

Mobile Service Delivery: a systematic literature review of m-Government in South Africa

by

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SUBMITTED TO THE UNIVERSITY OF CAPE TOWN
In partial fulfilment of the requirements for the degree

MPhil Public Policy and Administration

Faculty of Humanities
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Acronym list

3G: 3 generation

4G: 4 generation

ANC: Antenatal Care

ANC: African National Congress

App: Application

BS: Black Sash

CBOs: Community based organisation

CCSA: Competition Commission of South Africa

CDW: Community development workers

MAMA: Cell-Life Mobile Alliance for Maternal Action

COVID-19: coronavirus disease

DCDT: The Department of Communications and Digital Technologies

DOC: Department of Communications

DPSA: Department of Public Service and Administration

DST: Department of Science and Technology

DTPS: Department of Telecommunications and Postal Services

e-Administration: Electronic administration

ECA: Electronic Communications Act

e-Commerce: Electronic commerce

ECTA: Electronic and transactions Act

e-Democracy: Electronic democracy

e-Government: Electronic government

e-Learning: Electronic learning

e-Services: Electronic services

GITOC: Government Information Technology Officer's Council

GPRS: General Packet Radio Service

GRA: Grahamstown Residents' Association

Gs: Generations

GSM: Global system for Mobile Communications

ICASA: Independent Communication Authority of South Africa

ICT: Information Communications Technology

ICT4RED: Information communication technology for rural education development

IOS: iPhone operating system

ISDN: Integrated Services Digital Network

IT: Information technology

IVR: Interactive Voice Response

M-administration: Mobile administration

m-Applications: Mobile applications

MCH: Maternal child health

m-Communication: Mobile communication

m-Democracy: Mobile democracy

mG2B: Mobile Government to Business

mG2C: Mobile Government to Citizens

mG2E: Mobile Government to Employees

mG2G: Mobile Government to Government

m-Government: Mobile government

mHealth: Mobile health

MIOS: Minimum Interoperability Standards

MISS: Minimum information security standards

m-Learning: Mobile learning

MMS: Multimedia Messaging Service

MNO: Mobile Network Operator

MobiSAM: Mobile Social Accountability Monitoring

m-Service: Mobile services

Mthuto: m-Learning Thuto

NDoH: National Department of Health

NGO: Non-governmental organisation

NPM: New Public Management

OGCIO: Office of the Government Chief Information Officer

PCs: Personal computers

PEPFAR: The US President's Emergency Plan for Aids Relief

PNC: Postnatal care

PRC: Presidential Review Commission

PSAM: Public Service Accountability Monitor

RIA: Research ICT Africa

RICA: Regulation of Interception of Communications and Provision of communication-related information Act

RSA: Republic of South Africa

SARS: South African Revenue Service

SIM: Subscriber Identity Module

SITA: The State Information Technology Agency

SMS: Short Message Service

SLR: Systematic Literature Review

TIA: Technology Innovation Agency

UMTS: Universal Mobile Telecommunications Service

UNICEF: United Nations International Children's Emergency Fund

USAASA: Universal Service and Access Agency of South Africa

USSD: Unstructured Supplementary Service Data

WAP: Wireless Application Protocol

Wi-Fi: Wireless Fidelity

WLAN: Wireless Local Area Network

WML: Wireless Markup Language

WBPHCOT: Ward-based Primary Healthcare Outreach Teams

WPTPS: White Paper on the Transformation of the Public Service

WWW: World Wide Web

Abstract

The proliferation of Information and Communication Technologies (ICTs) has transformed how governments deliver public services to citizens. However, research has highlighted the inadequacy of electronic government (e-government) to improve public service delivery, particularly in the developing world. The ubiquitous nature of mobile phones presents the potential to bridge the digital divide and make public services more accessible to everybody through m-government. Against this backdrop, the South African government has prioritised the implementation of m-government to improve public service delivery and achieve its universal access mandate. However, the potential for South Africa's m-government programs to bring about greater digital inclusion remains largely unexplored. Accordingly, the objective of this paper is to examine whether South Africa's m-government programs have indeed made public services more accessible to everybody, and to highlight any access barriers. A systematic literature review was conducted to search, analyse and synthesise twenty studies on this topic. The research found that South Africa's m-government programs have been successful in creating access points for service delivery, and implementors have taken an active role in curbing digital exclusion by embedding skills training into their programs. Nevertheless, there are challenges that prevent South Africa's m-government programs from achieving the universal access objective. There remains a lack of affordability, sustainability, scalability and an overall m-government policy, which have contributed to the haphazard implementation of m-government programs in the country. This paper recommends that the government should have a more integrated approach in the coordination and implementation of m-government if it is to realise universal digital inclusion.

Chapter 1 Introduction

1.1 Background

There can be no successful service delivery without a sound public administration. Public administration concerns itself with the execution of public services geared towards meeting the needs of all citizens, thus making service delivery its cornerstone (Mfene, 2009:212). Under the Union of South Africa, the apartheid government governed its public service system according to the traditional public administration model, which views citizens as voters or constituents who only receive deliverables according to hierarchically and politically defined objectives (Bryson, Crosby and Bloomberg, 2014:446). This was coupled with a separate development policy that saw the apartheid government create and entrench a racially segregated and highly discriminatory service delivery system, where apartheid municipalities delivered services based on preferential treatment to white areas and systematic prejudice to black areas (Ndebele & Lavhelani, 2017:343). The stifling of public service delivery to these areas not only led to their deterioration, but also led to the unequal distribution of resources, infrastructure, and social services that subsequently alienated the majority of the population from government services (Maphumolo & Bhengu, 2019:1; Nnadozie 2013:81). Consequently, the democratic government inherited a diverse but severely unequal South Africa, with a wide divide in socioeconomic conditions and access to basic services across different demographic segments of its population (Nnadozi, 2013:98; Tsheola & Sebola, 2012:236). The African National Congress-led (ANC-led) government therefore introduced policies and programs that focused on redressing the injustices and inequities of the past (Nnadozie, 2013:83; Tsheola & Sebola, 2012:229).

Thus, there was a public administration reform that saw South Africa moving from a limited traditional public administration under apartheid to an administrative system more aligned to New Public Management (NPM), which aimed to be more efficient and citizen-focused. There was a clear policy commitment from the democratic government to ensure the universal delivery of basic services, and to develop a more efficient, effective, and equitable public administration system capable of improving the quantity and quality of service provision (Koma & Tshiyoyo, 2015:34; Nnadozie, 2013:83). In line with its NPM reform, the South African government began implementing Information Communication Technologies (ICTs) alongside several poverty alleviation programs to improve the socioeconomic and living standards of its citizens (Mutula & Mostert, 2010:39). Mobile technology was one of the ICT platforms that the government decided to leverage. Like most developing countries, South

Africa's mobile phone penetration rate is high and geographically widespread, making it a tool that could potentially transform the service delivery apparatus by ensuring that a larger demographic has access to basic public services (UNICEF, 2012:11; Mutula & Mostert, 2010:39).

1.2 Research Problem and Questions

South Africa's democratic government inherited an enormous service delivery backlog that deprived millions of citizens, particularly in rural and peri-urban areas, of access to basic services such as roads, clean water, secure electricity, proper sanitation and refuse collection (Tsheola & Sebola, 2012:229; Thornhill & Madumo, 2011:137). To achieve its well-articulated service delivery mandate for universal access, the government of South Africa recognized the importance of ICT, and more specifically e-government, in improving the way services are delivered (Mutula & Mostert, 2010:38). Hence, an e-government policy was introduced in 2001, and e-government programs were subsequently implemented across South Africa. However, these e-government initiatives had to contend with a number of realities, such as a weak ICT infrastructure, particularly in rural areas, as well as a general lack of government ICT readiness that perpetuated the unequal access to basic services among citizens (Kariuki & Tshandu, 2010:197; Trusler, 2003:504). Thus, South Africa's e-government program led to a digital divide that did not resolve service-delivery challenges, but rather continued the historic legacy of the apartheid era, where there was a great divide between the "haves" and "have-nots" in terms of the distribution and accessibility of public services (Masiya, Davids and Mangai, 2019:20; Nnadozie, 2013:98).

Accordingly, South Africa, like many other developing countries, started focusing on mobile government (m-government) as a means to improve service delivery. M-government is said to be better suited to the context of developing nations, which generally have high levels of mobile phone subscriptions. Hence, many South African departments and external entities have begun to implement m-government projects tied to a universal service-delivery mandate. Yet, local research on the progress and results of South Africa's m-government program is limited. Therefore, this study aims to fill this gap by answering the following research question: Is South Africa's m-government strategy improving access to public services for all citizens?

The supporting research questions are as follows:

- Is the South African government creating the right conditions to enable access to m-government?
- What are the challenges of South Africa's m-government projects?
- Is South Africa's m-government program bridging the digital divide?

