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Digital Transformation to Improve Public Service Delivery in Nigeria: a Case Study of the Joint Admission and Matriculation Board (JAMB)

Master's thesis

Technology Governance and Digital Transformation

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Tallinn, 2023

DECLARATION

I hereby declare that I have compiled the thesis/paper independently and all works, important standpoints and data by other authors have been properly referenced and the same paper has not been previously presented for grading.

The document length is 12,634 words from the introduction to the end of the conclusion.

Ifeanyi Pius Okwosha … 14. 05. 2023

Date

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ABSTRACT

With the evolving of digital transformation leading to shift from analog system to digital system, this study investigates how to enhance the delivery of public services in developing country like Nigeria through digital transformation using JAMB as a case. This study is to answer the questions; what is the actual nature of digital transformation for public service delivery while relying upon the current success story of JAMB from Nigeria? And what are the key challenges for digital transformation of public service delivery in the context of developing countries? To answer these questions, this study employs the qualitative research technique which relies on interview and desktop research data in collating the data for analysis relying on the PPR model. Data collated were analyzed using thematic analysis method to analyze the data which helped in answering the research questions for the thesis. The result of the study revealed that; the actual nature of digital transformation in JAMB is yet to reach full maturity but many developments have been made especially in terms of back office changes to position JAMB in the track to reach the full maturing level and further to revolution level of digital transformation. However, JAMB is bedevilled by some challenges such as poor data security, poor infrastructure, lack of digital personnel, and significantly political zeal. This study concludes that JAMB's appalling circumstances and its desire to improve the public's experience with its services make digital adoption necessary. Although service delivery has improved since JAMB implemented digital transformation, much more can be accomplished if JAMB's digital transformation can fully mature and progress to the revolution level, which is the peak.

Key words: Digital transformation, public service delivery, JAMB, developing countries.

INTRODUCTION

Overview

Digital transformation has become the focus of many public sectors across the world by shifting from an analog-based system of administration to a digital system. This is obvious as governments of different countries of the world continue to introduce and implement digital transformation systems which are necessary to improve their public sector services, reduce cost, increase the effectiveness and efficiency of provision of public services, and save time (Alshehri & Drew, 2011; Al-Shboul *et al.*, 2014). The preconditions that necessitate the need for digital transformation are the inefficiencies that characterized public service delivery (Nweze, 2010; Ibietan, 2013). Further emphases by Darma and Ali (2014) show that the expectations of service delivery by public service officials and the quality of services actually delivered are far apart and discouraging due to reliance on an analog system.

In a developing country like Nigeria, the present trend in the public sector has not fared well. Various government information, communication, business, and operations were still conducted using analog technology until recently (Obodo & Anigbata, 2018). This is because amongst several other factors blamed for inefficiency is paper-based administration which has not only marred service delivery but has also increased the cost and time of operations. To ensure the public sector organizations in Nigeria deliver best services, the transition of digital transformation has become imperative. This is particularly important in Nigeria's public sector-related cases since Nigerian public sector service delivery has been hindered by poor experience, and an analog culture of engaging the public (Mapira, 2013).

The Joint Admission Matriculation Board-JAMB is well suited in examining the implementation of digital transformation in Nigeria's public sector. This is because among popular public organizations that are well known for so much paper administration is the JAMB. Traditionally, JAMB had conducted her examinations using the paper-pencil test (PPT) model and its administration had been based on analog system. This examination mode is reportedly filled with inaccuracies and inefficiencies where both officials and

candidates could manipulate results and the result takes so much time to be released (Retnawati, 2015). JAMB officials had been blamed for masterminding examination malpractices leading to leaked exam questions to candidates prior to the exam, impersonations, and altering exam scores (Abubakar & Adebayo, 2014). However, with the introduction of digital transformation lots of improvements have been experienced in the Nigerian system. For instance, since the transformation from PPT to Computer Based Test (CBT), there has been a drastic reduction in the examination process, results are released in days, and officials find their work easier to execute (Onyibe, Juliana, & Abdulhakim, 2015).

According to Oloyede (2022), the Nigerian Civil Service and some private organization rely on JAMB digital facilities for their trainings, examinations, and recruitment processes. The Nigerian Civil Service has also gone ahead to partner with JAMB on digitalisation reforms. Going by Oloyede's claim, the benefit of digital transformation in JAMB is not only limited to the organization; many other public and private organization has relied on the JAMB CBT system to carry out successful digital recruitment and promotional examination processes.

Problem Statement

Generally, the journey of Nigeria to digital transformation has been very slow and this slow process limits the full benefit of digital transformation. This is the problem that this study seeks to addresses. The journey of digital transformation that started in the year 2000 following the liberalization of the Nigerian telecommunication sector which ushered in series of digital transformation policies and Digital Mobile License (DML) is yet to attain a state of maturity (ThisDay, 2019).

It is a big issue to see that over 20 years Nigeria started its journey to digital transformation; it has always been out of the first 100 digitalized countries of the world. Nigeria has never been found among the first 130 most digitized countries out of 192 countries surveyed by the United Nations almost on yearly basis. Nigerian digitization journey has been significantly slow and relatively stagnant having been rank around 140

out of 192 country for almost a decade. Also, in an analysis by United Nations of very populated countries like China, India, Nigeria, Brazil, and Indonesia, Nigeria is ranked as the least developed digitalized country, and not among the first three developed digitalized countries in West Africa (United Nations, 2022)

The public sector in Nigeria has continually experienced a slow process of moving from analog to digital eras since the introduction of digital transformation (Yusuf, 2006), which is why Nigeria is far from being among the top digitized countries of the world. This simply implies that Nigeria is lagging in its journey of digitally transforming the country to enhance public service delivery. This is also reflected in the case of JAMB, despite the fact that the implemented digital transformation in JAMB comes with benefits that extend to other organizations, and it has not reached the expected peak. Abdulkareem, Ishola, & Muhammed (2015) attributed this sluggishness of digital transformation in the Nigerian public sector, which impedes service delivery, to cultural, social, and technical factors.

Also, it cannot be over emphasized that implementing digital transformation comes with great prospects but its setbacks in countries like Nigeria are not farfetched. This transformative approach has been criticized for its challenges such as ICT infrastructural inadequacies and acceptability (Obioma *et al*., 2013); poor electric power supply (Oye *et al.*, 2011); and inadequate required ICT skill (Ilesanmi & Lasisi, 2015). This further contributes to the underperformance of digital transformation in Nigeria. Addressing this issue of underperformance is a problem which this study addresses in order to bring digital transformation to its full potential in Nigeria.

Aim and Questions

The core aim of this thesis is to enhance the delivery of public services in Nigeria through digital transformation using JAMB as a case. To achieve this aim, the below research questions are proffered;

1. What is the actual nature of digital transformation for public service delivery while relying upon the current success story of JAMB from Nigeria?

2. What are the key challenges for digital transformation of public service delivery in the context of developing countries?

This study is vital because it will contribute to empirical knowledge. Studies relating to digital transformation in the public sector are relatively scarce in developing countries like Nigeria because Nigeria like other developing countries is quite new in embracing digital transformation and the challenges especially in the area of infrastructure are impeding the success of digital transformation. Hence, the outcome of this study will help in the application of digital transformation amidst the challenges and how the challenges impeding the success of efficient public service delivery can be addressed.

1. THEORETICAL LITERATURE

1.1 Digital Transformation of Public Service Delivery

The Organization for European Cooperation and Development (OECD) explains digital transformation as the use of information and computer technologies to ensure transparency of government actions, the accessibility of government services and information, and the responsiveness of government to the rules, demands, and new ideas (OECD, 2016). The World Bank also explains digital transformation as the use of information technologies by government agencies that have the ability to transform relations with citizens, businesses, and other arms of government (World Bank, 2012). Digital transformation refers to using Information Technology (IT) to public services to be more efficiency, effectiveness, transparency, and accountable (Kraemer & King, 2003). Ibidapo-Obe (2013) in Ibikunle *et al* (2019) submitted that digital transformation refers to using Web 2.0 technologies like the intranet (internally) and internet (externally), to ensure improved collaboration and transparency, and efficiency. Intranet can be refer to a computer network-based protocol belonging to an organization which is accessible only by the organization's members, employees, or others with authorization while the internet is a global system of interconnected computer networks that use standard protocol suite to link several billion devices worldwide (Chukwuemeka, Ubochi & Okechukwu, 2017). A vast array of electronic and optical networking technologies connect millions of private, public, academic, business, and government networks that make up the internet; this can range in size from local to worldwide. Both intranet and internet technologies are anticipated to be deployed and appropriately maintained in the environment in order to ensure the correct adoption of a digital transformation platform in an organization (Chukwuemeka, Ubochi & Okechukwu, 2017).

The adoption of digital transformation systems is thought to be one of the most significant IT implementations and problem-solving associated with the organizational change of the future and it is seen as a radical and inevitable transformative change (Jaeger, 2003; Warkentin *et al.*, 2002; Marche & McNiven, 2003). A better understanding of the factors

influencing the adoption and acceptance of digital transformation systems and a better understanding of the factors that influence the effective use of these systems are two critical issues that have not been adequately addressed by existing research, despite the increased interest in digital transformation (Titah & Barki, 2006).

Digital transformation aims at creating interaction between government and citizens (G2C) which focuses primarily on developing user-friendly and one-stop centers service so that citizens can have easy access to high quality information and government services (Ibikunle *et al*, 2019); government and business enterprises/business (G2B) that facilitate and enhance the capability of business transactions between government and private sector by improving communications and connectivity between the two parties (Ibikunle *et al.*, 2019); and government to government relationships (G2G) which makes inter-government or inter-agency cooperation, collaboration and partnership more convenient, inexpensive, friendlier, and transparent (World Bank, 2011).

1.2 Conceptualizing the Changes Driven by Digital Transformation: Overview of L&L and PPR Models

This study is anchored on the Public Sector Process Rebuilding (PPR) maturity model of digital transformation by Andersen and Henriksen (2006). The PPR is an extended version of Layne and Lee's (L&L) (2001) maturity model which replicated the dominant rationalities used in adopting technologies from the period of 1970s to the 1990s. The L&L model ensures the increased quality of information, effectiveness, and efficiency, as well as intra- or intergovernmental interactions of the 1970s to 1990s (Layne & Lee, 2001).

As seen in figure 1, the L&L is modelled in four stages which view digital transformation maturity in two dimensions of Integration (ranging from sparse integration to seamless integration), as well as Technological and Organizational Complexity (Chaushi, Chaushi, & Ismaili, 2015). Emphasis on the four stages shows that:

1. Catalogue State: where government efforts are channelled towards online presence by building websites and then presenting information to their citizens via the

websites and this is an early stage where information is limited (Chaushi, Chaushi, & Ismaili, 2015).

