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REVIEW PAPER

Digital Transformation and E-Service Delivery in African Public Sector Organisations: Insights into Botswana's Ministry of Agriculture

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Abstract

This study identifies the key constraints to e-service delivery in Botswana's Ministry of Agriculture. The study uses exploratory desk research together with the Technology, Organisation, and Environment (TOE) framework to identify and analyse the key constraints in e-service delivery. Secondary data were obtained from e-government strategy documents, action plans, and progress reports on commitment to the digital transformation agenda of the Botswana government, including budget statements, state of the nation address and other relevant publications. The constraints are subsequently classified based on the three units of analysis, as stated in the framework. This study reveals that Botswana's progress in telecommunication infrastructure development has not generated the desired results in terms of online services. Digital service delivery of Botswana's Ministry of Agriculture is minimal due to outdated information and communication technologies and systems as well as applications that are not interoperable. In addition, network technologies and electronic workflow systems are extremely slow and unreliable. The study underscores that private investment to support government's investment through public-private partnerships will improve budget allocation and resource mobilisation for the digital transformation agenda to address information and communication technology infrastructural weaknesses and competency gaps. This article provides comprehensive information on core restraints to digital service delivery in Botswana's Ministry of Agriculture and how such constraints can be addressed to expedite digital service delivery. The study adds to the discourse on the role of technology in development by highlighting the role of digital technology in the agricultural sector.

Keywords Digitalisation · Digital transformation · E-government · Public services · Technology

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1 Introduction

In a quest to meaningfully serve society, governments in developing countries have integrated digital technologies into social and professional spaces (Vrana & Singh, 2023). Digital transformation has been an avenue for governments in developing countries to radically improve the low quality of public service delivery (International Telecommunication Union, 2021; Vrana & Singh, 2023). The African Union (2020) is not an exception, as its Africa Digital Transformation Strategy seeks to "harness digital technologies and innovation to transform African societies and economies to promote Africa's integration, generate inclusive economic growth, stimulate job creation, bridge the digital divide and eradicate poverty for the continent's socio-economic development." Understanding the importance of digitalisation for improved service delivery, the African Union further provided tailor-made strategies to meet the digital transformation needs for the Southern African Development Commission block, of which Botswana is a member. These are to harmonise the existing digital initiatives at the regional and national levels, reduce the digital divide within the region by developing reliable and affordable digital infrastructure beyond urban centres, and accelerate their implementation, targeting the digital transformation of strategic value chains (African Union, 2020; United Nations Economic Commission for Africa (UNECA), 2021).

Digital transformation involves innovating and restructuring traditional business models and improving the value chains and workflows with the use of digital technology. In practice, this involves the innovating business models, migration of businesses to digital platforms, integrating data and technology, and redesigning business processes (ElMassah & Mohieldin, 2020). Real-time interconnected, data-driven, intelligent and automated, and customer-oriented are the main characteristics of digital transformation (Yin, 2024). After reviewing 282 academic articles Vial (2019) observes lack of the comprehensive picture of the nature of and implication of digital transformation in developing countries. Further, Hamberg (2022) conducted a structured review of scholarly materials, together with interviews with 177 experts in digital transformation and observed that digital transformation lacks a comprehensive outlook of its nature and implication, further confirming Vial's observation. Arguably, an explanation to this can be found in earlier research (Westerman et al., 2011) which argues that successful implementation of digital transformation drive depends on the presence of digital technology and the transformation of the public sector organisations to capitalise on the opportunities in the new digital technology. Feliciano-Cestero et al. (2023) study which reviewed 272 published articles from 2002 to 2022 pointed to the need for more studies to empirically validate emergent theoretical constructs on digital transformation. These observations warrant the need to conduct this study with the view of improving the scope and impact of digital transformation in Botswana's Ministry of Agriculture.

In addition, the Sustainable Development Goals (SDG 4, 5 and 9) explicitly encourage countries to invest and use digital technologies to enhance training in ICTs (SDG 4), to leverage on technology for women's empowerment (SDG 5) and to improve digital development and increase access to ICTs (SDG 9, sub-section b) (European Union, 2022; United Nations, 2020). The digitalisation trend indicates

a global shift towards citizen-centric, agile, and data-driven approaches to public sector governance. Embracing digitalization enhances responsiveness, transparency, and efficiency in public service delivery, all of which are crucial for advancing societal development (Latupeirissa et al., 2024; Meru & Kinoti, 2022). Data are a valuable asset for the public sector worldwide, as they inform policy formulation and decision-making processes. Digitalisation enables governments to collect and analyse data, providing insights into societal behaviours, preferences, and needs—key drivers for enhanced monitoring and evidence-based decision-making. Additionally, citizen-centric service delivery has become a global trend and a fundamental principle of public service. By leveraging digitalisation, governments can collaborate with citizens to co-design public services and tailor them to meet specific needs effectively. Furthermore, initiatives such as open government, which have attained global relevance for making governments accountable and transparent, are achieved through digitalisation (Phuyal, 2024).