1.3 Significance of the study

The shortcomings of e-government have led many countries in the developing world to experiment with m-government, because a larger percentage of their citizens have access to mobile phones as opposed to personal computers (PCs). The ubiquity of mobile phones presents an interesting opportunity to address the digital divide brought about by e-government by ensuring greater access to public services for all citizens (Makitla, 2011:15). Firstly, the low cost and low infrastructural requirements of m-government programs make it possible to reach citizens anywhere, particularly in remote areas (Correa, Pavez & Contreras, 2020:1076; Nkosi & Mekuria, 2010:2). Second, m-government truly enables citizens to access public services at any time, as most people always carry their phones wherever they go. Hence, developing countries like South Africa, are now looking to m-government as the best solution to redress public service inequities, and support the delivery of public services to previously marginalized individuals and communities (Correa, Pavez, & Contreras, 2020:1077; Mengistu, Zo and Rho, 2009:1448). Thus, further research needs to be conducted to better understand m-government's ability to create more accessible public services, as limited data can lead to policymakers underestimating challenges related to digital inclusion (Sharp, 2022:12). Therefore, the purpose of this research is to fill this gap by examining the use of m-government as a tool for service delivery in South Africa and ultimately contribute to the ongoing global discourse and policies that endeavour to create more inclusive and purposeful technologies.

1.4 Dissertation Outline

This paper consists of six chapters. The introduction in Chapter 1 outlines the research problem, questions and significance of the study. Chapter 2 consists of a literature review and a theoretical framework that intend to establish a sound understanding of m-government, the digital divide and measuring access using digital inclusion indicators. An overview of South Africa's ICT legislative environment is presented in Chapter 3, as well as a theoretical perspective of the relevant m-government developments that have taken place in the country.

Chapter 4 outlines the methodology used in this study. Chapter 5 presents and discusses the research findings. Chapter 6 draws conclusions from the study and presents suggestions for future research.

Chapter 2 Theoretical Framework for m-Government and Digital Inclusion.

2.1 Introduction

This chapter provides a theoretical perspective on m-government as defined and explained by experts in the field. A discussion of the main concepts of m-government is provided, followed by a discourse on the various m-government benefits and challenges as well as the implications for service delivery in developing countries. The chapter also examines the related concepts of universal access and the various arguments around the digital divide, and further provides a framework for digital inclusion that the paper uses to interpret and measure access.

2.2 Universal Access

Universal access and universal services are often conflated terms; however, they have different conceptions, connotations and nuanced definitions. Some scholars describe universal access as the ability to ensure that all individuals, irrespective of disability, are able to use ICT, because particular features have been embedded into the technology or built environment (Stephanidis, 2001:159). However, for the majority of scholars, the concept of universal access has its historical roots in the US Communications Act of 1934, which sought to ensure that telephone, telegraph, and radio services are facilitated at reasonable charges, especially in rural areas, and are deployed in a manner that prevents discrimination on the basis of race, colour, religion, national origin or sex (Gregory, M., 2015: 168; Stephanidis, 2001:159). Therefore, due to the proliferation of technological developments, universal access is now largely discussed in terms of the digital divide and refers to an increase of basic access to publicly available telecommunication services for everyone, especially those in geographies that were historically marginalised (Gregory, M., 2015: 170; Oyedemi, 2004: 92; Muir & Oppenheim, 2002: 268; Stephanidis, 2001:160). Similarly, universal service refers to the availability and affordability of connectivity; however, it places emphasis on connectivity and access for all households, whether in the rural, peri-urban or urban locales of a country (Oyedemi, 2004:91). Consequently, given their similarities, both terms are often used interchangeably to describe equal access to information and digital services for everyone, irrespective of location, financial resources or disabilities (McMenemy, 2022:125; Gregory, 2015: 175).

Nonetheless, universalist policies are fiscally expensive, because they provide even for those who can afford to purchase digital services privately (Ng, Lim, & Pang, 2022:2). Hence, the process of achieving universal access and service mandates varies from one government to another, as the different socio-economic peculiarities of certain countries only allow them to prioritise the selective provision of free or subsidised services and devices to those who are unable to afford telecommunications services (Ng et al, 2022:2; Gregory, 2015:170; Oyedemi, 2004:94).

2.3 Digital Public Administration in Africa

In the 1980s, NPM public administration reform aimed to replicate private sector market ideals by forming market-based service delivery systems for public services in the hope of creating greater government efficiency and consumer responsiveness (Roy, 2017:541; Şandor, 2012:161; Kariuki & Tshandu, 2010:191). Although NPM focused primarily on management components such as decentralisation and customer orientation, the heightened proliferation of ICT technologies in the 1990s, as well as advances in internet technology platforms such as the World Wide Web (www), and the subsequent successful implementation of ICT in the private sector, influenced governments to view ICT as a tool that could further entrench NPM ideals (El Ammar & Profiroiu, 2020:78; Boustani & Chedrawi, 2019:181; Cordella & Bonina, 2012:514). This led various governments to implement ICT for back-end operations; however, when citizens began having new expectations brought on by their interactions with the private sector, governments moved their ICT integration to include front-office processes that extended government communication and services to citizens, thus making way for the implementation of e-government (Shareef, Dwivedi, & Kumar, 2016:255; Cordella, 2012:512; Mtingwi, 2012:9; Margetts, 2008:115; Hartley, 2005:33).

There are various definitions for e-government. El Ammar and Profiroiu (2020:78) describe it as “the use of ICT for the provision of governmental services.” Margetts (2008:114) defines it as “the use, by government, of digital technologies, internally and externally, to interact with citizens, firms, other governments, and organizations of all kinds.” Largely, the consensus among scholars is that e-government transforms information sharing and the processes of service delivery to enhance NPM ideals such as government accountability, transparency, effectiveness, and more importantly, to enhance the quality of citizens’ lives (Khaemba, 2017:61; Naidoo, 2012:63; Mtingwi, 2012:10; Brown, 2005:19). Technology is used to provide

governments with a new way of administering public services, but also using these technologies to create new forms of public services, therefore bringing on the total transformation of public administration (Mtingwi, 2012: 8; Gronlund, 2010:14-15; Brown, 2005:19).

Similar to previous public administration reforms, African countries began implementing e-government strategies amid the prominent desire to reap the benefits that modern technology was projected to have for their under-resourced governments. However, e-government would not be successful on the continent, as most e-government projects ended in either total or partial failure (Matavire, Chigona, Roode, Sewchurran, Davids, Mukudu and Boamah Abu, 2010:154). According to Heeks, 35% of e-government programs initiated in Africa were total failures, 50% were partial failures, while only 15% were successes (Nkohkwo & Islam, 2013:254; Ogunleye, Makitla, Botha, Tomay, Fogwill Seetharam and Geldenhuys, 2011:1615). E-government programs in Africa encountered several challenges and stumbling blocks that were not present in the developed world (Nkohkwo & Islam, 2013:254). For instance, the feasibility of a successful e-government program is directly dependent on the government's overall ability to spend on the necessary ICT and related costs (Basu, 2004:116). However, since the central government is the main source of financing development in various African countries, this made the implementation and sustainability of e-government initiatives particularly challenging. This is because the limited budgets could not be spent on costly telecommunications infrastructure or training, but rather on other projects that are overtly tied to the alleviation of poverty (Nkohkwo & Islam, 2013:258; Basu, 2004:116).

Furthermore, African countries generally lack information and telecommunications infrastructure; thus, without the necessary infrastructure, the deployment of e-government became counterproductive (Twizeyimana, Larsson, & Grönlund, 2018:19; Matavire et al, 2010:155). Additionally, most African countries have issues with electricity or a lack thereof, which further contributes to the unreliability of infrastructure and electronic services (e-services) (Nkohkwo & Islam, 2013:258). The second infrastructural issue occurs at the citizen level. Many African citizens do not have access to relevant personal infrastructure such as laptops, desktops or the Internet; therefore, there is no way to access e-services even if there is ICT infrastructure in their particular area (Khaemba, 2017:62; Matavire et al, 2010:154; Ogunleye et al, 2011:1615). Nevertheless, there are pockets of people in these African societies

that not only do they have access to personal infrastructure, but they also live in areas with ICT infrastructure.

Other additional barriers to the widespread adoption of e-government programs in Africa include high levels of illiteracy. The low literacy levels in Africa have hindered the information-sharing capacity and benefits of e-government, since those who are illiterate cannot read any information shared through e-services (Khaemba, 2017:63; Matavire et al, 2010:155). The African continent was also faced with a general lack of political will to prioritise e-government projects, because some government officials viewed e-government as a challenge and threat to their position, power and viability (Nkohkwo & Islam, 2013:259). These barriers to e-government in Africa led to an environment where a large population could not access the benefits of digital public services, thereby increasing the already present offline inequalities; these multidimensional barriers were eventually coined the “digital divide” (Twizeyimana, Larsson, & Grönlund, 2018:20; Gounopoulos, Kontogiannis, Kazanidis, & Valsamidis, 2020:401; Heeks, 2022:289).

2.4 The Digital Divide

2.4.1 First digital divide

In the early years of its theorisation, the concept of the digital divide was commonly understood in relation to material access (Carmi & Yates, 2020:6). Initially, in what is commonly called the first wave or first-level digital divide, scholars framed the term around the material gap between the material “haves” and the “have-nots” (Pérez-Escobar & Canet, 2022:2; Aruleba & Jere, 2022, 1; James, 2021:327). According to this definition, it was implicit that digital inclusion could simply be achieved through the provision of hardware and software (Carmi & Yates, 2020:3). However, qualitative sociological literature highlighted the shortcomings of this binary definition of the digital divide, and illustrated how its narrow focus fell short of encompassing the multidimensional nature of the term and the factors that caused it (Sharp, 2022:3).