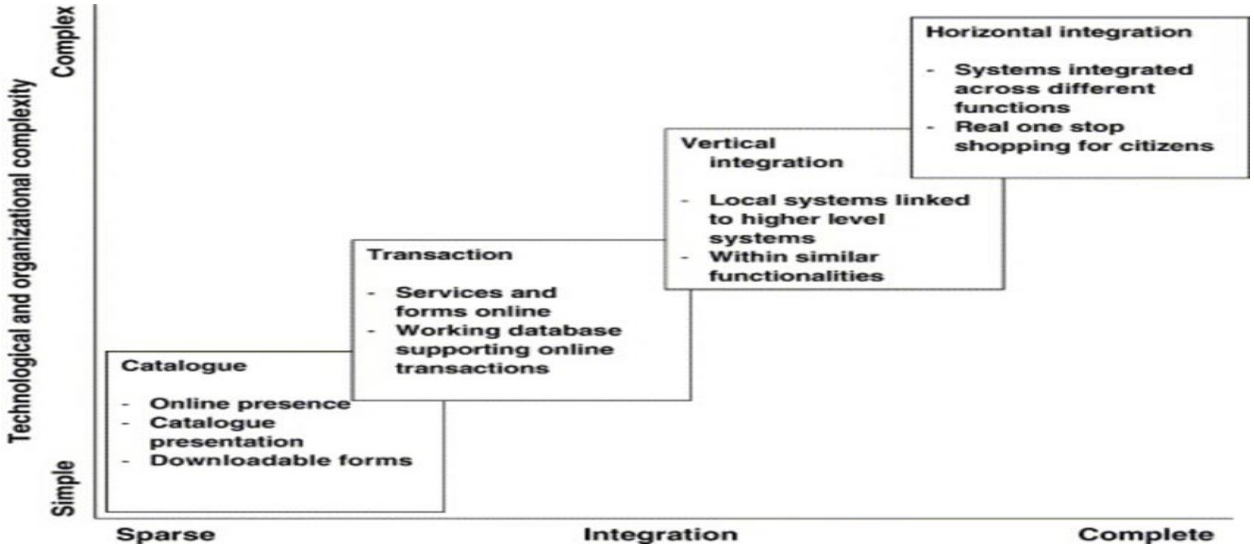

Figure 1: L&L Model Source: Andersen *et al*. (2012)

1. Transaction Stage: here the government has created an online presence for itself; hence they double up its efforts by giving citizens the chance to transact electronically with the government (Chaushi, Chaushi, & Ismaili, 2015).

2. Vertical Integration: here government service integration is carried out vertically making it easier to integrate likely functions at various government levels rather than integrating different functions of government at the same level (Layne & Lee, 2001). The interaction of government to government (G2G) is obvious at this stage implying that the systems of information at various levels interact thereby reducing the redundancy of data, helping share cost sharing and savings, and enhancing outcome consistency (Ebrahim & Irani, 2005).

3. Horizontal Integration: this is a more complex stage of the L&L model of integrating digital transformation where the occurrence of government horizontal integration is referred to as "seamless" integration (Chaushi, Chaushi, & Ismaili, 2015).

The major criticism against the L&L model is that its focus is channelled first on technology, then the bureaucratic inefficiency which is the complicated procedures and rules that causes elongated delays; this is the shift from offline to online mode (Coursey & Norris, 2008: Almuftah, Weerakkody, & Sivarajah, 2016). Also, the United Nations Public Administration Network-UNPAN further argued that the L&L model is associated with reinforcing technological bias that is informed by not just the government but also an international organization in their course of promoting digital transformation (UNPAN, 2002). Although the L&L is criticized for being biased and shifting bureaucratic inefficiency to online mode, however, it has an instrument in making the public sector efficient and reducing the cost of operation through cost sharing.

With the introduction of the PPR model, Anderson & Henriksen (2006) posited that instead of tagging a unit of government as either mature or immature, it is better to pay attention to the set of government activities by using users' view in more constructive and strategic thought. Therefore, PPR brings about a re-orientation of the L&L maturity models with attention on the application of IT to enhance the major activities of the public sector and by so doing bring the end-users as the core stakeholders which future investments in digital transformation are targeted at. Also, that factor that differentiates the L&L model from the PPR model is that the L&L model is based on the government-to-government (G2G) interaction while the PPR model is an approach built on user-centric. The PPR model is built on four phases which are Cultivation, Extension, Maturity, and Revolution as shown in table 1.

Phase I: Cultivation

This phase is characterized by the combination of vertical and horizontal integration of digital transformation, adoption, and deployment of intranet, and a front-end user service system with the government (Chaushi, Chaushi, & Ismaili, 2015). There is no tendency that public sector organizations in this phase will possess digital services or works that are displayed on the internet. Rather Anderson & Henriksen (2006) argued that these public sector organizations are unsure if to specify their aim using the internet to enhance users'

frequency, speed, and quality of services they provide. From the users' perspective, this phase of the internet interface relating to public sectors can be seen as another way of filtering the users and enforcing "gatekeeping", that is restricting their access. Anderson & Henriksen (2006) explained gatekeeping as the means through which employees keep themselves away from stress and put the flow of information under control.

Phase II: Extension

This phase is an extension of the cultivation phase characterized by the combination of extensive intranet usage while adopting a personalized user process web-user interface presented through websites. On the contrary, the lower side of the extensive phase involves the cost of not just developing separate websites but also its development due to non-integration with other public sectors or government agencies (Chaushi, Chaushi, & Ismaili, 2015). Although this phase is an extension of the cultivation phase (that is phase I) yet to some extent, manual procedures are still experienced. There is a tendency that there will be user redirection to other government sectors. What these government sectors do is to always use several websites to provide links leading to their sites or to provide information about their site (Anderson & Henriksen, 2006).

Phase III: Maturity

This is the phase where maturity is attained, leading to the replacement of the intranet and its integration with the internet. During this phase, websites offer requests that are processed for users' services with the aim of reducing the marginal cost that is incurred in the process (Chaushi, Chaushi, & Ismaili, 2015). Websites at this phase become organized to address issues rather than just the presentation of information (Anderson & Henriksen, 2006). At this phase, self-service prevails and whenever any service is not completed online, there are backup instructions on how to carry on using analog mode.

Phase IV: Revolution

This is the phase where there is a total or significant transformation from the old system to the new internet based. Andersen & Henriksen (2006) described this phase as that of high

mobility of data across sectors and organizations, application of the data across vendors, and the transferability of the ownership of data to users. It thus becomes obvious that transparency is guaranteed due to the ease of tracing the actions of employees and how request has progressed via the internet (Chaushi, Chaushi, & Ismaili, 2015).

The PPR maturity model application is changing the focus of digital transformation to the front-end of government and away from a technical integration issue, as is suggested in the L&L model. In contrast to the L&L model, the PPR model emphasizes the digitalization of the core activities not from the perspective of what is technologically feasible but from what is beneficial for the end-users regardless of the possible internal changes caused by the digitalization.

Table 1: PPR Maturity Model

General, widely applied			**Phase IV: Revolution** Data mobility across organizations; Application mobility across vendors; Data Ownership transferred to the user
User-centric		**Phase II: Extention** Extensive use of intranet; Personalized web interface for user processes	**Phase III: Maturity** Abandoning of the intranet; Accountability + transparency process; Personalized web interface for user processes
Exception sparse	**Phase I: cultivation** Horizontal & Vertical integration within government; Front-end system; Adoption and use of intranet		
	Few, rare	**Activity centric application**	**Widely applied**

Source: Anderson & Henriksen (2006)

Summary

While information communication technology has been acclaimed globally as a means of providing improved service delivery from governments (the public sector) and organization to citizens, the fact remains that each agency/organization that adopts digital transformation is at a certain stage of its implementation. The PPR maturity model will help us to ascertain what stage of digital transformation implementation the Joint Admission and Matriculation Board (JAMB) is in their service delivery to Nigerians. It will further help us to make possible recommendations to improve it and propel them to optimum capacity.

The PPR maturity model being a user-centric model as it concerns public service delivery is important in explaining the position of JAMB in particular as well as other public sectors in prioritizing their services to the public and making sure that all their digital transformation initiatives are user friendly, in order to ensure effective and efficient public service delivery.

1.3 Dimensions affecting implementation of Digital Transformation

There are different dimensions affecting the implementation of digital transformation. Mergela, Edelmannb, & Haug (2019) specify that the dimensions of digital transformation include **technological changes** and **organizational changes**. However, in addition to technological changes, and organizational culture, Al-Maamari & Bhuiyan (2021) include **environmental changes**, and **human resource changes**.

1.3.1 Technological Changes

Technological change is an aspect of digital transformation which has changed the way services are being delivered technologically. As a result, this aspect of digital transformation has led to the emergence of an online technological interface that creates two kinds of interaction within the organization; first, a technological interface that enables interactions between organizational members, and second is an organization-user interface that enables interaction between organization and users who are the recipients of the organization's services (Cascio & Montealegre, 2016). The place of social media platforms

that emerged as a result of technological changes is also evidenced as organization now interact and introduce their services through social media channels where they communicate and collaborate on internal matters (Mergela *et al.*, 2019).

However, Van Dyk & Van Belle (2019) posited that digital transformation through technological change like mobile, social media, interactive applications such are zoom, Skype, Google meet, etc. comes with opportunities and threats in an organization. For instance, organizations are now embracing digital technologies in order to increase the possibility of using their services through organization-user interactions interface to reach more people. Through digital technologies, organizations and individuals are increasing in their ability of inter-connectivity online which enable them to get instant access and to interact with a wide range of data that supports swift decision-making (Al-Maamari & Bhuiyan, 2021). Also, technological changes like storage cloud computing technologies help organizations to have a more flexible and large storage space and domain which also reduce the cost of storage infrastructure.

Linking technological changes to the PPR model, technological changes are manifested in the cultivation and extensive stages of PPR model which in the case of cultivation stage, it involves the combination of vertical (organization-user interaction) and horizontal (within organization) integration of digital transformation and in the case of extensive stage, it involves intranet usage alongside the adoption of a personalized user process web-user interface presented through websites. Technological change which is a shift from cultivation stage to maturity then revolution change could be within the internal activities of a public organization thus establishing a horizontal link, and changes through reliance of external bodies which is a vertical link. Technological changes could also involve an extensive intranet usage with the adoption of a personalized user process web-user interface presented through websites.