To enhance the efficient and effective delivery of public services, the government of Botswana has embraced digital transformation (European Union, 2022). This initiative aims to revolutionise public service delivery by improving responsiveness and eliminating challenges such as excessive paperwork, corruption, burdensome bureaucracy, delayed responses and lost files, all of which place unnecessary strain on citizens seeking public services in Botswana. This moved the Government of Botswana to adopt the Botswana Digital Transformation Strategy (SmartBots) in July 2020 to digitise Botswana's public service. However, despite earlier commitments to digitalisation dating back to 2016, the Ministry of Agriculture in Botswana (MoA) faced significant challenges in advancing preparations for e-service delivery. Many of the services provided by the MoA still require customers to visit physical offices or agent kiosks to complete transactions, as processes remain largely non-automated. This study seeks to identify the critical factors hindering the Ministry of Agriculture's transition to a comprehensive e-service provision in Botswana.

A previous study assessed the e-government programme in Botswana (Okike & Lobadi, 2019) focusing on citizen satisfaction with the e-government system. Their study revealed a higher satisfaction rate of 86 % among Botswana citizens. However, findings of the United Nations E-Government Survey (2022) showed a low online service index in Botswana, implying that only a few services are offered online, while most are offered manually. These observations have also been made by Moatshe (2014), who rightly stated that some forms are available online for users to print but inadequate relative to the targets. Networks and systems have been launched to support the internal operations of ministries, but the progress has not been satisfactory. Relative to all services provided by the government, only a small number are online, and there is a general dissatisfaction with this snail pace of e-government progress. Citizens ponder why they can transact online with private sector organisations, but when it comes to government, they have to go through a protracted and bureaucratic paper-driven engagement with government (Moatshe, 2014:180). For instance, the Ministry of Transport affirmed that out of a target of more than three hundred information services planned to go online from 2009, only sixty-nine of such information services are actually available online as in 2012, though with very constrained downloadable services (Government of Botswana, 2012).

Another study that examined the challenges and opportunities of e-government in Botswana, focusing on the deployment and use of e-governance in service delivery is Nkwe (2012). However, the study did not include a critical assessment of the factors that determine service delivery success. Samboma's (2019) study more broadly analysed the deployment of e-governance in Botswana's local government authorities. Their study revealed some implementation challenges, including inadequate availability and adoption of ICT devices in providing services, affecting service delivery outcomes. Overall, although these studies shed light on the successes and shortfalls of e-governance implementation, they focused on implementation aspects. However, the constraints arising from the planning and deployment of service delivery systems remain unknown. Such an analysis can generate insights into the critical factors that must be planned for in the successful delivery of e-governance for improved service delivery in Botswana and similar contexts. This study seeks to fill these gaps and suggests a way forward for the successful deployment of e-governance in Botswana, using the Ministry of Agriculture as a case study.

The remainder of this paper is organised into five sections. The second section presents the related literature review. This highlights the potential benefits of e-government and its service delivery models. This section further presents e-government in developed and developing countries and the e-government landscape in Botswana. This section also discusses the conceptual framework. The research approach is discussed in the third section of this paper. Findings from the analysis are presented and discussed in the relevant literature section. Conclusions and recommendations are then presented in the fifth section of the paper, which outlines the way forward for the successful deployment of e-governance systems for sustainable development in Botswana and similar contexts.

2 Literature

2.1 Digitalisation in Botswana

Botswana' National Development Plan (NDP 11) supports the digital transformation agenda which seeks to digitally transform the public sector and enhance public service delivery. An example of government services which has been digitised includes the online filing of tax returns, which began in 2019. This platform shows digital interactions between the government and citizens and between the government and businesses.

Another e-service is BAITS, which offers a platform for farmers to capture information about their livestock. The platform is used to register livestock, transfer ownership, arrive at livestock, administer veterinary drug treatments, and eliminate sold, lost, or dead stock. However, the service is not fully automated, as farmers still have to visit the Department of Veterinary Services to apply for user access, where the username and password are issued. Other services provided by the Ministry of Agriculture have yet to be mapped out and re-engineered. These services include: application and renewal of brand certificates, online sale of ear tags, renewal of keeper identity card, livestock buyer's licence, and application for bull fertility test-

ing, including laboratory testing of soils and water. Local authorities in Botswana are also implementing e-government, and the portal is updated at the maternal ministry, which is the Ministry of Local Government and Rural Development, where all local authorities submit data (Madala & Phirinyane, 2016).