2.4.2 Second digital divide

One of the most prominent critical voices of the first wave’s conceptualisation of the digital divide was Eszter Hargittai (as cited in Carmi & Yates, 2020). Hargittai, therefore, proposed a new way of examining the digital divide that focuses on different digital skills (Carmi & Yates, 2020:6). This was similar to other scholars such as Jan van Dijk and Kenneth Hacker, who also proposed a framework that focused on differential access to skills and usage (Carmi & Yates,

2020:6). These scholars found that even when the issue of access to hardware and material is fully or partially addressed, the problems of structurally different skills and uses become more operative, making digital skills a prerequisite for using the Internet efficiently (Van Deursen & van Dijk, 2010:894; Van Dijk & Kacker, 2003:316). Thus, the second-level digital divide usually refers to differences in skills and usage patterns (Van Deursen & Helsper, 2015:33).

Digital skills are not only about the instrumental ability to operate the hardware of computers and connect to the Internet, but they also include the informational skills needed to reap the full benefits of the Internet (Van Derusen & Van Dijk, 2015:381; Van Dijk, 2003:319). Van Deursen categorises these various skillsets into four categories. ‘Operational Internet skills’ are the basic skills needed to use the Internet and include the ability to search and select (Van Deursen & van Dijk, 2010:896; van Dijk & Kacker, 2003:316; Fuchs & Horak, 2008:100). ‘Formal internet skills’ relate to the hypermedia structure of the Internet, and therefore require the skills of navigation and orientation. ‘Information Internet skills’ are the skills needed to find and process specific information and ‘strategic Internet skills’ which later influenced the third wave digital divide, pertain to the user’s ability to effectively use the Internet and apply information from a variety of sources as a tool to reach particular goals (Van Deursen & van Dijk, 2010:896 ; Van Dijk & Kacker, 2003:316; Fuchs & Horak, 2008:100).

All these levels of digital skills present what Van Dijk refers to as “differential usage”, which is an environment in which different individuals can reap different results and benefits from the same technology, thus creating usage gaps (Van Dijk & Kacker, 2003:316; Fuchs & Horak, 2008:100). For instance, others may default by using the Internet for entertainment purposes rather than using more difficult applications for work and education, because they do not possess more complex digital skills (Van Dijk & Kacker, 2003:316; Fuchs & Horak, 2008:100). This phenomenon can be exacerbated by language and content barriers. English, being the predominant language on the Internet, not only excludes those who cannot read, but also those who can read but cannot read in English (Khaemba, 2017:63; Aruleba & Jere, 2022:1; James, 2019:327; Nkohkwo & Islam, 2013:258). Scholars of the second wave note that as the Internet becomes an integral part of home, school and work, it becomes more important for people to be equipped with relevant digital skills; otherwise, the usage gaps will contribute to the exacerbation of existing societal inequalities (Van Deursen & van Dijk, 2010:894). It is this rationale that influenced the conceptualisation of the third-level digital divide, which focuses on the offline implications of ICT, and the ability to use digital skills as a means to improve

one's position in education, work and society (Pérez-Escolar & Canet, 2022:6; Van Deursen & Helsper, 2015:33).

2.4.3 Third digital divide

Several scholars such as Fuchs, Selwyn, and Van Dijk have argued that the digital divide should be approached more comprehensively, and not be limited to issues of material access, digital skills and usage, but it should also incorporate the consequences of Internet use (as cited in Scheerder, Van Deursen, & Van Dijk, 2017). Research into the third-level divide presumes that even among users with access to ICT, there will be discrepancies in their abilities to leverage their digital skills and resources to achieve specific objectives. Accordingly, the digital divide discourse has shifted to include a focus on the beneficial outcomes of Internet use, labelled the third-level digital divide. This digital divide is present when possession of digital skills and Internet use does not lead to beneficial outcomes. Thus, the third wave approaches the digital divide more holistically by not only looking at the causes, but also at the consequences of ICT that can reinforce existing social inequalities (Scheerder, Van Deursen, and Van Dijk, 2017:4; Goedhart, Broerse, Kattouw & Dedding, 2019:2348).

2.5 Digital Inclusion and Measuring Access

Although the term digital divide is more commonly used, scholars like Parsons and Hicks agree that the notion of digital inclusion “more accurately captures the phenomenon of ICT gaps” (as cited in Pérez-Escolar & Canet, 2022). Thus, instead of referring to the first, second and third digital divides, respectively, the concept of digital inclusion encompasses the availability of hardware and software, the training for digital literacy skills, the offline effects of ICT, and it further considers the intersections of class, ethnicity, race, ideology, religion, gender and disability (Pérez-Escolar & Canet, 2022:2). Like universal access, digital inclusion can be broadly defined as different strategies designed to ensure that all people have equal access, opportunities and skills to benefit from digital technologies and systems, making it a more comprehensive term (Carmi & Yates, 2020:3).

While these distinctions are important, they have also created confusion regarding which digital inclusion metrics to adopt. Scholars such as Hilbert and Galperine argue that there is no use in standardising measures of digital inclusion because measures are inherently subjective and should be conditional on the desired impact (as cited in Sharp, 2022). Contrastingly, Bradbrook

and Fisher advocate for the measurement of digital inclusion using the ‘5 Cs’: connectivity, capability, content, confidence and continuity (Helsper, 2008:23). Alternatively, Helsper argues that digital inclusion should be measured and grouped into three broad categories: ICT access, ICT engagement and ICT skills (Emam, 2022:22). Van Dijk and Van Deursen propose a similar classification which includes four broad categories: material access, skills access, attitudes and the extent of use (Van Deursen & Helsper, 2015: 33; Helsper, 2008:23). This measurement framework was used in this study.

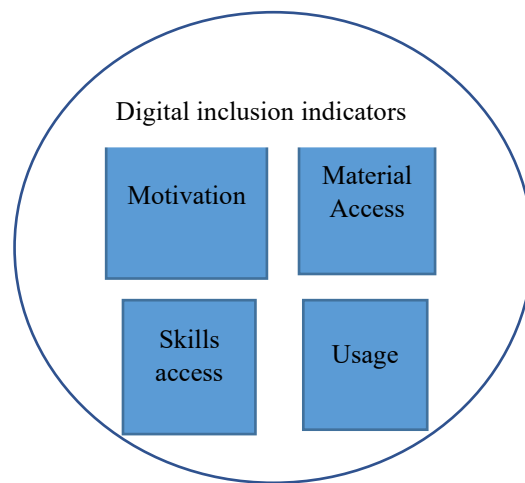


Fig. 2.1 Digital inclusion indicators. Source: Van Deursen, & Helsper, 2015

2.5.1 Motivation

Van Dijk’s notion of motivational access is primarily shaped by the attitudes individuals have toward technology (Van Deursen & Van Dijk, 2015: 380). These attitudes determine the appreciation people have for technology as well as their intentions to purchase and use ICT. For example, ICT anxiety or anxiety about using technology can discourage people from purchasing or using ICT (Goedhart 2019:2350). Nevertheless, there is currently no clear consensus on classifying and measuring different types of attitudes in relation to ICTs (Helsper, 2008:26).

2.5.2 Material Access

Similar to the first-level digital divide, the concept of material access refers to the means to access relevant hardware, software and general infrastructure (Van Deursen & Van Dijk, 2015:380). However, there are other elements of material access that go beyond ICT access

and take into account the quality of the material access, because even if two people have access to ICT, the quality of their experiences may vary (Sharp, 2022:6). Therefore, factors such as speed, quality and location are also considered when measuring material access (Helsper, 2008:23). For instance, most researchers regard home and school access as indicators of high-quality access (Helsper, 2008:23). Quality wireless mobile access and broadband access are also considered to lead to a higher-quality experience and broader use of ICT access, because they provide a high-speed connection (Sharp, 2022:8; Helsper, 2008:24). Affordability is another factor that influences material access. This can range from the cost of recurring data plan purchases to the cost of buying a device (Sharp 2022:8).

2.5.3 Skills Access

Skills access, like the second-level digital divide, relates to digital literacy and an individual's ability to understand and use information in multiple formats from a diversity of sources via the Internet and various digital devices (Ng et al, 2022:7; Manda & Backhouse, 2018:465). As mentioned by van Dijk, different skills are required to access digital services in a meaningful and beneficial way (Van Derusen & Van Dijk, 2015:381; Sharp, 2022:8). Accordingly, several digital inclusion studies have substantiated that digital training should be a prerequisite for digital programs so that the public can effectively utilise the technologies that are available to them (Pérez-Escolar & Canet, 2022:2; Aruleba & Jere, 2022:3).

2.5.4 Usage

There are two predominant methods of measuring digital use. Qualitatively, it can be measured according to the nature or content that is in use, and quantitatively it can be measured through an evaluation of the number of things that people use the technology for (Goedhart, 2019:2350; Helsper, 2008:28). Together, these indicate that some types of usage are better indicators of inclusion and 'proper' use than others (Helsper, 2008:28). For example, for policymakers and educators, learning, networking and civic engagement are viewed as socially more desirable, while using ICT for entertainment and leisure is not (Helsper, 2008:28). Nevertheless, studies have shown that the socio-economic status of individuals influences the use of ICT. For instance, poorly educated citizens tend to use ICT primarily for games and entertainment, while highly educated citizens more frequently use the technology for capital-enhancing activities such as news and information (Goedhart, 2019:2350). In addition, affordability also affects

usage; notably, if data or prices are relatively high to income, many people will not use ICT extensively, even if access is technically available in their region (Sharp, 2022:8).

