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Research Article

The significance of Enterprise Architecture in driving Digital Transformation on Public sectors

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ABSTRACT

Industries and organizations have recently engaged in initiatives focusing on the exploration of methods and models for digital transformation. As a result, it somehow remains unclear to many business leaders as to what digital transformation mean. However, based on the mere fact that industries at large are embracing the concept of digital transformation and initiating programs around this concept. It can only mean that there are common benefits envisioned though, the main challenge to be addressed is how best can organizations get over the initial humps from vision to execution. Enterprise Architecture (EA) discipline on the other hand, have been praised for being a good approach on mapping the future state of the enterprise ranging from business processes re-organization to technology alignment. Hence, the focus of this paper is to examine the capability of EA approach in driving the digital transformation, more so in the public sector. This study employed a case study research approach to investigate the significance of EA in driving digital transformation on public sectors. Semi-Structured technique was used as a method for collecting data. The analysis was carried out, using Actor Network Theory (ANT). Through the findings that was established using ANT as a framework for driving a digital transformation for public sectors was proposed.

1. Introduction

The Management of Enterprise Architecture (EA) has become a mostly accepted means to guide enterprises in transformations retorting to their constantly changing environment [1]. The way we live, work, communicate as well as collaborate with others has been changed through digital transformation. Digitization fosters the development of information technology (IT) systems with many rather small and distributed structures, like Internet of Things (IoT), micro services and mobile services [2]. Currently there are lot of imaging business opportunities which are utilising IoT such as, mobile systems, big data analytics, cloud computing and decision support.

Enterprise architecture frameworks are currently been used for analysis, design, and strategy execution, to assist with the transition of enterprise from as-is state to to-be state. The need for richer models has been suggested by emerging trends to support on-going adaptations and periodic transformations [3].

It was found by chief executive officers and senior executives that number one risk in Digital Transformation (DT) is their #1 concern in 2019. However, even with these findings Digital Transformation initiatives couldn't reach 70% of their goals. According to [4] the $1.3 trillion that was spent on DT last year, it was estimated that $900 billion of it went to waste. Reasons why some digital transformation efforts fail while others are succeeding? According to [5] Digital Transformation is still taking longer and facing more difficulties than it has been expected regardless of the multiplicity of technological

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novelties and methods for their implementation, irrespective of in business, public governance and private life.

2. Literature Review

The Management of Enterprise Architecture (EA) has become a mostly accepted means to guide enterprises in transformations retorting to their constantly changing environment [1]. Enterprise architecture (EA) "is a method and a process used to manage the complex information and communications technology (ICT) landscape in large organizations". According to [6] the management of EA is anticipated to provision and direct enterprise transformation. [7] argues that the pace of deploying EA within government enterprises is slow, which affects actualisation of the benefits towards service delivery. The importance of EA to the organization's performance is through enabling of its processes, acquiring new information systems and to also renew the ICT products. We can no longer ignore the increased importance of EA alignment, compliance and manageability when implementing ICT solutions in organizations [8].

Organizational structure, business processes, information systems, and infrastructure are some of the possibly affected areas of the enterprise by digital transformation that forms the Enterprise Architecture [9]. The management of EA is a discipline that pursues to address common alignment between these features through embracing perspective on the global EA [1]. Thus, a standard approach of driving digital transformation in the public sector is through the use of Enterprise architecture [10]. There is still a gap on the deployment of the EA, in attempts to use it to facilitate service delivery in transition economies towards transformation in the areas of health, economic, and social development [11]. According to [3], to streamline business processes and the new products offering as well as services to expand new business areas is what the tools that are used to enable enterprises using digital transformation and to all change their business models.

Digital transformation is proclaimed to be the essential dimension driven by the emergence of digital technologies and companies that aim to get value from this dimension need to have a viable strategy [12]. Meaning that, without a well-defined digital transformation strategy it might prove to be a daunting task for managers to realize digital transformation benefits. [13] Advocated that, "new digital technologies, mainly what we refer to as SMACIT3 (social, mobile, analytics, cloud and Internet of things (IoT) technologies, present both game-changing prospects and existential threats to immense old companies".