Based on extant literature, diverse issues must be addressed for successful e-government implementation (Bwalya, 2009). These issues serve as bottlenecks which can have a significant effect on an organisation's ability to deliver services and transactions online, and they include poor ICT infrastructure, lack of technological expertise, inadequate management support, and cultural differences (Alshehri & Drew, 2010). Another study by Porogo (2022), which examined digital preservation regulatory frameworks for digital records in Botswana, highlighted challenges in the preservation of digital records. Porogo concludes that although some ministries have started using electronic records management systems to enter and store digital records in servers, the systems used cannot preserve digital records throughout their epochs, thereby showing the inadequacies of Botswana's legal system regarding preserving digital records.

The scholars Maraga et al. (2022) examined e-government and the right to privacy in the context of Public Health Emergencies of International Concern, such as COVID-19 in Botswana. Their study recommends that individual privacy rights should not be compromised before, during, or after such pandemics so that the data protection act of 2018 is not yet functional (Maraga et al., 2022). Mokone et al. (2018) investigated critical success factors for e-government in Botswana and showed that there is a need for active e-government leadership, including the information and communication technology budget across ministries, as well as adopting a customer-oriented approach.

2.2 Classification of Digitalisation Implementation Challenges

As e-government provides significant benefits to governments, citizens, and other stakeholders, its implementation and adoption are complex and challenging. From e-government research, it is clear that constraints to implementing e-government are numerous (Al-Busaidy & Weerakkody, 2009; Gil-García & Pardo, 2005). This section attempts to classify digitalisation implementation challenges. Al-Shafi (2009) and Al-Shehry et al. (2006) classified them into (a) organisational; (b) technological; (c) social; (d) managerial; (e) operational; (f) strategic, and (g) financial. Almarabeh and Abu Ali (2010) defined the following constraints in terms of infrastructure development, law, and public policy; digital divide, e-literacy, accessibility, trust, privacy, security, transparency, interoperability, records management, education, and marketing, including workforce issues. To Gil-García and Pardo (2005), obstacles to digitalisation fall under five classes. These are information technology, organisational and managerial issues, legal and regulatory issues and information and data problems, including organisational and environmental factors.

2.3 Challenges and Progress in Botswana's Digital Transformation Infrastructure

Botswana has commendable infrastructure suitable for driving e-government, but individual government ministries internally do not have suitable information and communications technologies that can drive e-services. This may sound contradictory. For example, Botswana has a remarkable fibre network available in the heavily populated eastern part between the main towns in Francistown and Gaborone. Botswana rolled out a two-thousand-kilometre Trans-Kalahari fibre network that enabled interconnections between the main towns and promoted access to the East Submarine Cable System and West Africa Cable System in 2008 (Esiefarienrhe & Mokeresete, 2022: 496; Moatshe, 2014). This trans-Kalahari fibre network has fibre components that connect Jwaneng, Maun, Ghanzi and Orapa all the way to the Namibian boarder, while the other connection runs from Francistown through Nata to Kasane all the way to the Zambia boarder with another connectivity between South Africa and Zimbabwe (Moatshe, 2014). The Botswana government has leveraged the East Africa Submarine Cable System and West Africa Cable System, which provide high-speed connectivity to countries in Africa and the rest of the world. This development was expected to improve Botswana's international connectivity by providing reliable internet and telephonic services (Moatshe, 2014).

However, the initial targets set after these developments were not realised owing to outdated computing systems with low computer Random Access Memory that were used to connect communities. The target was to connect those communities with more than 2,000 inhabitants to high-speed Internet access by 2016. The other target was to have 50 fully-fledged community access centres that were operational by the end of December 2010, including all public libraries also connected to high-speed network access. The other initial targets for government online implementation were also not realised. For instance, all necessary government information was made available online as on the last day of 2007 (Government of Botswana, 2010). All Government services were targeted to be provided online by December 2009, and civil servants were to receive formal e-government training within the first year of joining the civil service, with effect from January 1, 2008 (Moatshe, 2014). The initial national e-health targets were also not realised. For example, all residents were to have proper access to health information online by the last day of December 2010, and all health facilities were to be connected by 31 December 2010. Again, 50% of the citizens were to have access to reliable power and connectivity on December 31, 2010. In addition, by 31 December 2016, information and communication technologies were to be made available to all citizens.