2.6 The Transition to m-Government for Digital Inclusion

The shortcomings of e-government and the digital divide have led many countries in the developing world to experiment with m-government in the hope of achieving a greater degree of digital inclusion and NPM ideologies of reduced costs, responsive government and improved service delivery (Goyayi, 2020:27; Makwembere, & Garidzirai, 2020:2; Correa, Pavez, & Contreras, 2020:1077; Kyem, 2016: 5). The high penetration of mobile technologies creates an optimal environment for the widespread usage of m-services and bridges the skills gap, especially in rural and remote areas (Venter & Daniels, 2020: 3250; James, 2021:328; van Belle & Cupido, 2013:3; Makitla, 2011: 15). Moreover, the diffusion of mobile phones makes it a more intuitive and accessible technology for citizens to receive information and transactional services from the government more effectively (Oghuma, Park and Rho, 2012:17; Abaza & Saif, 2015:137; GSMA, 2019:2; Kyem & LeMaire, 2006:3). Additionally, the general low cost and low infrastructural requirements of m-government enable developing countries to bypass building the heavy infrastructure required for e-government, thus leapfrogging their connectivity rate (Abaza & Saif, 2015:137; Abdelghaffar & Magdy, 2012: 333). Accordingly, mobile network coverage reaches areas in Africa where few or no other ICT infrastructures can (Kyem, 2016: 4). Overall, m-government presents fewer access barriers, as well as the opportunity to make digital public services accessible to more citizens in countries where e-government has failed (Correa et al, 2020:1076; Mengistu et al, 2009:1448; Oghuma et al, 2012:17).

2.7 Mobile Government

The rise in mobile phone penetration levels led scholars such as Kushchu to write about the inevitability of m-government (Kushchu, 2007:2; Ohme, 2014:299). M-government can be broadly described as the use of mobile and wireless communication technology, such as mobile devices, tablets and pagers in government administration to deliver information and services to citizens (Alshammari, Messom, & Cheung, 2022:190).

As one of the first scholars to write about m-government, Kushchu's views of m-government have been influential in its conceptualisation. For example, his view of m-government as a

transition or evolution from e-government rather than a standalone strategy, has become a norm among researchers (Makwembere & Garidzirai, 2020:1; Shareef, Dwivedi, Laumer & Archer, 2016:268; Kushchu, 2007:2). For these scholars, m-government is an extension of e-government, because it merely increases the number of digital services that can be made available in an already transformed digital process (Makwembere & Garidzirai, 2020:1; Kushchu, 2007:40; Shareef et al, 2016:268; Organisation for Economic Co-operation and Development, 2011:19). Kushchu was also of the opinion that m-government complements e-government, thus making it a subset of it (Azeez & Lakulu, 2019:51; Kushchu, 2007:107). For instance, m-government's ubiquity increases access to existing services, particularly in rural areas that e-government cannot reach (Kushchu, 2007:52).

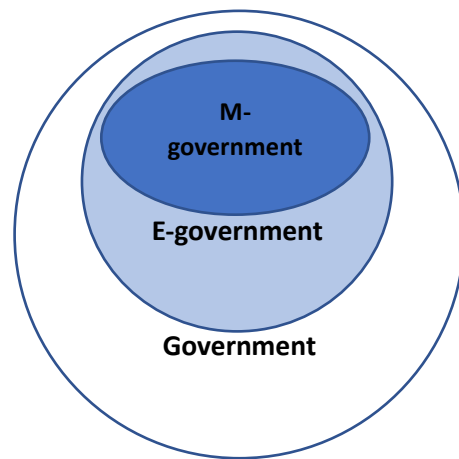


Figure 2.2 M-government as a subset of e-government. Source: Mtingwi, 2012.

Contrastingly, Hellström and Al-khamayseh argue that these definitions of m-government have the weakness of considering e-government as indispensable for m-government. They contend that the penetration rate of mobile devices and technologies enables m-government to be a standalone solution (Kushchu, 2007:52). Azeez and Lakulu, on the other hand, conclude that both e-government and m-government can concur or exist separately, depending on the infrastructure, regulatory framework and objectives of the structure of a digital government (Kushchu, 2007: 57; Azeez & Lakulu, 2019:204).

2.8 M-government Channels

As mobile broadband data services such as wireless local area network (WLAN) and universal mobile telecommunications service (UMTS) increase in coverage, m-government programs

are able to transmit content-rich information at a higher speed through various channels (Azeez & Lakulu, 2019: 203; Kushchu, 2007:61).

2.8.1 Voice Channel

Voice may be the oldest mobile phone channel; however, it is still as important as other channels, particularly when bridging the gap for those who are not literate (Kushchu 2007:82). Furthermore, through voice users can access information in various languages, as voice systems can be programmed in local or multiple languages, which perhaps the mobile device itself does not support. Additionally, smartphones now have the “text-to-speech” and speech recognition features that assist the visually impaired in accessing services (Kushchu, 2007:82).

2.8.2 Signalling Channel

2.8.2.1 Short Message Service (SMS)

All phones, including non-smartphones, also known as feature phones, have a text messaging function. This communication channel can be used by governments and government agencies to disperse notifications and alerts, engage with citizens, and bridge them back to websites in a timely manner (Azeez & Lakulu, 2019:201). Where voice may require the time-consuming process of call centres, SMS enables governments to reach millions of citizens immediately and simultaneously (Kushchu, 2007:82). Nevertheless, the downside of SMS is that there are many security vulnerabilities, as entities can create fake texts used to scam and defraud citizens. In addition, the use of text by citizens requires a certain level of literacy (Kushchu, 2007:82).

2.8.2.2 Unstructured Supplementary Service Data (USSD)

Unstructured Supplementary Service Data (USSD) was created to specifically make communication more accessible and faster via feature phones (Azeez & Lakulu, 2019:202). USSD prompts only require citizens to type in numerical codes often referred to as a “quick code” and this code is then transferred over network signalling channels as a response (Kushchu, 2007:83). Examples of how USSD may be used include mobile banking, voting, and accessing directories (Azeez & Lakulu, 2019:202). However, USSD messages cannot be saved or forwarded, and the code is often difficult to remember. In addition, usage is not always reliable, due to session-based timeouts (Azeez & Lakulu, 2019:202; Kushchu, 2007:83).

2.8.2.3 Wireless Application Protocol (WAP)

Wireless Application Protocol (WAP) browsers allows mobile devices to access websites in or converted to a Wireless Markup Language (WML) (Kushchu, 2007:83; Azeez & Lakulu, 2019:202). Through an internet connection, citizens can use WAP to instantly access information and services, as well as interact with the government, like they would on a web browser.

2.8.3 Data channel

2.8.3.1 Multimedia Messaging Service (MMS)

Another channel that uses WAP is Multimedia Messaging Service (MMS). MMS links SMS enables users to send text messages, however, it also allows users to attach additional items, such as videos and audios (Azeez & Lakulu, 2019:201; Kushchu, 2007:85). Thus, governments can use MMS to send bulk information which include other forms of media (Azeez & Lakulu, 2019:201). However, the channel is more expensive than SMS, which means that it often has a lower read and response rate. Moreover, it is not compatible with feature phones which marginalises a significant number of citizens, particularly in the developing world. It also has security issues, as malicious software can be transferred using an MMS (Kushchu, 2007:85).

2.8.3.2 Mobile web opportunities

With developments in WAP and the introduction of smartphones, citizens are now able to access the Internet through various free mobile browsers that only require using a compressed data format to connect to the Internet through a low-bandwidth link, such as the General Packet Radio Service (GPRS) (Kushchu, 2007:86). Governments can use the opportunity to deliver services using websites and portals and to communicate with citizens through social media platforms such as Facebook, Twitter and YouTube (Cruz-Meléndez, 2019:60).

2.8.3.3 Applications

Citizens with smart phones can access a plethora of applications. Some applications enable citizens to exchange messages and notifications, while other can be used to access services (Cruz-Meléndez, 2019:61; Kushchu 2007:84). Applications may or may not have a cost, and they may have varying operative system requirements (IOS, Android, Windows).

2.9 M-government Modes

Similar to e-government, m-government can be established for various purposes in the public sector, namely administration, democracy, information and services.

2.9.1 M-administration

M-administration applications, like e-administration, are used to improve the internal operations and processes of government organisations (Mtingwi, 2012. 20-21; Abu Tair & Abu-Shanab, 2014: 18). However, unlike e-administration, the ubiquity of mobile devices enables m-administration applications to accelerate these operations. Nonetheless, both m-administration and e-administration aim to assist in creating a transparent and accessible public sector responsible for citizens and optimising administrative processes (Azeez & Lakulu, 2019:208).

2.9.2 M-democracy

Through m-democracy, as with e-democracy, citizens can utilise their devices to partake in political decision-making, thus enhancing democratic participation and governance (Mtingwi, 2012. 20; Abu Tair & Abu-Shanab, 2014: 18). M-democracy further uses mobile phones to facilitate democratic structures and processes that encourage democratic principles such as “government by the people, for the people,” through widespread civil and political participatory behaviours and mobilisation efforts such as voting via mobile phones in a bid to increase voter participation (Pang, 2018:4; Gushardana, 2021:321).

2.9.3 M-communication

To ensure transparency, accountability and informed decision-making, governments may use m-communication applications to improve information sharing and communication with their citizens (Mtingwi, 2012. 20). These applications not only enhance communication coming from government going to citizens as recipients, but also improve communication coming from citizens going to the government as the recipient (Abu Tair & Abu-Shanab, 2014:18).