1.3.2 Organizational Culture

Work culture is an important part of an organization. People in the organization possess a variety of ideas, attitudes, and values; therefore, placing all these aspects at a collective

effect makes an organization stand out, hence, organizations that constantly promote flexible work culture are more efficient (Al-Maamari & Bhuiyan, 2021). This is why digital transformation in an organization must reflect the culture of the organization which makes organizational culture a layer of digital transformation. Cultural changes in an organization that becomes visible due digital transformation increase intra team collaborations which enable smoother communications between the members of an organization as they began to use digital platforms like Skype, Zoom, Google meet, etc for a better collaborations and communications that boost value (Solaris Technology, 2021). This allows organizational members to have real time interactions through which they could easily engage in ideation, meetings and provide input to one another about their work process. This allows the team members to be more connected and quickly engage with one another without wasting time on physical meetings. This gets work completed on time and makes work more efficiently.

In addition to allowing for changes in how public administrations carry out their work, communicate, and provide services, the use of digital tools can also have significant effects, such as altering an organization's structure and culture or involving and integrating stakeholders such as citizens and other partners in the co-design and co-delivery of public services (Bretschneider & Mergel, 2011; Sivarajah, Irani, & Weerakkody, 2015). In the case of monitoring, digital transformation has encouraged a supportive organizational culture where members are collectively monitored, which is easier than when it was carried out individually (Cascio & Montealegre, 2016).

Improving organizational culture are key propellers to digital transformation. This is because moving digital transformation from cultivation to extensive level and further to maturity level as emphasized by the PPR model requires organizational culture that is capable of adapting to the digital changes. Such cultural changes are the kind that shifts from the manual procedure of collaboration and communication like physical meetings and interaction to digital systems of using office communication and interactive tools (software) to save time and enhance efficiency. Also, digital influenced organizational culture promotes remote working where organizational member communicate and collaborate with themselves from any part of the world without necessarily meeting physical.

1.3.3 Environmental Changes

Digital transformation needs a stable and sustainable working environment to prevail which makes an environment a layer of digital transformation. The emergence of digital transformation in an organization has created an ubiquitous computing environment where technology allows nearly everything by ensuring organizational members can have some level of control and access to their work environment from anywhere and at any time (Cascio & Montealegre, 2016). However, the implementation of digital transformation has been poor especially in developing countries which Maroye *et al*. (2017) blamed the reasons for the poor level of implementation of digital transformation on the continuous shrinking of public budget that prevents government from investing in high quality technology, a deeply ingrained resistance to change, the difficulty in cross-organizational relations between public administrations, the rising political doubts in rapidly changing digital environment and the lack political autonomy in the decision-making process. Environmental change is vital for digital transformation. In order to achieve revolution stage of digital transformation prescribed by the PPR model, mobility of data across organization and their partnered vendor, and the transferability of data ownership to users requires an environment change that is capable of supporting a successful digital transformation (Al-Maamari & Bhuiyan, 2021).

Environmental change is crucial for the success of digital transformation, so in order to reach the PPR model-emphasized revolution stage of digital transformation, where data is mobile across organizations and vendors and transferable to users, the environment must first be changed to one that supports the process.

1.3.4 Human Resources Changes

Human resources are a necessary component of every organization. This is due to employee knowledge-derived exchange and application of collective experience and know-how. Thus, digital transformation in an organization must reflect in the human resource which is why there is digital HRM. According to Al-Maamari & Bhuiyan (2021), digital transformation can enter an organization through the three dimensions of human resources

which are people, technology and organization. People dimension of human are most vital of human resource dimension because their adaptation to knowledge is key that drives success through innovation, thus people are responsible for digital transformation in an organization. Changing human resources from personnel that work traditionally to those that operate digitally will help human resources effectively play roles towards enhancing performance (Dong & Phuong, 2018).

The importance of digitizing the department cannot be overstated because human resources is one of the most crucial functional departments in the company because it deals with the most crucial output and has more resources that are susceptible to changes in the company's internal and external environments (Al-Maamari & Bhuiyan, 2021).

Human resource changes as a dimension of digital transformation is mainly a back-office change since it is internally determined. At this stage of extension towards the maturity stage of the PPR model, manual procedure has been eradicated the web-based being dominance in the activities of an organization. Hence, adopting digital HRM is not only about just taking advantage of the merits of digital transformation but it also ensures employees brought into an organization have the capacity and the proficiency to embraced digital transformation.

1.4 Challenges of Implementing Digital Transformation in Developing Countries

Factors negating the implementation of digital transformation in developing countries could vary county by country. Therefore, developing countries like Nigeria have unique challenges to implementing digital transformation due to the nature of their economy and the acceptance of innovation in these countries. Some of the challenges to implementing digital solutions in developing countries are discussed below.

1. **Infrastructure for information and communication technologies:** The implementation of digital transformation in the public sector in Nigeria has some technical challenges, such as a lack of compatible infrastructure that shares a common standard across all agencies of the public sector. Working with the internet

is necessary to enable easy information exchange, open up new channels for communication, and provide new services (Nduo, 2004). Models and standards are required for a successful transition to electronic governance and for the architecture to provide a consistent set of guiding principles. Unfortunately, this essential component of the implementation of electronic governance has not yet been created in the Nigerian public sector (Obodo & Anigbata, 2018). Electricity is one of the infrastructures required to facilitate ICT by powering the ICT hardware at offices and institutions, but it hasn't gotten enough attention recently (Abdulkareem, Ishola, & Muhammed, 2015). At the moment, Nigeria generates and distributes a maximum of 5000 megawatts of electricity which is relatively very poor compared to countries in the developed world with relatively less consumption (Idowu, Ibietan, & Joshua, 2020), nor among the top 10 electrified countries in Africa (Energy Capital, 2022).

2. **Security and Privacy Issues:** Security and privacy concerns are major barriers to implementing digital transformation among citizens. This relates to the assurance of a sufficient level of protection for data associated with an individual. The government is obligated to protect citizens' rights to privacy and only process and acquire personal data for legal purposes. Hence, a major obstacle to the citizenry's acceptance of this digital transformation is the circumstance where personal data and information that the government has to preserve and secure are exposed to the public. No one likes their private information to be disparaged in the public without their consent (Obodo & Anigbata, 2018). Also, information and systems must be protected from accidental or deliberate disclosure, illegal access, and unauthorized modifications in order to be considered secure (Layton, 2007). The security of digital transformation operations, transactions, and policies are of utmost significance, hence, there are no assurances regarding the security of information which disrupts e-government as a whole. The Nigerian public service has not yet created a parameter that would ensure that access to private information is restricted to unauthorized individuals (Obodo & Anigbata, 2018).

3. **Lack of Qualified Personnel:** The most effective and reliable technique for ensuring the survival of digital transformation in the Nigerian public sector is training. There are recent shortages of experts and competent employees who can manage the whole digitization of public service. Many civil and public officials are computer illiteracy (Duru and Anigbata, 2015). The growth of digital transformation in the public sector has been slowed by this. Also, some public officers are accustomed to the traditional face-to-face process of rendering services and consider the use of the digital transformation system as un-useful and a waste of time (Nwankwoala, 2015). Therefore, no matter how well-educated a person is, without a working knowledge of fundamental computer applications in the modern world, they are behind the times. In actuality, a preset option and prerequisite for assuring good digital transformation is basic computer literacy.

4. **Lack of Collaboration and Partnership:** No individual is an island and no nation can exist in isolation. According to Obodo & Anigbata (2018), to guarantee global best practices in digital transformation, regional partnerships and international cooperation are required. Unfortunately, Nigeria is not demonstrating the momentum necessary for such a relationship. Any nation that wants to succeed in the digital age must go overboard and cooperate with other advanced economies by leapfrogging. For Nigeria to move forward in digital transformation rapidly, it must cooperate and partner with countries that have the modern systems of digital transformative innovations.

5. **Lack of Political Will:** It takes political will by politicians in power to start a developmental project like digital transformation which will contribute to development. However, the African politicians have not demonstrated the required political will to propel digital transformation which is why Obodo & Anigbata (2018) argued that the pace of digital transformation in the public sector has slowed due to the low political drive. This can be demonstrated by the fact that some crucial and top-secret documents are still housed in official files although they could have

been located using a computer or other electronic device. Politicians need to have a strong will in order for us to ensure that this is done.

6. **Digital Divide:** Digital divide adds to one of the socio-cultural barriers to the adoption of ICT not just in the educational system but also other public sectors. Digital divide is influenced by factors such as the rural-urban divide, literacy level, and costs of internet connection which is the gap between those who are computer literate and those who are not (Van Deursen & van Dijk, 2019). The implication of this is that there are more digital infrastructures in the urban areas of Nigeria than in rural areas which established the gap in accessibility. Individuals with digital literacy can easily access and use digital facilities than the those without digital knowledge. More all so, when people without digital literacy want to access digital services, they are force to employ the service of a digital literate which add to their cost; this can high cost could discourages the adoption of digital process and service. For example, digital divide exist in a situation where a company has digital advantage because it has the fund to contract or outsource digital experts than its counterpart. Because of the high cost of hiring and recruiting IT experts, some companies are lagging behind in ICT technologies. The vast majority of employees in the public sector who are unable to use a computer may attest to the fact that the system's digital divide is a major problem as the percentage of people who lack basic computer literacy must be reduced before a society can guarantee the implementation digital transformation (Obodo & Anigbata, 2018).

1.5 Summary

This chapter helps understand the impending issue of digital transformation from the angle of theory and the situation in developing countries. Being rooted in the L&L model and advancing to the PPR model, the stage towards reaching the peak of digital transformation was established. Also, this chapter help showed the various dimensions of digital transformation alongside the possible back-office changes in terms of technology, environmental culture, environment, and human resources that can take place in an

organization. Specifically, the specific challenges facing developing countries in implementing digital transformation was emphasized. This is important because addressing this challenge will help put digital transformation in developing countries on the track of reaching its peak.

2. METHODOLOGY

2.1 Research Method

This thesis adopts the qualitative research technique. This is because it relies on the subjective assessment of respondents' opinion, attitude and behavior. According to Creswell (2014), qualitative research technique relies on emerging questions rather than pre-determined questions and data are collected and analyzed inductively. This makes the research method flexible with data collection through interviews. To answer the research questions of this thesis, the researcher adopts a phenomenology case study design. The important of phenomenology case study research deign is have an insight of the subjective life experiences of the respondents. Also, it helps in understanding "how and why" a phenomenon is the way it is (Creswell, 2014). Hence through phenomenology case study design, data gathered through in-depth interviews help in describing both the in-depth and common features of phenomenon.