Botswana's drive to achieve a knowledge-based economy is anchored by its digital transformation and innovation (Government of Botswana, 2023: 13). From the Government of Botswana (2023) report, 170 online services have been launched and 130 services are due to be completed by close of the third quarter of 2024 to public sector onboarding citizens with walk-in and self-registration services for selected services in the public sector. To achieve this, the government of Botswana has devoted a total of Botswana Pula 260 million (according to google, the exchange rate at as at 20th July 2024 is 1 USD to 13.53 Botswana Pula) for youth-owned companies to develop e-services for the public sector (Government of Botswana, 2023).

This digital transformation drive of the Botswana government has resulted in citizen-centric digital services. The e-government services of Botswana include the E-Health strategy (2020–2024), which introduces electronic records and E-Education, which introduces an Education Management Information System for all levels of education, mobile ICT laboratories to primary schools, and interface platforms. The rest are an E-mobility programme which trains technicians with the skills to attend to E-vehicle issues.

The SmartBot village connectivity project of the government of Botswana, with the aim of promoting digital access in rural areas, has connected 1,138 public facilities in 144 villages in Botswana. To date, 301 villages were added in April 2024 (Government of Botswana, 2024). The SmartBots initiative was meant to improve Batswana's access to network connectivity and some online provided services. Botswana has launched two satellites: Satellite One (BOTSAT1), which was developed by the Botswana International University of Science and Technology in November 2022 to receive vegetation and water body data from other orbiting satellites in space. The second event will be a lunched on in August 2024 to collect data on tourism, surface water monitoring, agriculture, mining, communication, human settlement, and town planning. The Budget Statement of 2024 allocates Botswana Pula 1.83 billion (according to google, the exchange rate at as of 20th July 2024 is 1 USD to 13.53 Botswana Pula) to the implementation of projects and programmes towards digital transformation (Government of Botswana, 2024).

2.4 Launch of the BOTSAT- 1 as a Step in the Right Direction Towards e-governance

Another interesting development as far as e-governance is concerned is the launch of Botswana's first digital satellite dubbed BOTSAT- 1 at the United States of America. The launch of the satellite is geared towards harnessing data for easy governance. Botswana International University of Science and Technology (BIUST) (2025) states that the satellite launch will be used for environmental monitoring, enhancing disaster management and agriculture, as well as playing a leading role in urban planning. The vision behind the launching of the satellite is solely to enhance governance in ts various forms such as agriculture, disater management and environmental sustainability. Courtesy of the satellite launched in space, Botswana will be able to track weather patterns to always predict natural disasters such as floods. The National Disaster Management Office will greatly benefit from the satellite in orbit as far as disaster management is concerned. The spacecraft launch accentuates Botswana's determined gola to be a regional space leader and to enhance governance through the digital technology. The partnership and collaboration between BIUST and Ministry of Communications and Innovation is a pivotal one in ensuring the success of the satellite project. This collaboration underscores the need for collaborations for e-government to see light of the day.

2.5 Analytical Framework

According to Titah and Barki (2006) and Nkwe (2012), issues affecting e-government can be classified into individual and organisational. The two groups contend that the personal beliefs of citizens substantially affect the adoption of e-government services. With particular reference to Davis' Technology Acceptance Model (1989), individual beliefs such as perceived usefulness (PU) and perceived ease of use (PEOU) have been considered the leading beliefs that influence the decision to embrace technology, especially in the context of business to consumers. However, this study uses the technology–organisation – environment (TOE) theoretical framework to study factors stalling preparations for e-service delivery at the MoA.

TOE is a theoretical framework that provides explanations for the adoption of technologies in organisations and describes how the processes of institutionalising technological innovations are affected by the technological setting, organisational environment, and environmental context. Tornatzky and Mitchell (1990) published this framework, whose central argument is that these three distinct institutional elements influence adoption decisions. The technological-organisation-environment framework "originates from the theory of adoption of new technologies making it widely adopted in various studies" (Defitri et al., 2020: 40). This framework is very helpful for identifying and understanding factors in areas of technology, organisation, and the environment that affect procedures for new technological innovations. Technological factors relate to information and communication infrastructure, applications, and systems, both presently used and new ones needed for e-government (Defitri et al., 2020: 40).

Information and communication technology infrastructure is essential for e-government implementation. Without such infrastructure, e-government is dead on arrival. Although costly, such infrastructure must be available because it has long-term economic benefits. Organisational factors refer to elements of an institution such as senior management support and human resource issues such as relevant skills and competencies, including funding key to e-government. Scholars concur that a strong human resource base that can effectively design, run the system, and manage information technology also contributes to the realisation of e-government goals (Anthopoulos, 2015; Das et al., 2016; Krishnan & Teo, 2012). The environmental aspect denotes external pressure from multiple sources, such as government agencies, the community and users, and the business world (Defitri et al., 2020: 40). The TOE framework was selected as the supporting theory of the study because it reveals various factors related to technology, organisation, and environment that may affect e-government. This analytical framework is illustrated in Fig. 1.