2.9.4 M-services

Mobile channels that can be used to facilitate m-services, not only provide a channel of communication between government and citizens, but also enable transactions and payments to occur between both stakeholders (Mtingwi, 2012. 20). In contrast, e-services only provide a communication channel, while the transaction function falls under e-commerce. However, m-

services combine the modes of e-services and e-commerce, and together serve as a service delivery channel for citizens (Abu Tair & Abu-Shanab, 2014:18; Mtingwi, 2012. 21).

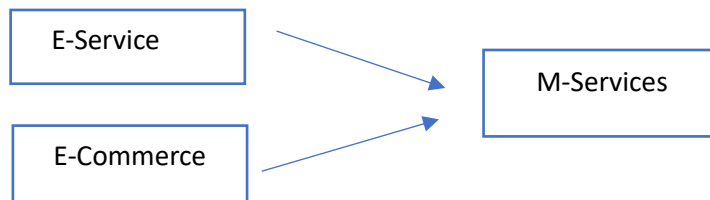


Figure 2.3 M-services. Source: Mtingwi, 2012.

2.10 Development Phases of M-services

M-government has four phases of development similar to e-government: information, interaction, transaction and transformation. The explanations of the phases are as follows.

Informational Services (push services)

Informational services, also known as push services, are the basic ways that the government can provide services. This phase involves the dissemination of information – government pushing information through a one-to-many model (Kushchu, 2007:10). This is often by way of SMS, but it can also be done via government websites or WAP sites. This phase involves a lot of static information with very limited citizen interaction (Kushchu, 2007:10; Organisation for Economic Co-operation and Development, 2011: 29).

What	Example
General information for citizens	<ul style="list-style-type: none"> • Sending weather alerts to citizens in specific districts which can include meteorological and high-rain risks, and low temperatures. Sending information regarding government services or policies.
Specific information	<ul style="list-style-type: none"> • Sending notifications of dates or processes regarding examination results. • Sending information about public hearings or meeting schedules.
Emergency alerts	<ul style="list-style-type: none"> • Sending alerts in cases of emergencies such as emerging floods or fires or electricity blackouts.

Health and safety education	<ul style="list-style-type: none"> • Sending information about prevention methods or family planning facilities. • Sending information regarding health facilities.
Notifications	<ul style="list-style-type: none"> • Sending reminders about government library book deadlines and requests. • SMS messages are sent to citizens in energy blackout cases.

Table 2.1 Informational services. Source: Kushchu, 2007 and Abu Tair & Abu Shanab 2014

2.10.1 Interactive Services (on demand)

In this phase, services become more interactive, as stakeholders can now actively engage with the government and government entities by sending inquiries, comments or even service requests (Kushchu, 2007:10). Furthermore, services become more personalised as the communication is now one-to-one rather than one-to-many; thus, stakeholders can choose which specific notifications to receive. Additionally, the services also become more detailed by allowing stakeholders access to government forms, applications and databases (Kushchu, 2007:10; Organisation for Economic Co-operation and Development, 2011, 31).

What	Example
Information inquiry services	<ul style="list-style-type: none"> • Inquiries regarding electricity bills and traffic contraventions. • Social media posts announcing breaking news, events and emergencies allowing for real-time citizen feedback and information sharing.
Filing claims and reporting problems	<ul style="list-style-type: none"> • Inquiries about service interruptions, like reporting sewage drainage.
Health services	<ul style="list-style-type: none"> • Applications that enable citizens to screen for health problems or enquire about test results.

Education services	<ul style="list-style-type: none"> • Applications where citizens can access their national examination results via their mobile phones.
Security services	<ul style="list-style-type: none"> • The application would enable citizens to send photos of criminal suspects to law enforcement agencies. • Citizens can make emergency assistance requests.

Table 2.2 Interactive services. Source: Kushchu, 2007 and Abu Tair & Abu Shanab 2014

2.10.2 Transactional Services

With transactional mobile services, the interaction between the government and stakeholders becomes a two-way communication. Stakeholders can now partake in transactions with the government at their convenience (Kushchu, 2007: 10). Mobile channels and social media provide increased opportunities to collaborate with stakeholders in real-time and provide them with up-to-date government information, regardless of their location (Kushchu, 2007: 10).

What	Example
Government transfer programs	<ul style="list-style-type: none"> • Citizens can apply for social services as well as receive relief compensation and basic income grants via the phones.
Employment	<ul style="list-style-type: none"> • These applications allow government employers to post job listings, and job seekers can get personalised text messages based on the kind of work they are seeking.
Paying taxes	<ul style="list-style-type: none"> • Through these applications citizens can both query and pay their taxes via SMS or filing tax returns.
Transportation services	<ul style="list-style-type: none"> • Citizens have the ability to buy public train or bus tickets.
Signing a transaction with mobile signature	<ul style="list-style-type: none"> • Signing commercial and public services and banking transactions.
Other	<ul style="list-style-type: none"> • Field workers are equipped with mobile devices that assist them in performing work on the ground.

Table 2.3 Transactional services. Source: Kushchu, 2007 and Abu Tair & Abu Shanab 2014

Each phase not only represents the maturity of a government’s m-government program, but it also represents the degree or depth of access. Therefore, stakeholders would have limited access to public services in the information phase.

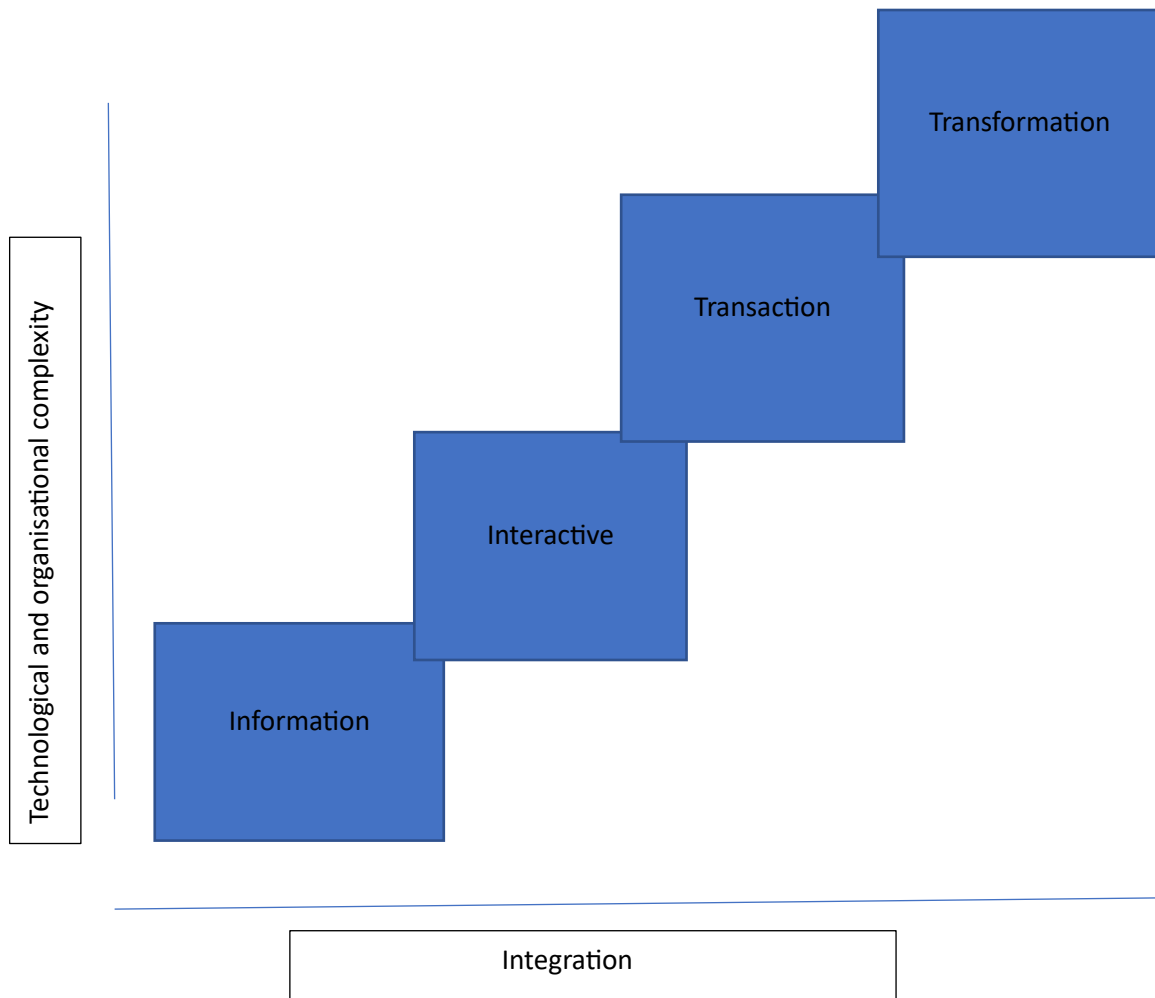


Figure 2.4 M-government developmental phases. Source Mtwigwi, 2012.

2.11 Levels of Interaction

Similar to e-government, there are four different levels of interaction for m-government, which are all concerned with the different stakeholders to whom the government delivers its services.