2.2 Data Collection

This thesis used the interview and "desk research data" method for data collection. Data collection through the interview is done using oral verbal stimuli and the replies are oral-verbal responses. This is possible through either a person-to-person interview, the telephone interview, etc (Kothari, 2004), or recently through online channel like ZOOM. Desk research data are data from published report materials that are readily available either in physical or online libraries or the outcome of already conducted survey (Nooraini, 2013). For the purpose of this study, a personal interview which requires the researcher (interviewer) and the respondents (interviewee) on a face-to-face interaction was used. Just as the interview entails, it helps the researcher collect data with more in-depth information with open-ended questions to enable the researcher and respondents discuss issues of interest. However, on the other hand, the limitation of desk data is that it is hard to find specific data which is why data may not be reliable but the fact that it is helpful in finding new opportunities, and focusing the research makes it worthwhile (Bhasin, 2020). In the case of the interview method, it may be bias and time consuming but it raises the validity of

the research outcome since it gives the researcher the opportunity to dig deep for understanding and clarification of the subject matter (Mcleod, 2014).

The interview section was constructed into frames to capture the demographic information of the respondent and the research question of the thesis. An interview section with a respondent took about 40 minutes to 60 minutes. Furthermore, the desk data collecting method was used to collect data sets from JAMB Quarterly Statistical Bulletin as supporting materials analyzed in this study.

2.3 Sample Information

This research thereby concentrates on the organization's staffs that through the management made themselves available after acknowledging the researcher's consent letter, requesting their participation in the thesis. It is ensured that employees interviewed have necessary experience about not only the organization but the activities surrounding digital transformation. Therefore, it is regarded as purposive or judgmental sampling technique since the technique depends on data collection from respondents who are knowledgeable and conveniently available to be involved in this thesis. This idea was coined based on Nikolopoulou (2022) who posited that purposive or judgmental sampling is a class of non-probability sampling techniques that choses units because they fit the criteria for sampling; as a result, it is based on researcher's judgment in deciding which people, situations, or events will yield the most useful data for the study's goals. The respondents that made themselves available for this research have generally gone through the research consent letter and are confident to partake. Interview sections were with 10 respondents of 60% male and 40% female, with adequate experience of the organization; 20% each across IT, HR, B2C, B2B, and other departments of organization which constitutes the sample of this thesis, but after their responses have been carefully reviewed (see appendix II). The limitation to the sample is that it may not account for a significant proportion of the entire members of JAMB but the experience of the interviewees with JAMB and their knowledge of the subject matter cushioned this concern.

2.4 Data Analysis Method

The collected data were transcribed from audio to text using a transcription engine. Thematic analysis method was used to analyze the data. This helped in answering the research questions for the thesis and result presentation is done thematically.

2.5 Background information about the readiness of citizens to use digital services in Nigeria

Achieving the peak of a digitalized public sector requires strategic planning followed by readiness assessments, then implementation of digital transformation (Al-Omari & Al-Omari, 2006). Hence, the preconditions for implementing digital transformation are the various readiness assessments. These readiness assessments are discussed below.

1. **Technological readiness:** The Nigerian technological infrastructure is not close to being ready for a digitally transformed country, despite the country's potential for growth via digital transformation. Certain crucial infrastructures needed for properly planned digital economic operations are still underdeveloped or non-existent. In 2017, a little over 62.05% of the total mobile subscriptions used 3G, while 89.79 percent used 2G and 11.04% used LTE speed network (ITU, 2018). Similar to this, only 3.0% of households had access to broadband Internet (RIA, 2019). In 2016, Nigeria was placed 70th position lower than Mauritius, making it the best-performing African nation, which came in at number 20 overall in Africa (Gillwald, Odufuwa, & Mothobi, 2018). Nigeria has continued to have low computer adoption, low internet adoption (30%), poor electricity supply, and few terrestrial networks (RIA, 2019). Despite the plans to consolidate on 3G network, up to 70% of the network under the largest national footprint is still on the 2G network and only a few of Nigeria's major cities currently have 4G networks that can accelerate the digital revolution (NCC, 2019). In the area of internet access, Nigerian internet penetration is relatively low, at about 28.7% (ITU, 2017; Dwyer & Molony, 2019). According to ITU (2017) report, only 61.2% of Nigerians have access to internet, despite the fact that more than half (63.3%) of Nigerian population own mobile

phone. The country's overall Internet usage is 27.7% (ITU, 2018). The places many Nigerians to lack access to internet. The country's rigorous regulatory framework for mobile network have stifled the industry's growth in Nigeria where the populace is among the least likely of eight assessed African nations to utilize mobile network (GSMA, 2017). Many Nigerians doesn't have the capacity to fully involve in a digital driven country. Online operations and services a heavily hindered due to the lack of internet access. Without widespread internet connection among the populace, economic development that is focused on digital economic policies might lack the desired impact. Ranking of technological readiness by the Economist Intelligence Unit (2018) put Nigeria in 112th out of 137 nations in their survey. Currently, Nigeria has a 31.5% broadband penetration rate, largely in urban areas and suburb, hhowever, the Federal Government stated that it targeted to improve the country's broadband penetration to 70% in 2021, and also improve rural area broadband penetration (Daily Trust, 2019). According to Nwokeocha (2018), the Ministry of Communication and Digital Economy stated that Nigerian broadband penetration which was less than 40%, was a major barrier to implementing digital transformation. By the end of 2018, household broadband penetration increased to 0.04% (ITU, 2018). By 2025, it's anticipated that National Broadband would increase its penetration to 70% (The Cable, 2020). Nigeria's inability to make adequate headway may be blamed on the country's ineffective broadband strategy.

2. **Local Content Availability:** Among the 137 countries surveyed for the 2018 Economist Intelligence Unit Technological Readiness (EITR) ranking, Nigeria was ranked 111th due to its lack of domestic patents and content (Gillwald, Odufuwa, & Mothobi, 2018). Online and digital content is supposed to be converyed locally for the clarity of all locals. However, the language used to convey digital and online contents are not usually in local content, and only hand full of experts can understand. Further investigation has shown that there is scarcity of local content in digital transformation as majority of digital technological contents are in foreign languages (Mutula, 2010). This can impacts digital transformation strategy and its

expected outcomes. It is thus expected that developing countries put together plans to address this issue to catch up with the rest of the globe as a developing nation.

3. **Digital divide:** World Bank (2016) explains digital divides as an unequal share of digital technologies. Gaps such as internet accessibility, internet infrastructures, etc, are the root cause of digital divides. If digital technologies are to benefit everyone and Nigerian "digital divide" is still a problem. According to Economist Intelligence Unit Report in 2016, there are more men than women own mobile phones in Nigeria, and only 61% of them use the internet. This is one of the contributing factors of digital gap that exists in the country. Digital divide gaps was more obvious in the 2018 survey conducted by RIA demonstrating that over 60% of Nigerians do not utilize the internet. The survey revealed that those who live predominantly in urban areas with higher incomes and education embrace ICTs more rapidly than those who reside in suburban or rural areas (ITU, 2018; RIA, 2019). In the area of human resource and digital skill, the 2016 UNDP ranking shows that Nigeria is still at 152 out of the 188 countries that was surveyed. Due to insufficient investment, development of Nigeria's human capital has not improved. There is need for fundamental digital skills to use internet services; however, Nigeria Digital Economy Diagnostic Report (2018) posited that digital illiteracy in Nigeria is still high. Majority of Nigerians if not all, need digital skills to compete on a global scale (Fischer & Lipovská, 2013). It has been suggested that Nigeria must take purposeful initiatives to improve its population's digital literacy in order to get involved in the fast emerging digital future (World Bank, 2016).

4. **Electronic Services:** In a digitalized country, information about the services of ministries, agencies, and departments online open a window into their interactions with both citizens and businesses; and the data they produce are usually available in electronically to facilitate policy-making (Hamajoda, 2018). Unfortunately, the bulk of the websites for these ministries, agencies, and departments are static, restricts users' access to important news and information from the ministry, agency, or department (Ha et al., 2020). Migrating to online transactions are essential for a

digital transforming country. Unfortunately, Nigeria has not effectively realized this potential. Most ministries or agencies lack intranets and internet capacities to engage in inter-ministry or inter-agency connections. Instead of having a searchable database for sensitive information and data, majority of ministries still provide PDF versions of their annual reports (Hamajoda, 2018).

3 RESULTS

3.1 Overview and background information about JAMB

The JAMB was founded in 1978 for the purpose of administering entrance exams into Nigerian tertiary institutions for potential universities candidates applying for various undergraduate programs (Vanguard, 2012), which also cut across the Nigerian colleges of educations, polytechnics, and monotechnics (both public and private). Students must first write and pass the West Africa Senior School Certificate Examination (WASSCE) or the National Examination Council (NECO) (Nigerian Voice, 2014) before writing JAMB. Michael Saidu Angulu who served as a National Youth Corp from 1978 to 1986 was the board's first registrar of JAMB. The present JAMB registrar appointed in August 2016 is Prof. Ishaq Oloyede (Adebayo, 2016).

A student's admission into an institution of higher learning is decided by JAMB each year. The JAMB examination score range is from 0-400 for universities while 0-300 is for colleges of educations, polytechnics, and monotechnics, which is valid for one year. The exam has 180 questions with a 2-hour time limit, testing for knowledge, quickness, and accuracy (NG Academics, 2022). English language is a mandatory requirement for all candidates, with three other subjects which can be different depending on candidate's undergraduate preferred program in any of the high institution (IBASS, 2023). After examinations each year, JAMB set the cut-off marks obtainable for colleges of education, polytechnics, monotechnics, and universities based of the average performance of the candidates. Typically the universities are given the highest cut-off mark while the other types of institutions are given less cut-off marks (Adedigba, 2017).

Prior to 2015, JAMB conducted its exam via Paper-Pencil Test (PPT) which means that the Computer Based Test (CBT) started officially in 2015. Since then, the organization has extended its services across to other organizations. JAMB is suitable for this study due to how the organization has digitally transformed from the traditional PPT as well as other paper-based system to paperless system of examinations and administrations (TheCable, 2015).

3.2 Document Analysis

Before and After the Implementation of Digital Solution in the JAMB

JAMB switched from paper-based tests (PBT) or pencil-and-paper tests (PPT) to a paperless system at the same time that PBT and PPT are being phased out globally because of their weaknesses, which allowed for widespread examination misconduct (JAMB, 2014). Other tasks pertaining to its public services, except administering the test via a Computer Based Test (CBT), are all completed online. The organization was infamous for its procedural challenges prior to the implementation of the digital solution. The simultaneous administration of the exam at numerous remote centers and the manual marking created high risk of accidents among the examiners and candidates travel to their exam centres; as well as subjective scoring and outcome manipulations (JAMB, 2014).