Fig. 1 TOE framework. Source Defitri et al. (2020: 42)

3 Methodology

3.1 Research Design

The study is a desk research which is exploratory in nature, and relies more on secondary data. Sources used include the National E-government Strategy, the MoA's e-government strategy documents, action plans, commitment to the digitalisation agenda, e-government project reports, including minutes from e-gov meetings, progress reports, and other relevant publications.

3.2 Inclusion and Exclusion Criteria

The inclusion and exclusion criteria ensure that only relevant publications are included in the study. The inclusion criteria used to select relevant articles were as follows. The first criterion is that the title of the document or keyword should contain one of the following nouns or phrases: e-government, e-services, online government, or digitalisation in Botswana. The second criterion is that articles should focus on e-government or online government in developing countries. The third criterion is that articles should focus on e-government in developed countries but should include a large-scale, latest international survey that provides an overall picture of the e-government landscape in both developing and developed countries. Another criterion is that articles should be written in English. The articles that were excluded were those that did not contain e-government, online government, or digital government as keywords or in the article titles. Documents with incomplete full text were also excluded from the Google Scholar and other search engines.

3.3 Data Results

The paper reviewed 60 articles, 22 of which addressed e-government in Botswana, 14 of which addressed e-government in developed countries, and 16 of which covered e-government in developing countries. Eight articles were also included because they

addressed e-democracy and e-participation as the resultant offspring of e-government, while two were included because they capitalised on the technological aspect of e-government without necessarily using e-government in the article title.

3.4 Analysis

Reading through the data, evolving themes were noted. The themes relate to constraints in the TOE analytical framework. Findings are classified based on the three units of analysis in the framework. Through this method, we strive to improve our understanding of the constraints of e-service delivery at the Ministry of Agriculture, thereby addressing the research question. The intention is also to improve the clarity of the meaning of the concepts used in e-government literature. In this way, the conceptual framework will be more helpful and practise relevant.

4 Results and Discussion

4.1 Introduction

The hindrances to Botswana's digital transformation are discussed in this section. Limited digital knowledge, especially within the Ministry of Agriculture, contributes to these problems, as does the employment of unskilled and inexperienced project managers. Digitalisation projects are often hindered by insufficient support from top management, the absence of dedicated budgets, and conflicting priorities that divert resources away from digitalization initiatives. System integration problems among various systems and applications hinder progress, while inadequate mobile security and recurring malware attacks compromise system functioning. Digitalisation efforts are hindered by leadership shortcomings, limited financial resources, digital divide, and inadequate rural infrastructure. Government and public resistance to cultural change, combined with limited participation from citizens, present substantial obstacles. This section explores the pressing issues, investigating their effects on Botswana's digital development and identifying possible routes to address them.

4.2 Extensive Use of Ageing and Outdated Computers

The implementation of Botswana's digital transformation has been hindered by the widespread use of outdated and ageing computers across government ministries. These computers are characterized by limited random access memory, which signifies the correlation between the moment a command is issued and when data become accessible. The performance of a system is largely dependent on the presence of Random Access Memory. It also allows computer users to launch applications, access the internet, and seamlessly switch between tasks. These computers typically respond slowly to input, load applications gradually, and struggle to transfer medium-sized files, thereby failing to meet the requirements of digital transformation (MoA E-gov progress report: Ministry of Agriculture, 2022). Mokone, Eyitayo and Masizana-Katongo (Mokone et al., 2018) pointed out the existence of outdated computers,

noting that the replacement of outdated computers in government offices is a key component of a larger effort to boost the effectiveness of public services by implementing digitalisation strategies.

Rafifing et al. (2022) noted a concerning usability issue with the Student Loan Management System, a digitalisation system at the Department of Tertiary Education Financing. They found the system to be non-upgradeable, slow to respond to commands, and prone to task failures, user lockouts, and access denials. Furthermore, the system struggled to integrate with other systems, failed to permit user error correction, and yielded inaccurate data, ultimately causing complications in reconciling student loan payments and tracking student academic progress. These difficulties are evident in outdated computers and the outdated software they use. Previous research (Bahari et al., 2015; Elnaim, 2014) has also found that IT infrastructure, including systems and applications, is the primary barrier to the rollout of online government services.

The Botswana government has explored various means of access, including mobile phones, service centres, and satellite receivers, in order to provide services to all members of society, regardless of their physical and financial limitations, as suggested by Ndou (2004).