Moreover, digital transformation is deemed to be the catalyst of combining the effects of numerous digital innovations bringing about novel actors (and actor constellations), structures, practices, values, and beliefs that change, threaten, replace or complement existing rules of the game within organizations and fields [14]. Hence, [15] in their study concluded that digital transformation is more than just a technological swing because these transformations have also had an influence on the business models, the operational processes and the end-users experience.

2.1. Actor Network Theory

Actor network theory has amplified consideration with researchers trying to prolong its applications beyond technology adoption and design to broader areas [16]. Both human and non-human actors work together as a collective to deliver information system as requested by the organization. Both human and non-human actors are considered to be equally in the ANT perspective [17]. This is the ultimate contribution of the lens of Actor-Network Theory (ANT), a theory which focuses on human and non-human factors.

ANT is a theory that incorporates both human and non-human actors to form or construct a network [18]. The teams, which institute a network, have different roles, responsibilities, understanding, and interpretation of the same system. Technical and non-technical are described by ANT as equal interrelated actors that can form a network of actors at any given time and referred to as heterogeneous network [19]. For the purpose of this study four moments of translation was used as the lens to analyse the collected data.

[20] has defined four moments of translation as:

1. Problematisation, is the defined as problem that needs to be elucidated? Who are the pertinent actors? Delegates need to be recognised that will characterise groups of actors.
2. Interessement, this relates to a sequences of processes where a focal actor attempts to lock other actors into a position that they have been offered in the network [20]. If the interessement succeeded, then the enrolment can take place.
3. Enrolment, is the third moment of translation, which refers to a set of strategies in which a focal actor tries to define and inter-relate the numerous roles that allow other actors to enrol. The process of enrolment involves "group multilateral negotiations, trials of strength and tricks that accompany the interessement and enable them to succeed" [20:211].
4. Final stage of moment of translation is Mobilisation which relates to a set of manners utilised by a focal actor to ensure that

all actors have genuine speakers to signify them in the groups and avoid disloyalty by various collectives from the latter [20,21].

3. Research Methodology

The study was carried out using case study based on its objectives. [22] argued that one of the strengths of the case study is that it can be a detailed study of a single unit. According to [23], case study is "an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth and within its real-world context." In [24] argument, case studies can be used to carry out in-depth investigations of a complex and poorly understood phenomenon. It can also be used to investigate and understand how individuals change and what circumstances foster these changes. A qualitative, interpretive case study research methodology was employed in the study. An interpretive approach was adopted to explore the relationship between actors involved in EA in the public sector to drive digital transformation. Actor Network Theory, the moments of translation was used as a lens to analyse the data. This was to done to investigate the significance of EA in driving digital transformation on public sectors. There were 3 case studies and in #case 1(3 participants), #case 2 (4 participants) and #case 3 (4 participants). The participants were labelled as follows:

(i) #case 1 "Sangatha": ST01 to ST03; (ii) #case 2 "Dzaphanda": DP01 to DP04; and #case 3 "Elusuka": EK01 to EK04. There was a need to ensure anonymity and confidentiality of the participants. Thus, for the purpose of the analysis, each of the participants were labelled, and a referencing format was adhered to as follow: case name, participant label, page number and line number. For example, ST01, 3:15-17 indicates participant number 1, page 3 of the interview transcript, and line numbers 15 to 17 of the document.

3.1. Data Analysis

Human actors are not necessarily superior to non-human actors because they are humans. Before analysing the network of three public sectors in South Africa, the first question to be addressed was what and who makes up these public sectors. According to [25] there are two categories of entities which are identified as heterogeneous entities (Actors and Networks) in terms of ANT perspective.