Prior to the implementation of the digital solution in JAMB, there were a number of problems, such as the issues of missing grades and late result release; expensive exam administration on the part of testing organizations, including honoraria for examiners, coordinators, markers, collators, and other supporting employees; and the case of candidates who were victims of fraud, financial loss, traumas and frustrations as a result of payment processes of obtaining bank draft needed for the exam application (JAMB, 2017). It is also clear that JAMB's operations and actions required a lot of personnel and money, and these personnel are susceptible to be compromised at any time.

Since the deployment of technology-based assessment model known as Computer Bases Test (CBT), JAMB testing system has now provided opportunities to measure complex forms of knowledge and reasoning that were a challenge when using the traditional PPT method. PPT primarily assesses students' cognitive abilities, whereas CBT includes a practical component that may be tested online (JAMB, 2017). While e-testing software is used to assess cognitive ability, e-portfolios or simulation software is required to assess practical skills (JAMB, 2019). An automated assessment can comprehensively and accurately evaluate students in the three learning domains with the right design. After the

implementation of digital solutions, the followings have become obvious not just to JAMB but to the Nigerian education sector;

Firstly, more flexibility in exam scheduling and location, increased dependability on machine marking's superiority over human marking, and an assessment of precision via adaptive testing where the previous response determines the next question to be asked, etc (JAMB, 2017).

Secondly, CBT resulted in objective evaluation because computerized marking is not bias because it does not "know" the students, so it cannot be used to favor or penalize any applicant; more efficient storage because tens of thousands of answer scripts can be stored on a server's portable hard disk instead of the physical space needed for paper scripts. There have also been improved question formats with multimedia and interactivity; and decreased cheating, question banks, and random question and response. In addition, electronic transmission and encryption have boosted test security, reduced the amount of time and staff needed to give the test, and decreased long-term costs (JAMB, 2017).

Thirdly, due to the CBT administration initiative for Nigeria’s entrance exam for tertiary institutions, e-testing has established itself and gradually adopted are the preferred testing system for other organizations in Nigeria, for example, the Nigerian Immigration Service (NIS) and other government entities have proposed using computer-based exams (CBT) for recruitment purposes in the next ten years, gradually becoming the standard for all public service entrance examinations (JAMB, 2017).

Fourthly, due to the positive outcome of the CBT, so far, private sectors and businesses in Nigeria are progressively employed job candidates' aptitude tests online, also universities and other higher education institutions have already adopted and started using online testing for their students' entrance selection and semester exams (JAMB, 2019).

3.3 Thematic Analysis (Interview)

Open-ended interview questions were served to the respondents; the responses given by the respondents were thematically analyzed. The interview questions which were arranged in

themes produced responses that are also in the same themes. Hence, the qualitative data from the interviews produced are:

- Theme 1: The actual nature of JAMB digital transformation for public service delivery
- Theme 2: The key challenges for digital transformation of public service delivery in the context of developing countries

To ensure confidentiality and anonymity of the respondents, their names and departments are withheld. Rather, the department of the respondents will be referred to as A, B, C, D, and E.

Theme 1: Actual Nature of Digital Transformation for Public Service Delivery by JAMB

There were some back-office changes made by JAMB following the presentation of the CBT solutions in the areas of technology, environment, and human resources. The technological, environment, and human resources constitutes the internal changes made by JAMB following the presentation of the CBT solutions. Also, inter-organizational changes were implemented by JAMB to present the CBT solution. This represents external changes made by JAMB following the presentation of the CBT solutions.

Sub-Theme 1.1: Has JAMB attained a required level of digital transformation?

Exploring the responses of the respondents, a respondent from department B said; "….. *I won't say we have gotten their but we have outgrown the basic level of digital transformation…because our services delivered to the public have been totally replaced with digital system through users' website, in our back office activities, there are still some level of intranet use*". A respondent from department C said; "…..*advanced level of digital transformation comes with significant data mobility and transferability but we are not there yet but if you look at it from the angle of replacing the intranet with internet, I will say we are significantly there close to 100%*." Also, a respondent from department A and D were of the view that digital transformation in JAMB has outgrown inception stage which

implies that JAMB has moved away from the L&L catalogue and transactions stages and the cultivation stage of the PPR model but when compared with public sector organizations in advanced countries which have reached the maturity level and advancing to revolutionary level, JAMB still have a long way to go. Lastly, a respondent from department E held that; "*....we may not be as the most advanced level but the level of digital transformation in JAMB is that where users can serve themselves because our web user interface offers self-service.....however due to unreliable infrastructural facilities, the process may be cut-off but our system provides analog mode to ensure any process is completed*."

Sub-theme 1.2: Back-office Technological Changes Implemented by JAMB to Present the CBT Solution

Exploring the responses of the respondents, several back-office changes were made to technological system of JAMB before presenting CBT solution. According to a respondent from department A; *"....prior to this time, our back office operations were manual as it was based mainly on human activities but this has changed as we now use computers through the help of artificial intelligence*." Respondent B was more specific by emphasizing inventory management. According to this respondent; "…..*technology has been introduced into the inventory management of our back-office changes. It used to be manual but it is automated now.....in as much as we are reducing physical material, there are still some materials within the office that constitute inventory, our automated process has helped managed our inventory better with least cost.*" According to a respondent from department C; "…..*before, every activities associated with finance and accounting in this organization..... salary record, invoice, cash-flow, and financial reports were printed manually, but technology back-office changes have changed it…no one need to be giving a financial report, invoice, etc manually, after every transaction, all these thing are sent directly to your email where you can retrieve it whenever, wherever.*" Also, respondents from department D and E held the view that there are series of operational and support systems rooted in technological innovation like artificial intelligent to make their work easier.

Sub-theme 1.3: Back-office Environmental Changes Implemented by JAMB to Present the CBT Solution

Exploring the responses of the respondents as regard the environmental changes in back-office to present CBT solution, respondents from department A and C held that the environment of JAMB as an organization has moved from the tradition kind of environment where they have to follow lots of unduly processes before getting feedback to the an environment that is fast-paced. According to a respondent from department B, changes in our work environment has enhance communication within everyone in JAMB. Quoting the respondent; "*….before, our environment is such that a member of a certain department may have nothing to do with another member of the organization in another department…..but with changes in the organization, a cooperative atmosphere of work environment where free from workplace conflict and enhanced teamwork have been created*." According to respondents from department D and E, due to changes in the JAMB environment, the environment has transformed to the extent that when there is an itch in the workprocess, the source is easily identified and resolve.

Sub-theme 1.4: ***Back-office Human Resources Changes Implemented by JAMB to Present the CBT Solution***

The responses from respondents show that the HR of JAMB has change so much and it is as a result of technological innovation. From the words of a respondent from department A; "*…..the HR department used to monitor our attendance by ensuring we sign-in whenever we get to office…..this system were not easy to know who comes late. Some even signed against the next day and they may end up not coming to work…..now, we use our thumbprint to sign-in which is very difficult for anyone to cheat.*" According to a respondent from department B; "*….I've not been here for too long but I applied for my job at JAMB online, took the test online, my first interview was online……the first time I came here was to meet the head of the organization and department head in person.*" Also, respondents from department C, D, and E held that the HR department now appraises their performance digitally using different kinds of software like the Systemspecs. They believe

that this method is without bias and they like it because it encourages them to work. Having the organization members to have gone through a digital means to get employed means they have what it takes to drive digital process in JAMB. Also, the HR department working together with the IT department to carryout recruitment process into JAMB also shows that the digital transformation processes is not limited to internal work process but also in the process of recruiting candidates with digital proficiency. The human resources at JAMB is thus justified to not only driving digital transformation in JAMB but also equipped in developing employment skills needed to meet the challenges that come with digital transformation.

Sub-theme 1.5: Inter-organizational Changes Implemented by JAMB to present the CBT solution

In terms of inter-organizational changes implemented by JAMB towards presenting CBT solution, a common thought were shared by the respondents. Inter-organizational collaboration changes from collaboration with organization that supply hardcopy materials inputs to JAMB to digital organization that design JAMB software and telecommunication organizations that provides internet services to JAMB. This collaboration is needed to present a CBT solution.

The important of this inter-organizational change to JAMB is that it changes the collaborations that mobilize and link the organization's resources and assets towards achieving an improved public service delivery. While the process of inter-organizational changes may become complex due to the increasing need to solve educational and other societal problems, inter-organizational changes between JAMB and other organizations on the premise of digital transformation is very important. With JAMB collaborating with telecommunication organizations and software developing organizations, it further fosters the pool of resources from these organizations to help JAMB deliver improved service to the public. Also, as JAMB embarks on inter-organizational changes by collaborating with digitally inclined organizations like Glo Telecommunication, TAGDEV Technologies, etc which puts JAMB in a better position for data mining and a deep knowledge of the use of

resources and the support needed in executing solutions with vast sustained opportunity and improved public service delivery.

Theme 2: The key challenges for digital transformation of public service delivery in the context of developing countries

Sub-theme 2.1: Overall Challenges for Digitalizing Public Service Delivery in Developing Country

Exploring the responses of the respondents on the challenges for digitalizing public service delivery in developing countries, one major challenge that most of the respondents emphasized was the perception of political leaders in the developing countries. According to a respondent in department A; "*.....most of the political leaders in developing countries do not have awareness of the importance of digitalization so their perception in that area is poor……so don't expect them to channel their energy towards digitizing public service delivery*." A respondent from department B said; "….*most of African leaders are still so stereotyped with the use of carrying document around in their traditional hardcopies,……their poor enlightenment has not helped them develop the political will for implementing the digital ways of delivering public services*." From the view of a respondent from department C, developing countries lack the skill personnel who can execute digital processes. According to this respondent; "*.....here in the developing world, even though we have some number of personnel who are trained to execute digital process, yet the number is inadequate and not well spread.*" A respondent from department D hold strongly that the poor level of digital infrastructure is the key challenge to digital transformation in developing country. According to the respondent; "……*if you look at digital transformation in the developing and developed countries, the gap you will see is that of infrastructure*." According to a respondent from department E; "*one of the major challenge we face in this part of the world is our security environment…..hackers can easily take advantage of our data for malicious activities*".