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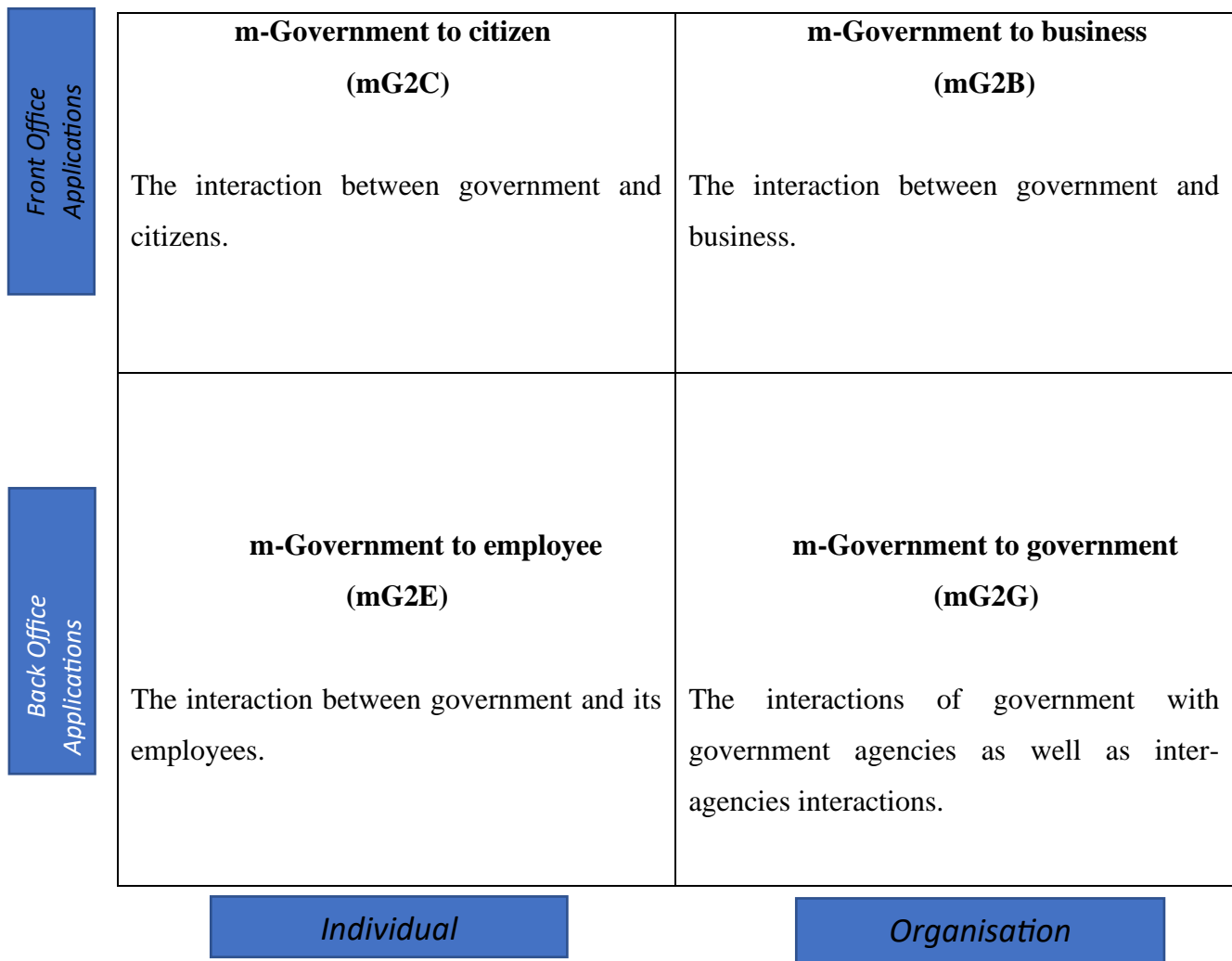


Figure 2.5 levels of interaction. Source: Mtingwi, 2012

2.11.1 Government to Government

As shown in Figure 2.5, government-to-government (mG2G) refers to back-office applications that enable interaction between the government and its agencies, as well as interagency interactions (Palka, Jurisch, Schreiber, Wolf and Krcmar, 2013). Some examples of this interaction include access to knowledge bases and records, such as public health records and educational documents, and the coordination of government activities for inspections, controls and supervision (Nguyen, Goyal, Manicka, Nadzri, Perepa, Singh and Tennenbaum, 2015:12). This is closely related to the m-administration mode.

2.11.2 Government to Employee

With Government to Employees (mG2E) services, governments provide services to their employees, particularly when they are in remote or secondary locations, to enable them to access and work on real-time and context-specific data (Palka et al, 2013; Organisation for

Economic Co-operation and Development, 2011: 38). Other applications include training that will improve organisational efficiencies and accountability, as well as general information on relevant policies, contact details and meeting schedules (Nguyen et al, 2015: 12).

2.11.3 Government to Business

As described in Figure 2.5, government-to-business (mG2B) applications refer to front-office applications that allow for interaction between the government and businesses. Applications are often geared towards the development and support of small and medium enterprises (Palka et al, 2013). For example, providing businesses with information related to procurement, licensing, etc., as well as having a feature that permits them to pay for taxes (Nguyen et al, 2015:13; Organisation for Economic Co-operation and Development, 2011:38).

2.11.4 Government to Citizens

With Government to Citizens (mG2C) services aim to improve the relationship and the processes that connect governments and citizens (Mukanu 2020, 17; Nokele & Mukonza, 2021:105). The majority of m-government services tend to fall under this category, and this is the category that the paper focuses on (Organisation for Economic Co-operation and Development, 2011:27). G2C is ultimately linked to the fulfilment of citizen rights, such as health, employment, voting and education (Alguliyev & Yusifov, 2017:202). These applications enable citizens to partake in a plethora of activities; for instance, citizens can receive emergency alerts and notifications, voting, health assistance and access transport and education services (Mukanu, 2020:17; Nguyen et al, 2015:11; Organisation for Economic Co-operation and Development, 2011:28). Therefore, G2C can contribute to process improvements by increasing public sector accountability and public participation in government decisions and actions, and additionally improving the quality, access and cost of service delivery (Mukanu, 2020:18; Nokele & Mukonza, 2021:105).

2.12 M-government vs E-government

M-government and e-government strategies overlap in various areas. Both strategies involve the digitisation of government information and processes linked to service delivery and socio-economic development (Mtingwi, 2012:10). These strategies have the same “levels of

interaction” and target the same stakeholders through these interactions (Mtingwi, 2012:10; Soliman & Affisco, 2006:14)

Stakeholders	m-Government	e-Government
Government to Government	mG2G	eG2G
Government to citizens	mG2C	eG2C
Government to employees	mG2E	eG2E
Government to business	mG2B	eG2B

Table 2.4 M-government vs e-government

Both strategies are implemented according to the same developmental cycle or phases of maturity: information, interaction, transaction, and transformation (Soliman 2006:15).

Phase	m-Government	e-Government
Information	Push services that provide information one way.	Website presence only offering information.
Interactive	Mobile platforms can be used to send inquiries, comments, or service requests.	Websites have “search” functions and citizens are able to download forms.
Transaction	Two-way transactions with the government through various platforms.	Websites allow citizens to conduct and complete tasks i.e. applying for drivers’ licences.
Transformation	Redefined process of delivering public services by providing a single point of contact to constituents that makes government organization totally transparent to citizens.	

Table 2.5 m-government vs e-government phases

Finally, both m-government and e-government share the same modes (Mtingwi, 2012:12).

Mode	m-Government	e-Government
Administration – ICT that assists with back-office processes.	m-administration	e-administration

Service – the ability to provide information and services digitally electronically for meaningful services to the public.	m-service	e-service
Democracy – facilitates public participation.	m-democracy	e-democracy
Commerce – connecting of government organisations with business firms for supplies and services.	m-commerce	e-commerce

Table 2.6 m-government vs e-government modes

However, these strategies have key differences.

	Conventional Government	Electronic Government	Mobile Government
Principles	Bureaucratic Process (Phone, fax)	Transforming the bureaucratic process using IT (PC, Internet)	Integrating mobile devices into the transformed process (wireless and mobile devices)
Services Times	8 hours a day, 5 days a week	24 hours a day, 7 days a week.	24 hours a day, 365 days non-stop.
Service Space	In person visit, fax or phone	Customer's home and office or kiosk using the internet	Anywhere the customer is
Sensory/Geospatial	Non aware	Non aware	Aware

Table 2.7 Government, e-government and m-government. Source: Kushchu, 2007

2.13 Drivers of m-government

The forces influencing the adoption of m-government predominantly emanate from the weaknesses of e-government and the factors required for its readiness. These factors include broadband, Internet and infrastructural issues with which m-government has made significant progress.

2.13.1 Wireless Broadband

E-government relies on the expansion of fixed broadband, whereas m-government relies on mobile and wireless broadband. Over the past few years, there has been an increase in wireless broadband but a slow progression in fixed broadband; consequently, many Internet users are migrating from fixed to wireless connections (Palka et al, 2013; Wirtz & Birkmeyer, 2018:1385; Al-Hubaishi, Ahmad and Hussain 2017:5). This increase in wireless broadband has significantly contributed to the m-readiness of many countries (Al-Hubaishi et al, 2017:5).

2.13.2 Mobile Internet

Wireless and mobile broadband increase user connectivity to mobile Internet and applications, thus contributing to the growing mobile phone penetration rates (Abdelghaffar & Magdy, 2012:333; Kushchu, 2007:7). Accordingly, mobile Internet access is how the majority of African citizens connect to the Internet, especially those living in rural areas (Organisation for Economic Co-operation and Development, 2011:26).

