3   Information Security

Prior studies indicate that organisations embarking the journey of digital transformation are faced with the daunting task of managing the appropriate changes that are necessary for digital transformation (Jonathan 2019). 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 on how organisations make use of the data. Unfortunately, researchers and practitioners seem to overlook the influence of information security on the success of the digital transformation. 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 contributes to improved information security management in public organisations.

H6: Information security management influences digital transformation in public organisations.

2.4 Organisational Culture and Organisational Structure

Researchers in the IS and cognate disciplines have recognised the daunting task of managing digital transformation in pursuit of improved organisational performance. However, the focus of these studies is often 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 as well as external factors that are 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). Organisational culture is concerned with how employees and leaders view digital transformation and the various related activities. For instance, in relation to information security, the organisational culture determines the risk-taking behaviours as well as leaders' involvement in information security formulation. Organisational culture is also an important variable in determining the level of IT alignment and organisational agility. Digital commitment and willingness to learn are cultural issues with implication for both 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.

Organisational structure is one of the determinant factors influencing the success of the digital transformation. According to prior IS studies organisational structure plays a role in how organisational wide IT strategies are formulated and managed in pursuit of achieving 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 structure 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 implication 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.
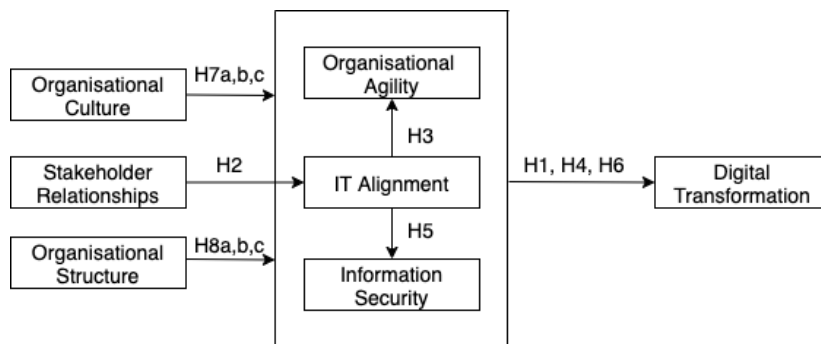
Figure 1. Research Model

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	Item	Sources	Construct	Item	Sources
Digital transformation	Equal access, Service quality, Value for investment	Førsund (2017), Andersen et al. (2016), Mergel et al. (2018)	IT alignment	Communications Dynamic IT Scope, IT Governance, Partnering, Skills development, Value analytics	Luftman et al. (2017)
Organisational agility	Flexible IT infrastructure, Rapid organisational learning, Scalable workforce	Tallon and Pinsonneault (2011), Seo and La Paz (2008), Nijssen and Paauwe (2012)	Organisational culture	Centralisation, Coordination, Formalisation	Nijssen and Paauwe (2012), Liang et al. (2017)
Information security	Accountability, Availability, Confidentiality, Integrity	Chang and Lin (2007)	Organisational culture	Acceptance of failure, Exploratory character, Readiness for change, Role orientation	Legner et al. (2017), Ifinedo (2014)
Stakeholder relationship	Citizens involvement, Inter-governmental relations, Collaboration with suppliers	Gil-García and Pardo (2005), Winkler (2013), Seo and La Paz (2008)			

Table 1. Operationalisation of constructs and the Research Model

3 Research Methodology

Exploratory and confirmatory research approaches are chosen for this study. The choice of mixed research approach is to improve the rigour of our study as recognised among researchers (Koufteros 1999).

3.1 Data Collection

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 the IT alignment—the evolution of the construct over time, antecedents, as well as research approaches. The second literature review of 13 articles looked into the various factors influencing IT alignment and organisational agility in the 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.

The second stage of the data collection, we conducted interviews in multiple organisations. The first set of interviews were 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. The sampling strategy was purposive for all interviews. Respondents from IT and administration divisions were selected if they possess expertise and responsibilities for digital transformation initiatives and information security. The interviews were found useful for several reasons. The responses were important 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 will be used to prepare the survey questionnaire. The survey questionnaire will be distributed in similar public organisations, in addition to those where interviews were conducted. Based on the number of contacts we managed to establish, we expect to collect about 500 complete responses. Consistent with the research model and the hypotheses posited, the 26 measurement items listed in Table 1 will be used to test the seven constructs. For all measurement items, 7-point Likert Scales will be adopted. The unit of analysis for the study is a public organisation. Thus, the questionnaires are formulated in such a way that respondents answer how the various organisational and managerial factors influence digital transformation in public organisations. A sample of experts will test the survey questionnaires for comprehension and clarity before distribution.

3.2 Data Analysis Method

The study is set out to explore the various organisational and managerial factors that are relevant for 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 is chosen. Thematic analysis method has gained popularity among IS researchers since it is not tied to particular theoretical or epistemological stances (Boyatzis 1998).

For 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-steps 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.

The analysis of the quantitative data from the survey is the last step in the data analysis. To test the hypotheses posited and the proposed research model is shown in Figure 1, Partial Least Structural Equation Modelling (PLS-SEM) will be adopted. 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). The analysis will be in two steps. First, by evaluating the convergent and discriminant validity, the measurement model will be assessed (Hair et al. 2017). Then, by assessing the coefficients of determination (R^2) and path coefficient significance, the structural model will be evaluated. The SmartPLS software version 3.2.8 will be used to run the analysis.

4   Expected Contributions

According to the findings of prior studies (for instance, Jonathan, 2019; Kahre et al., 2017), IT alignment is one of the prerequisites for successful digital transformation. Thus, empirical studies aiming at exploring the relationship between the introduction of emerging digital technologies and approaches to adjusting the related organisational and managerial factors are important.

The findings of this study will contribute to research and practice. For research, this study will be an addition to the scarce literature on IT management in the public sector. Particularly, the study responds to the call for IT alignment study in the sector. Particularly, the study focuses on two IT management issues related to IT alignment—organisational agility and information security management. As IT alignment has become critical following the widespread of digital technology adoptions, it is in the best interest of organisations to identify the factors essential to reach IT aligned position (Tu et al. 2018). Unlike the long list of studies investigating the technical aspect of digital transformation, the current study identifies organisational and managerial factors with implication for digital transformation.

The mixed-research method will also make it possible to reveal how the different organisational and managerial factors are related to digital transformation success. For instance, by identifying the influence of organisational culture and organisational structure on IT alignment, as well as the degree of influence, leaders might formulate an actionable plan. The degree of influence between the constructs is helpful to prioritise the deployment of resources to successfully accomplish digital transformation.

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