Sub-theme 2.2: Overall Challenges for Digitalizing Public Service Delivery in Nigeria

Irrespective of the success of digital transformation in Nigeria, there are certainly factors that negates these success achieved by digital transformation in the country. According to a respondent from department B; "…..*even as Nigeria is investing on ICT infrastructure, there are many problems which have remained….for instance, ICT infrastructures like software, access to bandwidth, and hardware remain inadequate*". Respondents from two different departments A and C emphasized on electric power supply as a core factor that negates the success of digital transformation in Nigeria. Quoting a respondent from department A; "……*we can't take away the issue of electric power supply which remain a big factor to digitalization in Nigeria in general*". Also, a respondent from department C said that "*....even here in JAMB Head Office like many other public organizations, we rely on electric power supply from generator for our operations because the electric power supply from the authorities are not reliable*". A respondent from department D was concerned about the increasing activities of software hacking as a factor that negates the success of digital transformation in Nigeria. According to this respondent; "…..*software hacking is a global issue which we tend to ignore at times in this part of the world…..there had been some hacking attacks on our serve to perpetrate illegal activities several time*". Thus, an issue JAMB should concern itself about is that of software hacking since digitalization heavily rely on software design which stands the risk of cyber-attacks. This is because with the number of data JAMB is exposed to in yearly bases, these data are often at risk of been hacked or compromised either in their local computer servers or in a digital system like cloud. Hence, while going digital may help JAMB improve public service delivery, it as well creates cyber security risk. From the view of a respondent from department E, digital transformation comes with frequent change which may be cost involving. Quoting this respondent; "…*the extent of innovative change in digital transformation is very fast and to stay on top of our game we have to align with the pace of change ……but this change comes with huge monetary cost to the organization*".

Sub-theme 2.3: Challenges Affecting the Success of Digital Transformation in JAMB

The implementation of digital transformation in JAMB did not come with ease. There were some problems the organization faced in the process. According to a respondent in department B; "….*when the notion of implementing digital transformation in JAMB was birthed, some top officials of the organization didn't accepted it initially…….I've been here for over a decade and I felt it was due to corrupt practices because if the process is digitized every loopholes of fraudulent activities will be blocked…….I can't go deep on this but what I can certainly say is that implementing digital transformation was not totally accepted at first due to corruption*". This is one of clear indication of lack of readiness for the implementation of digital transformation in JAMB. Another respondent from department D emphasized on the ICT and technical readiness of the staff said; "…*as staff of this organization, a lot of us were not very literate in computer so coping with digital transformation like the process of CBT and also transforming every office activities to paperless work process made the process of digital transformation slow……..to adjust, most of us had to take on courses on computer studies to boost out computer literacy*". However, a respondent from department A said that the problem was also about the computer literacy level of students who were expected to take JAMB exams online. Quoting this respondent; *"…..during the earlier stage of CBT, most candidates were not computer literate, they lacked basic knowledge of how to operate a computer for their examination purpose,……although basic computer studies have been incorporated into their studies now*". According to a respondent from department A, the problem faced by JAMB when implementing digital transformation was lack of a regulatory framework that guides the process. Quoting this respondent; "*Although the Digital Mobile License which ushered in digital transformation in Nigeria was already in place still there was no relevant framework that guides the implementation digital transformation…. It is just some few years ago that the Nigerian government started to put adequate and operational legal framework in place for organizational digital transformation*". Lastly, a respondent from department E holds that; "…….*the access to internet had been very poor and for digital*

transformation like CBT to fly, it required a stronger internet network than the 2G and unreliable 3G that was prevalent in Nigeria some few years back".

Sub-theme 2.4: the way Forward to Enhancing the Success of Digital Transformation in JAMB

In suggesting the way forward to enhancing the success of digital transformation in JAMB, the respondents gave some of following recommendations;

Respondent from Department A: *There is a need to frequently train our staff not just on the basic level of computer literacy but on the emerging changes in ICTs. On the side of the users, like students in particular, ICT studies and practical should be a core subject starting in primary school or at least at the senior secondary level.*

Respondent from departments B and E: *On the side of the government, there should be investment in ICT infrastructure and a legal framework that will be a base or support for organizations to rest on and enhance the implementation of their digital transformation.*

Respondents from departments C and D: *Since digital transformation like that of JAMB cuts across every state in Nigeria, the Nigerian government must embark on an aggressive scheme that will help make internet access and basic internet gadgets affordable to all*. This will not only help the public in relation to JAMB but also the entire country.

3.4 Overview of Result and Discussion

An overview is made on the results and discussed in line with providing answers to the research questions of this study. This thesis is guided by the L&L model with advancement to the PPR model of e-government and the models help picture where JAMB was before implementing digital transformation and how it has and can enhance public service delivery through the implementation of digital transformation.

Research Question 1: What is the actual nature of digital transformation for public service delivery while relying upon the current success story of JAMB from Nigeria?

To establish the actual nature of digital transformation for public service delivery while relying upon the current success story of JAMB in Nigeria, the result shows that although JAMB has outgrown the sparse stage of digital transformation that the L&L model (figure 1) which was specified as the transaction stage that supports online transactions, certain intranet usage still exists, which is specified by the PPR model in extension stage (Table 1). The result of this thesis showed that the nature of JAMB digital transformation for public service delivery has attained a maturity stage demonstrated by PPR model which entails abandoning intranet, improvement in accountability and transparency alongside personalized user web-interface (Table 1). Although there are some elements of the extension level specified in PPR model like small fractions of manual procedures but in general, digital transformation in JAMB is gradually migrating toward full maturity level. Thus, there is room for improvement in JAMB it must fully consolidate the maturity level and reach the peak of digital transformation which is the revolution stage according to the PPR model.

Achieving the level required by JAMB to implement some back-office changes and inter-organizational changes. The result of this study shows that back-office technological changes implemented in JAMB range from the use of computer to the inclusion of artificial intelligence; automating inventory management, and finance and accounting; and operational, and support system rooted in technological innovation. Drawing from the responses that was gotten, back-office changes in environment propelling CBT solution has gone from a traditional system to a fast-paced system with swift feedback; it has also make the environment a communication driven one; and a kind of environment that easily detects problem and solves it. Also back-office changes in human resources have moved from traditional methods to digitalization of the core functions of human resources. These enhancements further affirmed that the nature of JAMB digital transformation for public service delivery could be said to have attained maturity stage.

Research Question 2: What are the key challenges for digital transformation of public service delivery in the context of developing countries?

The result of this thesis established that the challenges to implementing digital transformation in developing countries which is also affect an organization like JAMB include poor data security, poor infrastructure, lack of digital personnel, and political will. Among these challenges, if there is political will, other things will fall in place. Achieving the revolution stage of digital transformation as specified by the PPR model (Table 1) will mean that all the highlighted challenges hindering digital transformation has been addressed. However, for this to be achieved, political zeal has to come first. Thus, while we embrace the success of digital transformation, we also need to be prepared for other rising challenges to these successes if successes must be fully harnessed and maintained. Considering JAMB peculiar case, the problems faced by the organization in implementing digital transformation were both internal and external. Internal factors being lack of readiness and acceptability among the senior staffs because it will block the loopholes for corruption and most officials then were not technically ready, whereas external factors lies on the lack of network infrastructure and legal readiness, and also students were not also technically prepared.

CONCLUSION

This study is set out to examine how to enhance the delivery of public services in Nigeria through digital transformation using JAMB as a case. To achieve this, it becomes necessary to understand the preconditions that warranted digital transformation in JAMB; the present actual nature of digital transformation for public service delivery in JAMB; the effects of digital transformation in JAMB to other public and private organizations; and the key challenges for digital transformation of public service delivery in the context of developing countries.

Theoretically, the PPR model helped to explain how digital transformation transit from conceptual stage (cultivation) to the maturity stage and further to the peak which is the revolution stage. The PPR model is important for this study as it help ascertains the present actual nature of digital transformation in the context of JAMB and how JAMB has come to reach its present stage of digital transformation despite the fact that Nigeria is poorly ranked at 140 among 192 countries in terms of digitally transformed country (United Nations, 2022). Relying on the adoption of qualitative research techniques which is based on subjective assessment of the attitude, opinion, and respondents' behavior that were made possible through interview sessions and documents analyzed (JAMB Quarterly Bulletins), the following conclusions are made;

JAMB went from its traditional method of delivery of examination services to the public, that is the paper-based tests (PBT) or pencil-and-paper tests (PPT), to computer based tests (CBT); and office practices characterized by traditional work processes which did not only waste time but also involved huge cost with poor service delivery to a digitalized system process that saved time, reduce cost, and increase productivity in public service delivery as a result of implementing digital transformation in the organization. In the area of delivering public services, several issues such as missing grades and delayed of results; expensive and high cost of exam administration, logistics and recruiting ad hoc staffs to assist during the examination processes, including honoraria for examiners, coordinators, markers, collators, and other support ad hoc staffs; and experience of several candidates who defrauded during

application payment that is bank draft fraud, financial loss, stress, and trauma, etc, all necessitated the need for digital transformation in JAMB.

Back office changes were made to present CBT. This include technological back office changes which transformed manual operations to digital operations; environmental back office changes which made the JAMB environment more flexible with improved communication where organizational members adopted communication tool such as ZOOM, google team, google meet etc, making remote work possible; and back office changes in HRM by digitizing the recruitment process in JAMB; also inter-governmental changes opened up collaboration and partnership with other organizations and ICT stakeholders changing the interaction from manual interactive organization system to digital interactive organization system. Following these back office changes that led to implementing digital solution, JAMB public service delivery has experienced higher reliability because machine marking has become more reliable than human marking; there are greater flexibility in exam timing and location, and an assessment of accuracy through adaptive testing. The CBT produced an objective evaluation because computerized marking cannot be utilized to favor or condemn any candidate because it does not "know" the candidates thus eliminating bias.

This study identified the reasons why the level of digital transformation is JAMB has not successfully reached full maturity. These reasons are several persistent challenges such as unreliability in electricity supply, poor data security, poor infrastructures, lack of digital personnel and expertise, and low political will. Among these challenges, this study suggests that political will is the most important because the critical organizational decisions are politicized in Nigeria; therefore, the right political will is envisaged to propel positive change towards enhancing digital transformation. This shows that the problems JAMB faces as a public organization in implementing digital transformation are balance of internal factors which the organization has control over and external factors which is beyond the control of JAMB.

Therefore, this study concludes that, issues hindering the effective service delivery in JAMB necessitated the need for incremental innovation that led to the digital transformation implementation. Since the implementation of digital transformation by JAMB, service delivery such as user accessibility, staff members' collaboration, quick release of result after examination, low cost of operation, etc, has led to public trust and reliability on JAMB. However, it is the opinion of this study that a lot more can be achieved if digital transformation in JAMB attains PPR full maturity level and further to the revolution level. This will be possible only when the challenges or setback to digital transformation is addressed.