2.13.3 3G

The development of generation protocol has progressed alongside the introduction of smartphones, and currently provides users with multiple functions and mobile applications that increase the variety of communication, networking and interactive experiences through their phones, making mobile phone use more appealing (Organisation for Economic Co-operation and Development, 2011:16). The development of various generations (Gs) has increased the usage of both mobile devices and mobile Internet. Higher Gs facilitate higher data transfers and enable easier and faster access to large quantities of information and sites. For instance, third-generation (3G) protocols support much higher data rates and are intended primarily for applications, such as video conferencing and full Internet access (Sadeh, 2003).

2.13.4 Societal Demand

Research has demonstrated a dramatic increase in the use of and accessibility to mobile technology in both developed and developing countries. By the end of 2012, there were an estimated 6 billion mobile cellular subscribers, including 940 million subscriptions to 3G services, and most people in the developing world had access to mobile networks (Organisation for Economic Co-operation and Development, 2011:17; Palka et al, 2013). This makes mobile devices the backbone of communication and the mainstream way of accessing Internet services in the developing world. The popularity of mobile phones also influenced governments to transform their activities according to the demand for convenience and efficiency of interactions (Kushchu, 2007:2; Organisation for Economic Cooperation and Development, 2011:26).

2.13.5 Low infrastructural requirements and costs

An additional driving force for m-government is its low infrastructural costs and requirements (Abu Tair & Abu-Shanab, 2014:17). By using m-government, governments are able to deliver more efficient services at a much lower cost compared to computer-based services (Abu Tair & Abu-Shanab, 2014:17; Organisation for Economic Co-operation and Development, 2011:19). Fixed broadband, especially in Africa, requires a very expensive infrastructure as opposed to wireless, and this has been a major constraint for the progression of e-government (Organisation for Economic Co-operation and Development, 2011:16). Another aspect of affordability is from the users' perspective; more people can afford a mobile phone than a PC, and they are also more comfortable with learning to use mobile devices in their daily lives (Organisation for Economic Co-operation and Development, 2011:95).

2.14 M-government Benefits

The benefits of m-government stem from its mobility and ubiquity, which enable time-critical, location-based, and personalized services to be offered to citizens and compensate for the weaknesses of e-government (Eibl, Lampoltshammer & Temple, 2022: 3). M-government not only has the ability to increase channels for accessing public services, but it also extends the remote delivery of public services and information, especially for those who are unable to access those services through traditional means (Kyem, 2016: 4; Eibl, Lampoltshammer & Temple, 2022: 3; Jahanshahi, Khaksar, Yaghoobi, and Nawaser, 2011:1191; Organisation for Economic Co-operation and Development, 2011:95). By bypassing the need to build expensive infrastructure and technical requirements for e-government, m-government programs can be

implemented in areas where traditional fixed lines are not available, as most feature phones can connect citizens to the Internet via WAP (Abu Tair & Abu-Shanab, 2014:19; Organisation for Economic Co-operation and Development, 2011; Abdelghaffar & Magdy, 2012:333). The lowered cost of infrastructure also means that the scalability of m-government programs is more viable and cost-effective.

The penetration levels of mobile devices work in favour of diminishing the digital divide. Although most citizens in the developing world do not have access to PCs, a large majority of them have access to mobile devices (Kyem, 2016: 5). Therefore, through m-government programs previously marginalised citizens can now be reached (Kyem, 2016: 5; Roggenkamp, 2004; Organisation for Economic Co-operation and Development, 2011:64). Additionally, many individuals may not know how to use PCs; however, the interface of mobile devices makes them easy to learn and their ubiquity allows most people in society to have basic knowledge of how to operate their phones (Kyem, 2016: 5; Abu Tair & Abu-Shanab, 2014:19; Kushchu, 2007:6). Similarly, the affordability of mobile devices in comparison to laptops and desktops lowers the entry barrier for all classes to be connected to government services (Kyem, 2016: 5; Organisation for Economic Co-operation and Development, 2011:26). Governments are also able to reach citizens with disabilities using voice communications or Interactive Voice Response (IVR) for visually impaired people and for senior citizens, as well as SMSs for those who are hearing-impaired (Organisation for Economic Co-operation and Development, 2011:40).

PC and desktops are usually shared among individuals, contrastingly, mobile devices tend to be used by one person, which enables governments to offer personalised services and information unique to each citizen's needs (Nguyen et al, 2015:9). This one-person usage builds up to ensuring that privacy is upheld. This ability is also enhanced by multiple sensors that provide governments with access to an expanse of data and insights that develop more user-aware applications and services (Nguyen et al, 2015:9). For example, real-time location sensors allow the government to provide location-specific services, which is especially helpful in cases where citizens are notified of emergencies (Eibl, Lampoltshammer & Temple, 2022:3; Kushchu, 2007:3). This feature can also be used by government fieldworkers, such as health workers and police officers who deliver services on the ground. Therefore, this enables greater mobilisation of these government workers who can now handle real-time information and

events concerning crimes, accidents, emergencies and other public issues (Abu Tair & Abu Shanab 2014: 21; Kushchu, 2007:3; Roggenkamp, 2004).

The portability of mobile devices and the fact that they are always switched on, truly embodies the anytime and anywhere access concept. Citizens are able to retrieve and receive information whilst on the move, and government can be encouraged to also provide more responsive services as certain functions can be fully automated. This diminishes waiting time and supports instantaneous service delivery (Organisation for Economic Cooperation and Development, 2011: 16 & 41).

Overall, by reaching citizens through a more personal, ubiquitous and easy-to-use technology such as mobile devices, the government can work towards ensuring that more citizens have access to public services (Kushchu, 2007:6).

2.15 Mobile government Challenges

2.15.1 Infrastructure and Interoperability

Although m-government uses mobile infrastructure and wireless networks to offer services, there can be interoperability issues if it is used as a complementary function to e-government (Kyem, 2016: 10). The m-government architecture would need to be built on a sound e-government infrastructure to start leverage mobile or wireless technologies for the delivery of public digital services, which is often not the case (Chen & Wellman, 2004:14; Alssbaiheen & Love, 2016:22). Secondly, other interoperability issues are presented by the variety of technical capabilities within various mobile devices, which make creating an m-government architecture based on interoperability and scalability complex. For instance, mobile devices offer an array of platforms such as WAP and GSM. However, most of these lack standardisation, which can further interoperability issues (Chen & Wellman, 2004:14; Alssbaiheen & Love, 2016:23). Therefore, the implementation of an interoperable m-government architecture is a difficult task, because different government agencies and bodies need to ensure the interoperability of content and systems where all devices and networks are able to “talk to each other”, irrespective of platforms and standards (Chen & Wellman, 2004:14; Alssbaiheen & Love, 2016:22).

2.15.2 Accessibility

As governments seek to make m-government more accessible, there is a reliance on the deployment of public wireless networks to assist with the cost and accessibility of m-services

(Chen & Wellman, 2004: 14; Alssbaiheen & Love, 2016 :22). However, wireless network coverage remains limited (Azeez 2019:211; Chen 2004:14). Additionally, many governments may struggle to keep up with the frequent changes in hardware and software and changes in application programs (from 2G to 3G and 4G phones) (Kyem, 2016: 10).

2.15.3 Security and Privacy

All information and activities on the Internet are at risk of interception, however, wireless network operators who transport secured data through public airwaves experience a heightened risk of hackers intercepting and misusing online information (Chen & Wellman, 2004:14; Alssbaiheen & Love, 2016:21). Therefore, disclosing confidential or critical information, such as tax and banking information, can raise many privacy concerns in m-government (Chen & Wellman, 2004:14). Additionally, the size of mobile phones makes it easier for them to be misplaced or stolen, placing the information stored on them at jeopardy of falling into the wrong hands (Chen, 2004: 14). Moreover, the ease with which users can change their mobile phones or numbers often adds to the risk of information going undelivered or being sent to the wrong person (Alssbaiheen & Love, 2016:23).

2.15.4 Usability

Usability refers to the ability of m-government channels to be accessed easily with minimal effort (Chen & Wellman, 2004:14). While the screens and power of mobile phones have been growing over the years, in comparison to PCs most mobile phones have smaller screens and keypads, limited computational power, memory and lower display resolutions (Chen & Wellman, 2004:14). These limitations can cause usability issues, particularly for the elderly, who tend to have vision, physical and cognitive impairments due to age (Chen & Wellman, 2004:14). Other usability issues arise because of the variations in mobile phones; different phones offer different platforms. For example, some mobile phones do not have Internet access and therefore they cannot download relevant mobile government applications, thus limiting certain users from accessing the full scope of m-services (Alssbaiheen & Love, 2016:21). Furthermore, despite the high global mobile penetration rates, many individuals remain unaware of the complete capabilities that mobile devices possess, and therefore they are unable to reap the full benefits of m-services, while others are oblivious to the services that government offers through mobile phones (Alssbaiheen & Love, 2016:22). Finally, channels such as SMS are confined to the transmission of 160 characters, limiting the transmission of complex and voluminous information (Kyem, 2016: 10).