4.3 Limited Digital Expertise

The digital transformation project is inherently intricate and highly technical, necessitating enhanced technical proficiency as noted in Botswana (2010) and European Union (2022). A blend of IT skills and prior experience is necessary for designing, installing, operating, maintaining, and helping others use online systems (Botswana Unified Revenue Service, 2013; European Union, 2022). The Ministry of Agriculture suffers from severe shortages of staff with expertise in information and technology due to unappealing compensation packages. The designed systems are inherently flawed, prone to being overwhelmed, and necessitate regular upkeep, ultimately resulting in impaired service provision. The situation is further complicated by the utilisation of inexperienced personnel to design systems (European Union, 2022). These are primarily fresh graduates who are participating in internships, as well as temporary employees, to make up for the shortage of trained and experienced information technology officers. The drawback of incorporating these officers is their deficiency in practical expertise and inability to integrate digital subsystems due to the disparity between theoretical knowledge and real-world application. A study was conducted by the Human Resource Development Council (HRDC) of Botswana in 2016 to identify skill shortages in the country. The list encompasses the ICT sector skill shortage for all ICT professionals. The document also identifies a shortage of skills, including digitisation skills, software engineers, and big data specialists. A recent European Union (2022) national study on Botswana's digital transformation finds that difficulties with maintaining and implementing Botswana's digital transformation arise due to a shortage of staff with the necessary digital competences and skills.

The government lacks the necessary preparation to address the skills gap, given that its employees are not permanent. The lack of sufficient information and technology officers, combined with inadequate technological skills and experience, hinders

the provision of e-services within the Ministry of Agriculture, as noted by previous researchers, including Moatshe (2014). The paper makes no case that fresh graduates and temporary employees should not be integrated into the system. Instead, these students should not be placed in positions for which they lack sufficient training. Individuals must acquire essential on-the-job skills and practical experience prior to being entrusted with significant tasks. In many developing nations, this challenge is a widespread issue. According to a 2021 report from the International Telecommunication Union and a 2022 study by Malephane, the absence of necessary digital skills poses a challenge to internet usage in developing nations.

4.4 Use of Untrained and Inexperienced Project Managers

The experience of project managers is generally considered one of the leading factors in the success or failure of information and communication technology projects in Botswana (Alshehri & Drew, 2010; Munafumpa & Phiri, 2023; Nkwe, 2012). For the success of projects, a project manager should essentially have appropriate technological skills, domain expertise, and great experience, which should be a combination of information technology experience and project management experience (Botlhale, 2017). Thus, project managers who have very little experience, have not been engaged in several projects, and have few years in senior management positions tend to deliver compromised projects. The progress of the e-government initiative in the Ministry of Agriculture and by extension the government of Botswana has been lethargic owing to the use of untrained, unskilled, and inexperienced project managers. This finding is consistent with many other project implementation studies, particularly those related to information technology (Mphale et al., 2016). These authors emphasise that project failures are associated with the inadequate requisite knowledge and experience of designated project managers. Mphale et al. (2016) further showed that in certain instances, the larger parts of unsuccessful projects are those that were given huge budgets, running for an extended period of time, stressing that this would be beyond most project manager's capabilities, thereby leading to project failure.

4.5 Top Management Support and Commitment

It is acknowledged in digital transformation literature that organisational factors that can lead to the success or failure of information and communication technology projects include top management support and commitment (Wright & Capps, 2010). Scholars in other fields, such as strategic management, generally believe that top management support, commitment, and ownership can positively influence most projects towards success. This includes information and technology projects. Leaders have a certain degree of influence and motivation. They also provide other success strategies, such as instilling team commitment and empowerment support structures required for project success (Mphale et al., 2016). Therefore, if top management support and commitment, including project ownership, is inadequate, as in the case of e-government implementation across government in Botswana, the project will most likely take longer than expected and the quality may also be compromised, thereby

leading to partial failure. Other organisational factors include weak project organisational structure whereby projects are not properly structured and staffed. In some cases, project team members have a poor technical background, cannot effectively communicate, and cannot address trouble shooting (Mphale et al., 2016). This is the case across government ministries in Botswana. A related issue is the misallocation of staff, where officers are assigned tasks they are neither trained nor qualified to perform. In this case, people cannot deliver results that they could positively deliver if they were posted in line with their qualifications and experience. This tendency works against e-government implementation, especially in the Ministry of Agriculture.