Recommendations

Following conclusion, this study recommends the followings;

- Implementing digital transformation needs a leadership with a strong will and vision that can implement comprehensive strategies which are not just rated on the benchmark of global best practices; but align with the contemporary economic and political realities.
- Developing countries including Nigeria have the advantage of leapfrogging in aspect of digital innovation. With the right political will, digital transformative policy designs and strategies should be enshrined in public organization.
- This study also recommends political and decision autonomy in JAMB - it is assumed that politics does not influence JAMB affairs, however, in reality its major policy, regulations, financing, and budgeting are heavy politicized. As the study recommends freedom from politics, this means that there should be full autonomy in every aspect of JAMB operations; however, the government can establish an oversight committee to monitor.
- For the peak of digital transformation to be realized, JAMB in collaboration with the government alongside other stakeholders must create a framework for national strategy that portrays the targets, standards, technical approach, and vision of the government for digital transformation in Nigeria.

- There should be inter-educational body collaboration and cooperation - JAMB and other education bodies like WACE, NECO, ICAN, NBA, higher institutions including the basic education should create and inter-organizational interface that could maintain singular database and academic process. This will make inform easily accessible and conduct of academic screenings more comprehensive.
- Outsourcing and constant training - database and storage should be properly outsourced. Leapfrogging is that fastest way of employing experts or collaborating with foreign institution that have gotten it right. This could make the digital transformation more efficient and focused.
- Infrastructural collaboration - it will be difficult for JAMB as an entity to setup infrastructure in the whole 36 states of the federation. However, with a transparent and mutual collaboration and partnership with other educational organization like WACE and NECO which are also yearly and the large in term of academic entrance organizers/bodies; exam center, ICT infrastructures, expert infrastructure, etc, could be exchanged and shared.
- The government must unreservedly invest into ICT infrastructure and other infrastructures such as electricity, software and hardware equipment which can encourage the growth of digital transformation in Nigeria. This is further achieved by reducing import duties and tariffs on ICT related products.

Suggestion for further studies

This study was qualitatively carried out. It will be proper to carry out a quantitative study in further studies relating to improving public service delivery and the results compared.

There is need for a comparatively analysis study between JAMB and other agencies in the Nigerian educational sector like WAEC, NECO as well as private sector organizations in similar capacity.

Also, there is need for further studies that will highlight indicators that could measure and monitor the pace of digital transformation in public sector in Nigeria and developing countries' context.

References

Abdulkareem, A. K., Ishola, A. A., & Muhammed, A. (2015). Issues and Challenges of Power Sector in Nigeria: Addressing Policy Gap to Achieve Efficiency. *Ilorin Journal of Administration and Development*, 1(1).

Abubakar, A. S. & Adebayo, F. O. (2014). Using Computer Based Test Method for the Conduct of Examination in Nigeria: Prospects, Challenges, and Strategies. *Mediterranean Journal of Social Sciences*, *5*(2), 47–55. https://doi.org/10.5901/mjss.2014.v5n2p47

Adebayo, F. (2016). *Buhari appoints new heads for 17 education agencies…names Oloyede JAMB registrar*. Punch Newspapers. Available at: https://punchng.com/buhari-appoints-new-heads-17-education-agenciesnames-oloyede-jamb-registrar/

Adedigba, A. (2017). JAMB fixes cut off marks for universities, polytechnics, colleges of education. *Premium Times Nigeria*. 2017-08-22. Retrieved on 2022-03-18 from https://www.premiumtimesng.com/news/headlines/241139-breaking-jamb-fixes-cut-off-marks-universities-polytechnics-colleges-education.html.

Al-Maamari, N. K. L. & Bhuiyan, A. B. (2021). The empirical review of the organizational, technological, environmental and human resources factors on the efficiency of the digital transformation, Oman. *International Journal of Business and Management Future*, Vol. 5, No. 1.

Al-Omari, A. & Al-Omari, H. (2006). E-government readiness assessment model. *Journal of Computer Science*, 2 (11), 841-845.

Al-Shboul, M., Rababah, O., Al-Shboul, M., Ghnemat, R. & Al-Saqqa, S. (2014). Challenges and factors affecting the implementation of digital transformation in Jordan. *Journal of Software Engineering and Applications*, **7**, 1111-1127. http://dx.doi.org/10.4236/jsea.2014.713098

Almuftah, H., Weerakkody, V., & Sivarajah, U. (2016). Comparing and contrasting digital transformation maturity models: a qualitative-meta synthesis. *Electronic Government and Electronic Participation*, 43(3).

Alshehri, M. & Drew, S. (2011). Implementation of digital transformation: advantages and challenges. *International Journal of Electronic Business*, IASK E-ALT2010 Conference Proceedings.

Andersen, K. V. & Henriksen, H. Z. (2006). Digital transformation maturity models: Extension of the Layne and Lee model. *Government Information Quarterly*, 23, 236–248.

Andersen, K.N., Henriksen, H.Z., & Medaglia, R. (2012). Maturity Models in the Age of Digital Diversity: Beyond the Layne & Lee Legacy. *Innovation and the Public Sector*, 19:205-220. DOI:10.3233/978-1-61499-137-3-205

Bhasin, H. (2020, October 22). *Desk Research: Definition, Importance and Advantages*. Marketing91. https://www.marketing91.com/desk-research/

Bretschneider, S. I., & Mergel, I. (2011). Technology and public management information systems: Where have we been and where are we going. In H. J. W. D. C. Menzel (Ed.). *The state of public administration: Issues, challenges, and opportunities* (pp. 187–203). M.E. Sharpe.

Cascio, W. F., & Montealegre, R. (2016). How Technology Is Changing Work and Organizations. *Annual Review of Organizational Psychology and Organizational Behavior*, *3*(1), 349–375. Researchgate. https://doi.org/10.1146/annurev-orgpsych-041015-062352

Chaushi, A., Chaushi, B.A., & Ismaili, F. (2015). Measuring digital transformation maturity: A meta-synthesis approach. *SEEU Review*, Volume 11, Issue 2.

Chukwuemeka, E.O.; Ubochi, E.I. & Okechukwu, E.U. (2017). Effect of digital transformation on service delivery in Federal University, Ndufualiko Ikwo, Ebonyi State. *Review of public administration and management*. 5 (1).

Coursey, D., & Norris, D. F. (2008). Models of digital transformation: Are they correct? An empirical assessment. *Public administration review*, 68(3), 523-536.

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (4th ed.). Thousand Oaks, CA: Sage.

Daily trust (2019). FG targets 70% broadband penetration by 2021.

Darma, N. A., & Ali, M. (2014). An assessment of public sector service delivery in Nigeria: A case study of federal capital territory area councils, 2007-2011. *International Journal of Development and Sustainability*, 3(8), 1756–1776.

Dong, L. N. T., & Phuong, N. N. D. (2018). Organizational justice, job satisfaction, and organizational citizenship behavior in higher education institutions: a research proposition in Vietnam. *The Journal of Asian Finance, Economics, and Business, 5*(3), 113-119.

Duru, E., & Anigbata, D. (2015). *Public administration: A conceptual approach*. Abakaliki: Felico Press.

Dwyer, M. & Molony, D.T. (2019). *Social media and politics in Africa: democracy, censorship and security*. Zed Books Ltd.

Ebrahim, Z. & Irani, Z. (2005). E-Government Adoption: Architecture and Barriers. *Business Process Management Journal*, 11, 589-611. http://dx.doi.org/10.1108/14637150510619902

Economist Intelligence Unit report (2016) Building a Digital Nigeria.

Economist Intelligence Unit report (2018). E-readiness rankings 2009: the usage imperative. The Economist, A Report from the Economist Intelligence Unit written in cooperation with the IBM Institute for Business Value.

Energy Capital (2022, June 22). The ten most electrified countries in Africa. https://energycapitalpower.com/electricity-access-most-electrified-africa/

Fischer, J. & Lipovská, H. (2013). Building human capital: the impact of parents' initial educational level and lifelong learning on their children. *Journal on Efficiency and Responsibility in Edu Sci*, 6 :218-31.

Gillwald A, Odufuwa F, Mothobi O (2018). The State of ICT in Nigeria 2018.

GSMA (2017) Mobile Money as a driver of financial inclusion in Sub-Saharan Africa.

Ha, Z., Io, O., Fj, B., So, E., & Ik, M. (2020). Assessing the e-readiness of Nigeria for digital economy. *American Journal of Computer Science and Information Technology*, *8*(2). https://www.imedpub.com/articles/assessing-the-ereadiness-of-nigeria-for-digital-economy.php?aid=28626

Hamajoda A(2018) An E-readiness Survey of Selected Federal Ministries in Nigeria for Freedom of Information (FOI) and E-government Implementation, *Research Journal of Mass Communication and Information Technology*, 4 :1 :37-48.

IBASS (2023). Syllabus System. www.jamb.gov.ng. Retrieved February 27, 2023, from https://www.jamb.gov.ng/ibass

Ibietan J. (2013). New public management and public service effectiveness in Nigeria. A pragmatic discourse. *Public Policies and Administration Research*, 3 (7), 53-61.

Ibikunle, B. Q., Eweje, A. O. & Obisanya, A. R. (2019). Digital transformation and public service delivery in Lagos State Ministry of Works and Infrastructure**.** *LASU Journal of Management Sciences*, Volume 5, No. 1.

Idowu, S. S., Ibietan, J., & Joshua, S. (2020). Debureaucratization of Power in Nigeria. *Global Encyclopedia of Public Administration, Public Policy, and Governance*

Ilesanmi, O. A., & Lasisi, F. A. (2015). Nexus of change management on organizational performance and survival in Nigerian Universities: A case study of the University of Ilorin. *International Journal of Business and Management Review, 3(4): 66 – 81*

International Telecommunication Union-ITU (2017) ICT Regulatory Tracker 2017. 23 May 2019, Nigeria Country Card.

International Telecommunication Union-ITU (2018). News "How the Republic of Korea became a World ICT leader"; 2018. https://news.itu.int/republic-korea-leader-information-communication-technologies/. Accessed on 21 January 2020.

Jaeger, P. (2003) The endless wire: digital transformation as a global phenomenon. *Government Information Quarterly*, **20**, 323-331. http://dx.doi.org/10.1016/j.giq.2003.08.003

JAMB (2014). Quarterly statistical bulletin. Third Quarter.

JAMB (2017). Quarterly statistical bulletin. First Quarter.

JAMB (2019). Quarterly statistical bulletin. Fourth Quarter.