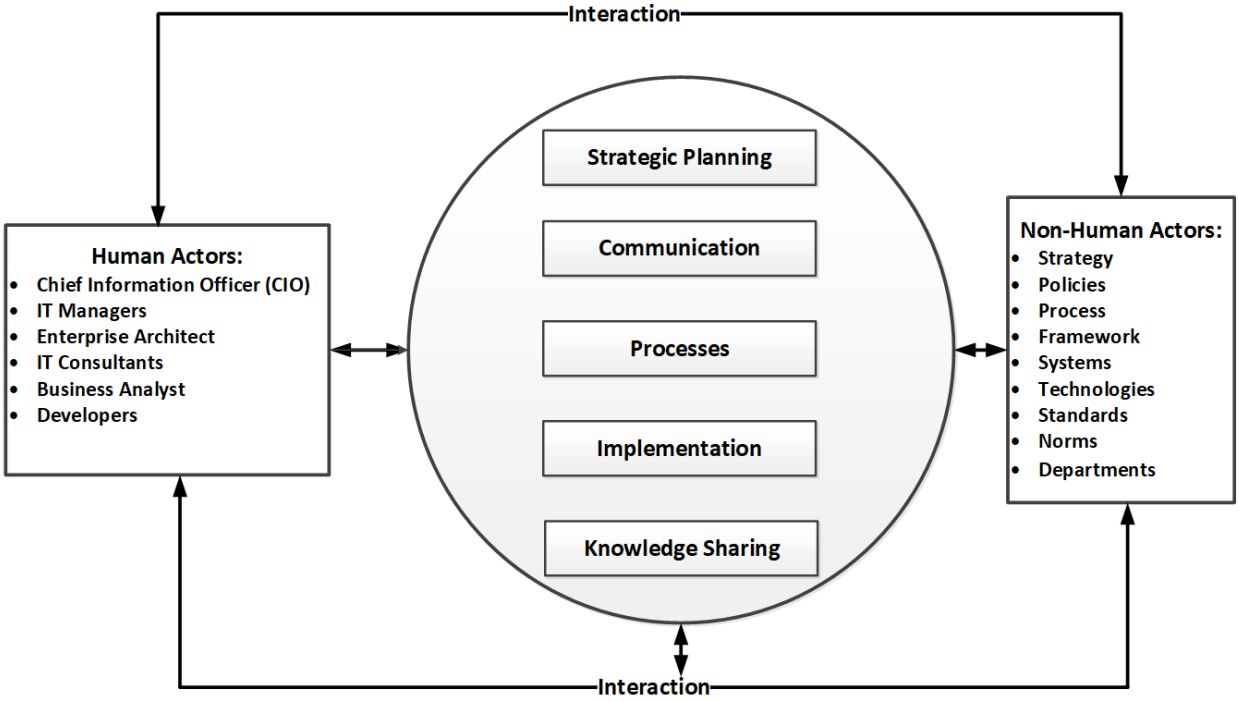

Figure 1. Human and non-human actors' interaction between the in public sectors EA networks

In the public sectors the human actors who are involved on the drive of digital transformation included, CIOs, IT consultants, EAs and managers, business analyst and software developers from different sectors. These actors were from different sectors that have different backgrounds, culture, norms, rules and procedures of how they conduct their businesses. The only one thing that they had in common is the implementation of the Enterprise Architecture in their different perspective areas.

"All the government departments somehow participated in the EA implementation and the Government Information Technology Officers from each government department constituted the team that led the implementation process. The lead for this implementation was Dzaphanda, and us as (Sangatha) we were also

involved. I don't know at what extent but Dzaphanda were part of the whole process" (ST01, 2: 69 -70)

"*It is important to indicate that non-human actors possesses a different reasoning as oppose to human actors, but they are able to perform what they are directed to do*" [26:163]. The non-human actors include public sectors departments, ICT Strategy, policies, GWEA Framework, technologies, ICT Standards, process and norms.

According to (EK01, 1: 28 – 31), "We developed our own strategy our own ICT, Elusuka ICT strategy and framework and architecture so although is all build on top of the GWEA framework it is not called anymore the GWEA architecture or the GWEA framework so when we talk we always talk about the ICT framework"

In ANT network consist of actors, such as people, organizations and standards of the aligned interest [20]. Also, networks can be heterogeneous within social systems [27]. Therefore it can be deduced that actors hold a responsibility of cohesion within the network and to maintain the intention to reach the end goal as a team. These networks were separated into two groups, technical and non-technical network. In this case, technical refers to CIOs, EAs, Managers, Consultants, Business Analyst and Software Developers while non-technical were departments, systems used, policies and strategies. Some of the networks were formed on the basis of reporting line, area of specialisation or interest, and systems used. Some of the actors such as Managers were part of many networks, through which networks were formed within networks, creating heterogeneity of networks. For example, they were liaising with the CIO on the plan of implementing EA, and they had to facilitate different meetings with their team members who are involved in planning, strategy, analysing or the implementation process of EA.