4.6 Interoperability and Limited Coordination and Cooperation among Ministries, Departments and Parastatals

Interoperability is defined differently in different contexts. The term refers to the capability of different systems, devices, and applications to easily connect with each other, share data, and communicate harmoniously without restrictions (Bwalya, 2010). In other words, although information and communication systems and applications are distinct from each other, they should be able to link without any challenge and exchange data (Government of Botswana, 2010). The computing technologies currently used at the Ministry of Agriculture were developed with a silo mentality, leading to system failures that, in the past, delayed the release of the standard seven results (Alshehri & Drew, 2010). They do not share information and cannot easily link with other systems (Government of Botswana, 2010). In addition, some gadgets used across departments disrupt information exchange, thereby leading to system inefficiencies (Alshehri & Drew, 2010). Such systems cannot be used for digitalisation because they require multiple interconnections between various government departments (Government of Botswana, 2010). The same observation was made by Dias (2020), and Bayona and Morales (2017). The use of computing systems and applications that are not interoperable is a major hindrance to e-service delivery at the Ministry of Agriculture. Scholars such as Ndlovu et al. (2016) examined interoperability within the health care industry in Botswana. They report that interoperability remains a challenge in African countries, including Botswana's healthcare industry, referring to the healthcare interoperability landscape in Botswana as "discrete island" posing barriers to the effective sharing of information, fragmentation, and possible misinformation.

Ndlovu et al. (2021) stated that the lack interoperability in Botswana's health care industry fragments health care delivery, resulting in the duplication of effort and unnecessary health care expenditure. The authors agree that Botswana's eHealth strategy supports interoperability platforms, but the same report does not provide guidance for interoperability. The authors further stated that "despite the proliferation of both mHealth applications and eRecord systems, the need for their bi-directional interoperability has not been fully appreciated or addressed in Botswana" (Ndlovu et al., 2016).

Additionally, in order to achieve Botswana's digital transformation, it is necessary to establish more effective governance through a coordinated effort from all actors and stakeholders, incorporating a clear structure, processes, and the successful

implementation of interventions and initiatives (European Union, 2022). The present framework is struggling to realise the digital transformation advantages in the public sector due to inadequate co-ordination and collaboration among government ministries, departments, and parastatal bodies. In this context, the digital transformation strategy (SmartBots) team of Botswana has pinpointed critical challenges in implementing the digital transformation Strategy that necessitate outside support (European Union, 2022).

4.7 Limited Mobile Security and Malware

It is clear from the e-government literature that most government ministries in Botswana have very limited mobile security, which contributes to widespread viral attacks that negatively affect system performance (Alshehri & Drew, 2010). Mobile security involves protecting tablets, laptops, and other portable computing devices and the networks to which they connect from threats related to wireless computing (Defitri et al., 2020). Malware software is specifically designed to disturb, harm, or gain illicit access to a computer system (Abu Ali, 2010). Malware is a broad term that encompasses various types of computer threats such as viruses and worms. Worms software uses computer networks to identify security gaps through which they can access a computer (Botswana Unified Revenue Service, 2013). Unauthorised applications in the work environment also attract viruses. Employees download applications from the web without establishing whether it is safe to do so, thereby attracting viruses that ultimately make a system excessively slow, thereby compromising e-service delivery.

4.8 Shortfalls in Leadership and Financial Restraints

It is further realised that e-government is primarily hampered by leadership shortfalls. Inadequate senior management support and insufficient commitment negatively affect e-government implementation, in addition to budgetary problems and time overruns (Nkwe, 2012). Poor coordination regarding the initiation, implementation, and constant support of e-government projects requires leadership from the top. Leaders' inability to address the needs and priorities of expected users inevitably hampers citizens' adoption (Abu Ali, 2010). Moreover, e-government success is also deterred by financial restraints to actualise current and future e-government initiatives, disparities and inequalities in skills and access (digital divide) to ICT and suitable systems, and poor technical designs (Government of Botswana, 2010). The same cost-related issues, such as the cost of devices and the cost of service, were argued by the International Telecommunication Union (2021), and Malephane (2022) as challenges to developing countries from benefiting deeply from internet usage.

4.9 Digital Divide and Other Infrastructure Challenges

Issues such as the digital divide and slow and expensive internet access were raised by Botlhale and Dick-Sagoe (2023) and the European Union (2022) as challenges facing the success of digital transformation projects in Botswana. Electricity con-

nectivity issues in specific rural areas contribute significantly to Botswana's failure to improve ICT and internet connectivity, which affects access to and use of e-government services (Mudongo, 2021). There is also a scarcity of ICT and internet service providers because the market has already been monopolised by well-known service providers, such as Mascom and Orange (Mudongo, 2021). Furthermore, the digital divide has affected most African countries, including Botswana. Most rural areas in Botswana, where most Ministry of Agriculture clients reside, do not have good internet connectivity, and those that do have good internet connectivity continue to face problems with expensive internet costs because most rural dwellers are smallholders and poor farmers, effectively blocking some people from accessing the Ministries' e-government services.