JAMB (2022). Advisor on extending the scope of service for CBT centres. JAMB Bulletin: a weekly Publication of the Office of the Registrar, Vol 3, No 1, p13

Kamal, M. M., Bigdeli, A. Z., Themistocleous, M., & Morabito, V. (2015). Investigating factors influencing local government decision makers while adopting integration technologies (IntTech). *Information & Management, 52*(2), 135-150. doi: https://doi.org/10.1016/j.im.2014.06.007

Kothari, C.R. (2004). *Research methodology: methods and techniques*. 2nd Edition, New Age International Publishers, New Delhi.

Kraemer, K. and King, J. (2003) Information technology and administrative reform: will the time after digital transformation be different? Available at: http://escholarship.org/uc/item/2rd511db

Layne, K. & Lee, J. W. (2001). Developing Fully Functional Digital transformation: A Four Stage Model. *Government Information Quarterly*, 18, 122–136.

Layton, T. (2007). Information security: Design, implementation, measurement, and compliance. *Florida: Auerbach Publications (IADIS) International Conference ICT, society and Human Beings, 2010*.

Mapira, N. (2013). The importance of establishing job analysis exercise in an organisation: a case study of bread manufacturing companies in Zimbabwe, *Australian Journal of Business and Management Research*, 2(11), 35-42.

Marche, S. & McNiven, J. (2003). Digital transformation and digital transformation: The future isn't what it used to be. *Canadian Journal of Administrative Sciences*, **20**, 74-86. http://dx.doi.org/10.1111/j.1936-4490.2003.tb00306.x

Maroye, L., van Hooland, S., Aranguren Celorrio, F., Soyez, S., Losdyck, B., Vanreck, O., & de Terwangne, C. (2017). Managing electronic records across organizational boundaries. *Records Management Journal*, 27(1), 69-83. doi:10.1108/RMJ-11-2015-0037

Mcleod, S. (2014). *Structured and unstructured interviews*. Simplypsychology.org. https://www.simplypsychology.org/interviews.html

Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly*, *36*(4), 101385. https://doi.org/10.1016/j.giq.2019.06.002

Ndou, V. (2004). Digital transformation for Developing Countries: Opportunities and Challenges. *The Electronic Journal of Information Systems in Developing Countries*, 18, 1-24.

NG Academics (2022). How JAMB Score is Calculated - JAMB Marking Scheme 2023 - www.ngacademics.com. (2022, December 27). https://www.ngacademics.com/jamb-score-calculation-jamb-marking-scheme/

Nigeria Communication Commission-NCC (2018). *2G remains most pervasive network in Nigeria – NCC - ITPulse.com.ng*. Itpulse.com.ng. https://itpulse.com.ng/2018/12/19/2g-remains-most-pervasive-network-in-nigeria-ncc/

Nigeria Digital Economy Diagnostic Report (2018).

Nigerian Voice (2014, August 2). Varsities set irrelevant post-UTME questions and blame candidates for failing - Prof. Dibu Ojerinde, JAMB boss. Retrieved February 27, 2023, from https://www.thenigerianvoice.com/news/154340/varsities-set-irrelevant-post-utme-questions-and-blame-candi.html

Nikolopoulou, K. (2022). *What Is Purposive Sampling? Definition & Examples*. Scribbr. Available at: https://www.scribbr.com/methodology/purposive-sampling/#:~:text=Purposive%20sampling%20refers%20to%20a

Nooraini, R. (2013). Algorithm Analysis of Definite Integration by Using Desk Check Method. *Journal Inform. Bisnis*, 1, 50–55.

Nwankwoala, H. N. L. (2015). An Investigation of Lecturers' and Students' Use of ICTs in Nigerian University Education as a Panacea for National Development. IISTE Research on Humanities and Social Sciences, 5(20). 167-176.

Nweze M. T. Chinwe (2010). The Use of ICT in Nigerian Universities: A case study of Obafemi Awolowo University, Ile-Ife. *Library Philosophy and Practice (e-Journal)*, 494.

Nwokeocha S. (2018). Right to education and teacher gap in Nigeria: estimating the problem and lessons from international best practices. *Advances in Social Sciences Research Journal,* 5.

Obioma, G., Junaidu, I., & Ajagun, G. (2013). The Automation of Educational Assessment in Nigeria: Challenges and Implications for Pre-service Teacher Education. A paper presented at the 39th Annual Conference of the International Association for Educational Assessment (IAEA), Tel-Aviv, Israel, October 20 – 25. Retrieved from http://www.iaea.info/paper_5bc19d07

Obodo, N. A. & Anigbata, D. O. (2018). Challenges of Implementing Electronic Governance in Public Sector Organizations in Nigeria. *International Journal of Applied*

Economics, Finance, and Accounting, Vol. 2, No. 1, pp. 30-35. DOI: 10.33094/8.2017.2018.21.30.35

OECD. (Organisation for Economic Co-operation and Development). (2005). *Digital transformation for Better Government*. Paris: OECD.

Oloyede, I. (2022). Police Recruitment: JAMB screens 37,000 candidates in 156 CBT centres. Vanguard News. Retrieved from https://www.vanguardngr.com/2018/05/996059/ [Accessed 20/2/2023].

Oloyede, I. (2022). Paperless regime would enhance efficiency. JAMB Bulletin, Vol.3 No. 1, p1.

Onyibe, C. O., Nwachi-Ikpor, J. O., & Abdulhakim, A. A. (2015). Computer-based testing technique in Nigeria: prospects and challenges. *Journal of Information Engineering and Applications*, Vol.5, No.10.

Oye, N. D., Mazleena, S., & Iahad, N. A. (2011). Challenges of E-learning in Nigerian University Education Based on the Experience of Developed Countries. *International Journal of Managing Information Technology, 3(2): 39 – 48*.

Research ICT Africa (RIA) (2019) Africa - Household And Individual ICT Access And Usage Survey 2017-2018.

Retnawati, H. (2015). The Comparison of Accuracy Scores on the Paper and Pencil Testing vs. Computer-Based Testing. *TOJET: The Turkish Online Journal of Educational Technology*, *14*(4).

Solaris Technologies. (2021, January 11). *How can technology change your company culture?* https://www.solaristek.com/how-can-technology-change-your-company-culture/

Sivarajah, U., Irani, Z., & Weerakkody, V. (2015). Evaluating the use and impact of Web 2.0 technologies in local government. *Government Information Quarterly, 32*(4), 473–487. https://doi.org/10.1016/j.giq.2015.06.004.

TheCable. (2015, MArch, 9). How prepared is JAMB for full-fledged CBT? https://www.thecable.ng/prepared-jamb-full-fledged-cbt

TheCable (2020) Pantami receives 2020-2025 draft report of national broadband plan.

ThisDay. (2019). *Digital Transformation: How Ready Is Nigeria?* Www.thisdaylive.com. Retrieved May 14, 2023, from https://www.thisdaylive.com/index.php/2019/09/27/digital-transformation-how-ready-is-nigeria/

Titah, R. & Barki, H. (2006). Digital transformation adoption and acceptance: A literature review. *International Journal of Electronic Government Research*, **2**, 23-57. http://dx.doi.org/10.4018/jegr.2006070102

United Nations Public Administration Network-UNPAN (2002). Benchmarking digital transformation. A global perspective. New York7 United Nations Online Network in Public Administration and Finance.

Van Deursen, A. J., & van Dijk, J. A. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. new media & society, 21(2), 354-375.

Van Dyk, R., & Van Belle, J. P. (2019). Factors influencing the intended adoption of digital transformation: a South African case study. Paper presented at the 2019 Federated Conference on Computer Science and Information Systems (FedCSIS).

Vanguard (2012, April 9). Ojerinde re-appointed JAMB registrar. *Vanguard News*. 9 April 2012. Available at: http://www.vanguardngr.com/2012/04/ojerinde-re-appointed-jamb-registrar/ [Accessed February 27, 2023]

Warkentin, M., Gefen, D., Pavlou, P. & Rose, G. (2002). Encouraging citizen adoption of digital transformation by building trust. *Electronic Markets*, **12**, 157-162. http://dx.doi.org/10.1080/101967802320245929

World Bank (2011). Definition of Digital transformation. http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTINFORMATIONANDCO

MMUNICATIONANDTECHNOLOGIES/EXTEGOVERNMENT/0,,contentMDK:20507153~menuPK:702592~pagePK:148956~piPK:216618~theSitePK:702586,00.html

World Bank (2012). *The transformational use of information and communication technologies in Africa.* Washington DC: Temporary Relocation Agency, World Bank press.

World Bank. (2016) *Bridging the Digital Divide: Applying Lessons from the 2016 WDR for Land*. Retrieved May 14, 2023, from https://www.worldbank.org/en/news/video/2016/04/07/bridging-the-digital-divide-applying-lessons-from-the-2016-wdr-for-land

Yusuf, S. (2006). Under New Ownership: Privatizing China's State-owned Enterprises. In *Google Books*. World Bank Publications. https://books.google.com.ng/books?hl=en&lr=&id=XubcLywz0LQC&oi=fnd&pg=PR3&dq=digital+transformation

APPENDICES

Appendix I: Interview Questions

Note: RE is Research Question (as stated in the thesis)
IQ is Interview Question (build up from RQ)
Exchange of compliments and reintroduction of selves and purpose of the interview

Respondent's Demographic Information

IQ1: How long have you been working in JAMB?

IQ2: What is your highest educations qualification?

IQ3: What department and position do you occupy in JAMB?

RQ1: What are the preconditions for the digital transformation in JAMB?

IQ4: How were the activities of JAMB before implementing digital transformation like the CBT?

IQ5: What would you say were the factors that necessitated the need for CBT?

IQ6: How would you say digital transformation in JAMB has been successful so far?

IQ7: Would you say JAMB has attained a required level of digital transformation?

RQ2: What is the actual nature of digital transformation for public service delivery while relying upon the current success story of JAMB from Nigeria?

IQ8: What kind of technology back-office changes has JAMB actually implemented Human Resources to present the CBT solution?

IQ9: What kind of environment back-office changes has JAMB actually implemented to present the CBT solution?

IQ10: What kind of human resources back-office changes has JAMB actually implemented to present the CBT solution?

IQ11: What kind of inter-organizational changes has JAMB actually implemented/developed to present the CBT solution?

Appendix II: Respondents Information

Demographic Information	Percentages
Gender	
Male	60%
Female	40%
Department	
IT	20%
HR	20%
B2C	20%
B2B	20%
Others	20%
Work Experience	
2-6 years	20%
7-12 years	40%.
Above 12 years	40%
Staff Level	
Low Line Staff	0%
Middle Line Staff	40%
Upper Line Staff	60%

Appendix III

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