"I think because the CIO involves the different managers, so all the managers of the whole ICT was involved in a total implementation" (DP01, 3: 86 - 87)

3.2. Moments of Translation

Actor or actors' translation into a network can be best accomplished through a series of four "moments of translation [28]. Figure 2 illustrate the key concepts of translation including their notions of connotation. It is not intended as a flow diagram, but as a visual representation of ANT, with each concept described as follows:

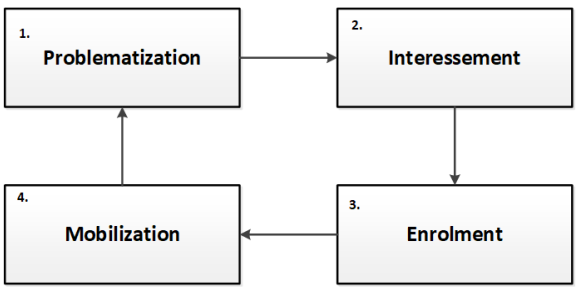

Figure 2. Moments of Translation [20]

1) *Problemitization:* The heading in level-1 should be numbered in uppercase Roman numerals and centred with small caps. For an example see heading for Section I of this document. It was evident enough from the three public sectors that were used for this study that, the common area of standardisation was problematized. The problematization of standardisation includes the disintegrated business processes, non-standardised ICT environment and the duplication of applications. For all three public sectors departments, to run public service delivery effectively including their internal operation they needed a well-coordinated IT component to assist them with technology solutions. According to a participant from one of the public sector said that:

"*ICT was in a mess, it was not according to standards, people were not satisfied with the ICT" (DP01, 1: 56 - 57)*

Hence one will ask as to how efficient the technology related solutions are in the department if ICT component is perceived to be a mess. In addition, another participant posited that:

"*Unavailability of proper standards, meaning that nothing was standardised and hence the business is not conforming to any unified standards" (ST01, 1: 52 -54)*

This further suggest that in the business processes as well there were some areas of disintegration and maybe hence the chaotic state of the ICT environment.

2) *Interressment:* The heading in level-2 should be numbered with an uppercase alphabetic letter and must be left-justified in italic. For example, see heading for Section II.A above. It is imperative to indicate that these three public sectors (Dzaphanda, Sangatha and Elusuka) were solemnly interested in changing the status core to a newly reformed type of business environment, more so in the ICT setting. One common element that keeps on emerging during the analysis in all the three cases is the standardisation within the component of ICT. Therefore, it was clear that a shift on how things are done currently in certain areas of business needed to be refocused and urgently so. One of the participants, said:

"To innovate and improve the productivity within the department, to help in the reduction of ICT costs while improving the effort in service delivery" (*EK01, 2: 51-53)*

One thing to be applauded is that, there was a certain degree of interest in areas such as enterprise architecture envisaged to transform the business from its current state. Supported the notion of enterprise architecture indicating that EA is needed.

"*To support the effort to increase productivity in department, to make ICT service cost effective and to support services delivery improvement" (ST02, 6: 206-208)*

It can be deduced that the departments were showing an interest in the enterprise architecture discipline and hopping this approach will help in changing the current to a much-desired state. Therefore, it is only when the implementation of

EA proves to be beneficial to those embracing it, that the area of digitisation come to the fore. Hence, this study pursues to examine how the EA effort can assist organization in the aspect of digital transformation.

3) *Enrollment:* Change is unavoidable constant in our work lives. Sometimes it is within our control, but most often it's not. Even though most of the departments were showing interest, some were challenged with adapting to the innovations. Everywhere, when people are faced with having to change the way they are used to do things it's always a challenge.

"I think the one challenge is always the people to adapt to your new architecture and to see what that coming is" (EK01, 3: 94 – 95)

There are several valid reasons in the workplace that employees use to defend change. For an example, When an organization is considered the systems, technological advancement, process, organizational settings and more changes would include cost reduction, streamlining, smart work, efficiency, faster turnaround times and more. The fear by employees on the possibility of their roles being reduced to eliminate hype and this drives them to resist change.

According to EK01, (1: 37 - 41) *"our architecture itself is being adopted by people very well in think we try to build everything around it e.g. Our business architecture, our technology architecture, we try to build all around the EA framework or all around our ICT framework".*

There is absolutely no doubt in that, communication is deemed to be a very critical aspect to be considered when change happens. Hence fear fade way when people receive proper communication.