Most importantly, the central government must support e-service delivery by allocating the necessary resources to the Ministry of Agriculture to acquire IT infrastructure. Funds must be used to purchase IT infrastructure and provide education for training employees. Again, mass public education must be implemented to educate local farmers who depend on the services of the Ministry of Agriculture to ensure full public acceptance of e-service delivery. It is also worth noting that the rural area of Botswana lacks adequate ICT infrastructure compared to rural areas, thus making access to internet connectivity in rural areas a challenge.

Additionally, Statistics Botswana's publication in 2019 revealed interesting trends that seek to explain the issues described in this section. According to Statistics Botswana (2019), 244,268 households in Botswana did not have access to the internet for several reasons. Lack of knowledge of the Internet accounted for 35.8 percent of the 244,268 households, followed by high cost of Internet equipment, which was the reason given by 29.1 percent of the 244,268 households. The remaining reasons were a lack of skills to use the internet (19 percent of 244,268 households), do not need internet access (17 percent of 244,268 households), and high connection and subscription costs (9 percent).

4.10 Limited Citizen Involvement and Participation

The goal of a democratic government such as Botswana is to provide impartial access to public information and services (Fishkin, 1995), which has become the driving force for most political leaders in the implementation of e-government (Grant & Chau, 2005; Jaeger, 2005). The primary goal of e-government is to deliver services online to citizens, business partners, and other entities (Layne & Lee, 2001) more efficiently and effectively. However, one of the key challenges of e-government is limited stakeholder involvement. Users are still not given adequate platforms to take part in e-government design, leading to implementation solutions that are driven by what the government thinks citizen users want, as observed by Mofleh and Wanous (2008); and Cook (2002) that governments hardly provide e-services based on users' needs. We contend that the inclusion of all citizen-user groups is critical for successful e-government actualisation. This statement of digital inclusion was repeated by the president of Botswana (President Masisi) in his state of the nation's address (Government of Botswana, 2023). President Masisi specifically stated that "as we drive towards a Knowledge Driven Economy, not only should we create an inclusive digital space,

but we must also facilitate all parts of our country to participate in the realisation of a knowledge economy." In their dealings with government users and agencies, they should be aware of services and channels of accessibility as well as greater involvement, particularly in a transparent, democratic process. However, if e-government fails to incorporate end users and stakeholder views, it is not meant to better serve citizens' stakeholders (Botswana Unified Revenue Service, 2013). Limited stakeholder involvement creates a deficiency in implementation efforts (Abu Ali, 2010). Therefore, there is a need to increase awareness of the benefits of e-services among citizens through literacy campaigns programmes (Bwalya, 2010). The reports of the International Telecommunication Union (2021), and Malephane (2022) stated a lack of awareness of the internet as a challenge for internet usage in developing countries.

4.11 Organisational Culture

Organisational culture is another factor that impedes the transition to e-services. For successful e-government implementation, employees need a mindset change that is more service-oriented. Cultural transformation is imperative because civil servants are reluctant to embrace change programmes (Mothusi, 2008). Employees need to be inspired to perform more demanding tasks and be supported to readily assume responsibilities (Moatshe, 2014). This helps them transition smoothly from traditional to modern e-service transactions. Factors related to business processes are also identified as another constraint given that e-government calls for re-engineered and automated processes. This is critical for efficient and effective e-service delivery. These observations were also affirmed by Kim et al. (2007), and Ho (2002).

5 Conclusions

Botswana has achieved notable advancements in constructing its infrastructure to facilitate digital transformation projects. The country's sophisticated fibre network, comprising the 2000-kilometer Trans-Kalahari fibre network, offers reliable connectivity between major cities and facilitates access to international submarine cable systems like the East Submarine Cable System and the West Africa Cable System. Although the existing infrastructure is commendable, the rollout of digitalisation encounters a multitude of obstacles, which have been examined within the Technology, Organisation and Environment (TOE) framework, categorizing the results according to the three framework elements. These elements demand significant attention since they pose obstacles to Botswana's digital transformation. Unless the identified factors are thoroughly addressed, digital service delivery will continue to remain an unattainable goal.

The research makes a positive impact on the local community by enhancing farmers' and other stakeholders' access to agricultural digital services. Enhanced access to agricultural services empowers farmers, making it possible for them to access more essential support, resources, and information to boost their livelihoods and upgrade their agricultural practices. Accessibility to digital services should be simplified for everyone, ensuring that people from all socioeconomic backgrounds have equal

opportunities to utilise them. Societies that have been marginalised will receive the same level of service and reap the advantages of cutting-edge technology through digitalisation. Digital transformation enables more efficient and effective service delivery, resulting in improved responsiveness and enhanced resource utilisation. This outcome results in a public sector that is accountable and responsive, ultimately benefiting all members of the society.

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Declarations

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