"Our CIO sort of repeat it at every meeting for us so that it sort of get like a second nature the total architecture is like a second nature we currently call it like a digital city architecture or ICT framework" (*EK01, 2 : 44 - 46*)

The significance of change is that, when well accepted the organization communicate and then the change would be effective.

"Yes there is that interest. ...some have seen the value because they can look at the infrastructure and see where any changes relates to the value to the company like I said some see the value and especially big departments are using various versions of it" (DP02, 7: 226-228)

4) *Mobilisation:* Companies do not have a choice than to adapt to change and survive in the competitive world. Unfortunately, it is very challenging to thoroughly implement organizational change because people resist change even when it is happening for good. Deep behavioural change is needed to create a culture of ongoing change. Management should therefore, continually seek ways to adapt to change in order to be on the top of their game.

"We ran awareness sessions throughout the country. Basically we were visiting each and every Sangatha office on all the nine provinces that we have making them aware what GWEA is supposed to do" (ST01, 2: 40 - 43)

A change in the environment is a pointer to the fact that organizations need to incorporate change in the internal systems. Awareness of the forces for change helps managers to decide when change should be considered. We will examine these forces that create the need for change.

"It is a big change and therefore it needs to be customised" (ST02, 8: 280)

Motivation and Mobilisation was made possible due to constant communication, which again stresses how communication plays a vital role in a change process. Not only did communication help the CIO and his team to determine or establish what motivates employees, there was also a high level of trust. Employees were motivated by the transparency in management and how the level of communication was.

"People started to know where they were going and have the direction through the GWEA architecture or through the ICT architecture, so I think that really made a big different and gave us confidence" (ST01, 3: 113 - 115).

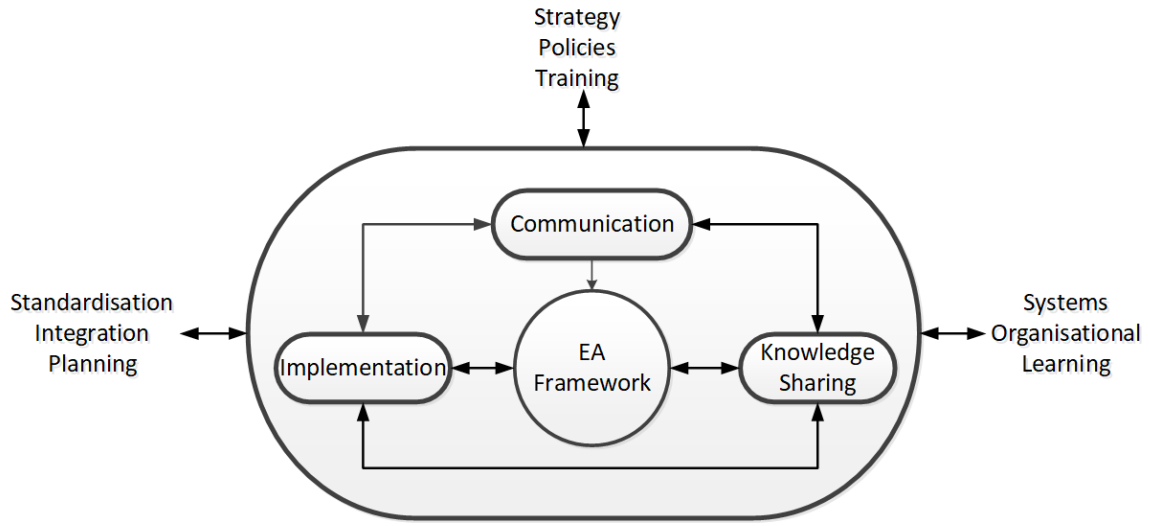

Figure 3. EA framework for driving digital transformation

3.2.1 Knowledge Sharing

Due to the over-changings conditions and continuous transformation, organizations are constantly adopting to new ways on how to address these circumstances. Thus, due to the complexity that has constructed over the years in the organization it makes the planning and steering this transformation a daunting task. Enterprise Architecture (EA) has been extensively adapted as a planning and governance tactic to manage the complexity and persistent change, and to align the organization towards a common goal. Right methods are required such as change and knowledge sharing needs to be supported to overcome the challenges of transformations and transitions in the business models and processes of diverse organizations. In order to implement new knowledge sharing Steering boards can use enterprise architecture (EA) for their strategic planning initiatives.

Enterprise architecture (EA) is the process by which organizations normalize and consolidate IT infrastructure to align with business goals. These process need to be communicated across all business areas as a business strategy that support digital transformation. Through the use of EA this processes are conveyed as meanings from one entity or group to another through the use of mutually understood signs, symbols, and semiotic rules. EA is extensively employed to ease the complexity and to advance business–information technology alignment. The biggest of obstacle in the organisations if the Privation of communication and cooperation. As EA assist with building the businesses structure, aligning the IT projects and policies to achieve desired business results. In order for the organization to stay on top of industry trends and disruptions they must learn to communicate better using architecture principles and practices. The lack of

There is a scarcity of literature and methods on the implementation and development of enterprise architecture in public sector irrespective of the increasing interest to adopt EA in this space. The spectrum is however gaining attention as a solution to improve business e-communication and cooperation has over the years triggered some undesired effects to organizations, such as being unable to set common goals and achieve a shared understanding, personnel's distrust. Which at the end caused a loss of competitive edge and EA ineffective output due to the lack of innovation capability. To ensure that the business is aligned with digital transformation strategies and technological growth modern EA strategies has introduced philosophy to the entire business, not just IT. Thus, advisable for organizations to enhance on their communication and cooperation to reduce some of the obstacles before embarking on EA. Because it would allow them to pay emphasis on bringing process legacy and applications together to form a more seamless environment.

How well the program's worth is communicated to interested stakeholders such as, top management and effectively communicating its value throughout the organization (in both technical and nontechnical settings) determines the success of an EA program. It also relies on the training and development of enterprise architects who understand the business and can further strengthen the organization's EA capability. Enterprise Architect has a wide range of tools that can assist with the development of the communication plan and the dissemination of information to stakeholders. These tools are guided by the organization's business requirements which helps to lay out how information, business and technology flow together. B -Thus, has become a significance for businesses that are trying to keep up with new technologies such as the cloud, IoT, machine learning and other emerging trends that will prompt digital transformation.

3.2.2. Implementation

Government functions from the public sector perspective rather than as a method that can be implemented for the alignment of business processes. These is caused by the complexity and inflexibility that public sector is facing with the implementation of the EA frameworks.

The increase complexity of business processes and services that are rendered by the public sector poses a challenge for the different departments to see the holistic view of their business. However, if EA is supported it can offer support to this business process during the acquisitions or major organizational changes. Organization can also benefit from EA in dealing with challenges, such as effective strategic planning, improvement on decision mankind and alignment of business and information technology. If the public sector can adopt the implementation of EA this can assist with the process of bringing EA features and functionalities to real life practices. However, this will require all stakeholders support, buy-in and support of the initiative. The implementation of EA is a challenging process but at the same time gaining its importance in any organisation mostly those which are undergoing the transformation.

4. Conclusion

The promise of digitalization in the public sector interplanetary is its capability to use information, move incrementally, and continuously optimize. Digital technologies are aiding organizations to undertake transformations for streamlining business processes, offering new products and services, increasing in new areas, and even fluctuating their business models. Transformation of organizations (large or small) gradually is not a tranquil matter, as we have experienced it. Thus, digital transformation is more than just a technological shift because these transformations have also had an impact on the business models, the operational processes and the end-users experience.

During the whole journey of transformation, EA can produce tangible outputs. Due to the continuous business transformation that is happening most of the organizations are constantly adjusting to their activities to meet ever-changing conditions However, due to the complexity that has been built into the organization over the years it creates the planning and piloting this transformation a daunting task. A successful EA implementation depends on the stakeholders involved to effectively communicating the value throughout the organization (in both technical and nontechnical settings). Those who understand the training and development done at the enterprise for architects are able to motivate and promote the organization's EA capability.

This study was adopted due to the fact that its interpretive in nature, that interpret a case study research, the interpretive method was adopted to explore the interaction between actors involved in EA implementation at the public sector to drive digital transformation. Generalization was restricted to provide opportunities for forthcoming research. This study can be used for further research and contribution for subsequent in the EA implementation, digital transformation and other public sector enterprises.

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