2.15.5 Lack of legislation

Many countries have not enacted relevant policies to create an environment for thriving m-government program implementation. This includes legislation that stipulates the information rights regarding citizen data, as well as the responsibility of governments regarding the protection and usage of that data (Alssbaiheen & Love, 2016:22; Azeez & Lakulu, 2019:211). More specifically, this relates to the regulation and legislation surrounding the recognition of mobile documents, mobile transactions, digital signatures, online taxable transactions and online filings (Alssbaiheen & Love, 2016:23 4; Chen & Wellman, 2004:14).

2.16 Summary

Advances in ICT have pressured governments to incorporate ICT into government processes at different levels and to different stakeholders. Although African countries encountered challenges with e-government such as poor infrastructure, literacy and political will, M-government on the other hand, presented an opportunity to circumvent these opportunities and bridge the digital divide. Other benefits and challenges of m-government are examined in this chapter. Additionally, the concept of digital inclusion was interrogated, along with the role that m-government can play in bringing about greater levels of digital inclusion in developing countries.

Chapter 3 The Case for m-Government in South Africa

3.1 Introduction

At the dawn of democracy, South Africa sought to create an administrative system that was responsive to the needs of its citizens, availed public services to the masses, and enhanced the quality of services (Department of Public Service and Administration, 1997; Kuye, 2007:69). In line with global trends, the South African government began utilising mobile technologies to provide information and services to its citizens (Jantjies, 2010: 34). This chapter provides a theoretical perspective on South Africa's m-government development. A historical background is provided that describes where its approach towards m-government originated. The chapter further examines various pieces of legislation that have been developed to create a conducive digital environment. Additionally, the chapter also examines the key stakeholders involved in South Africa's m-government. Developments in infrastructural deployment, as well as the gaps that are present due to skills and affordability divide are also analysed.

3.2 Policy

Following the advent of democracy in 1994, South Africa faced many developmental challenges, such as high poverty levels and socioeconomic inequality. Thus, the democratic government prioritised the creation of legislation rooted in redressing the apartheid legacy of service delivery inequity. The ANC-led government therefore created laws and policies geared towards achieving universal access and digital inclusion, with the understanding that ICT has the potential to play an essential role in integrating services to previously marginalised communities and contributing to development (Aruleba & Jere, 2022:4; Lesame & Seti, 2014:331).

The publication of the White Paper on the Transformation of the Public Service (WPTPS) in 1995 led to the creation of the Presidential Review Commission (PRC) (Jantjies, 2010:55). The PRC set out to continue the mandate of the WPTPS, which was to transform government and public services while empowering communities, particularly those who were previously disadvantaged during apartheid (Jantjies 2010:55). A process of consultation involving public servants, union members, and civil society at large took place and culminated in the publication of the PRC report in 1998 (Jantjies, 2010:55). This report is regarded to have paved the way for the government's migration to digital communication and services, because it promoted the need to regard ICT in South Africa as an essential infrastructure and to be used to transform

the relationship between citizens and government to enable greater access to both government information and services (Jantjies, 2010:55). To accomplish this vision, the report highlighted the need to prioritise the formulation of policies that would create a conducive legislative environment that addresses the extent to which information is collected, collated and analysed on digital public service systems (Jantjies, 2010:55). Consequently, the South African government began developing legislation and frameworks to encourage transparency, responsibility, information security, good governance, choice in the procurement and use of ICT, as well as legislation that sought to address the issues of affordability, availability, and accessibility of ICT services in the country (Blom & Uwizeyimana, 2020:211).

3.2.1 Digital Public Service Transformation

The Public Service IT Policy Framework served as a foundational ICT policy and introduced four focal points that would be used to determine the success of the South African government's digital projects and services: security, interoperability, economies of scale and the elimination of duplication (DPSA, 2001:8). ICT security requires that all devices, systems and online data be protected against unauthorised access, malicious code, and denial of service attacks (DPSA, 2001:8). To this end, South Africa developed several policies, such as the Minimum Information Security Standards (MISS) Handbook and the Protection of Personal Information Act (POPIA). The MISS outlines the necessary procedures and security measures that apply to any person or computer that has access to classified information, and it highlights the need for encryption to maintain the integrity and protection of the shared information (DPSA, 1996:27; Jantjies, 2010:51). Other security elements were further expounded in the Cybercrimes Act and in POPIA, which aim to ensure that information is collected, processed and stored according to the principles of privacy and security (Snail ka Mtuze, 2022: 569; Jones, 2022: 241). Together these policies prioritise electronic security and serve as a basis for ICT security governance in South Africa.

The Minimum Interoperability Standards (MIOS) and Electronic Communications Act (ECA) all highlight the importance of interoperability in digital service delivery (DPSA, 2017:9; Davids, 2011:20). Interoperability is regarded as a cornerstone feature for the overall implementation of digital services, as it ensures that information and services are made available through all government IT systems and projects, including m-government (DPSA, 2001:18). Hence, the MIOS and ECA set out the government's technical principles and

standards for achieving interoperability and coherence of information systems across all departments and government bodies, thereby ensuring greater interconnectedness and data exchange within and between the government's digital systems (DPSA, 2017:5&8; Davids, 2011:20; Jantjies, 2010:50; RSA, 2006:20).

The third focal point of economies of scale necessitates leveraging the government's collective purchasing power to encourage compliance with other key IT focus areas, especially through the lowering of unit prices for industry (DPSA, 2017:6). Although it does not specifically mention economies of scale, the Electronic Communications Act (ECA) also highlights the issue of ICT affordability by promoting competition within the telecommunications sector, particularly as it relates to sharing infrastructure, price regulations, licensing and spectrum (DOC, 2012:2). Some mobile network operators have historically complained about the roaming rates needed to use infrastructure belonging to established mobile network operators, and how this environment has, in turn, resulted in South Africans paying higher rates for mobile services in comparison to other markets, thereby creating potential cost and structural barriers for m-government initiatives (DOC, 2012: 14). The Broadband Policy further extrapolates on spectrum which has experienced an increase in demand, due to rising levels of mobile, wireless and public access technologies as well as digital services. The deployment of these technologies has created a need for the amount and speed of transmitted data to increase, therefore requiring the deployment and use of a high-demand spectrum (DOC:2012:15). By addressing the regulatory and policy bottlenecks associated with the assignment of spectrum, the policy aims to enable greater digital service delivery through the likes of m-government (DOC 2013:22; Gillwald 2012:8).

Finally, the elimination of duplication requires the government not to duplicate similar digital projects, IT functions, and the data it collects, processes, and archives (DPSA, 2001:25). Instead, the government could, for example, allow the general public to access and use personal information collected through previous programs (DPSA, 2017:6). There are several policies that aim to facilitate data communication and transactions, namely Electronic Communications and Transactions Act (ECTA), ECA, and the Regulation of Interception of Communication and Provision of Communication Act (RICA). The ECTA contributes to creating an ICT structure that ensures that digital transactions and communication conform to the highest international standards, thus encouraging legal certainty and trust for citizens to engage with digital transactions found in m-government (Jantjies, 2010:48; Gereda, 2006:269; DOC, 2002:3). On

the other hand, the ECA enables automated transactions conducted through data messages, where the content or data messages of one or both parties are not reviewed by a natural person, which is also a common occurrence in m-government services (Gereda, 2006:272). Additionally, the ETCA also enables electronic payments and the ability of any public body to accept and transmit documents in the form of data messages, all of which are necessary for m-services. Similarly, RICA mandates the registration of every Subscriber Identity Module (SIM) card in use. A SIM card not only enables mobile phones to transmit and receive indirect communication through telecommunications systems, but it also allows for that specific SIM card as well as its installation information to be identified (RSA, 2002: 14). This ensures that correct information is sent to the intended person.

South Africa's Public Service IT Policy Framework served as a cornerstone for the development of policies that provide general standards that foster a conducive environment for digital government services; however, the framework is also the first policy to mention m-government as a service delivery tool (DPSA, 2001:5; Jantjies, 2010:49).

3.2.2 Universal Access to Digital Public Services

Electronic Government the Digital Future: A Public Service IT Policy Framework clearly outlines how mobile phones form part of South Africa's e-government vision to transform public services across a wide range of sectors (DPSA, 2001: 4). This rhetoric of m-government as a subset of e-government is later emphasised in the National e-Government Strategy and Roadmap (DTPS, 2017: 15 & 21). In this strategy, mobile phones are highlighted as a channel that enables the government to achieve the goal of reaching more citizens, given South Africa's high mobile penetration rate (DTPS, 2017: 8). Therefore, the strategy prioritises the acquisition of relevant infrastructure and the development of government mobile applications and USSD services, which will facilitate the delivery of public services to everybody (DTPS 2017:18). Both of these policies highlight the importance of deploying digital services that will ensure equal access to government services, especially in light of South Africa's deeply racialised communication divide. This theme of universal access remains an overarching objective of South Africa's ICT policies.

The ECA mandates the universal provision of affordable electronic communications networks, electronic communications services and connectivity, so that there is non-discriminatory access to broadcasting services, electronic communications, and networks (Lewis, 2013:96; Jantjies,

2010:50; RSA, 2006:20). In the ECTA, universal access is endorsed as an objective that will lead all South Africans to have equal access to the Internet and other relevant ICT infrastructure, giving them the ability to reap the benefits of electronic transactions and become partakers in the information society (Mosehlana, 2018:697; Davids, 2011:23; RSA, 2002:17). The Telecommunications Act, likewise, states the intent to “promote the universal and affordable provision of telecommunication services” (Lewis, 2013:96). Lastly, the e-strategy not only aims to optimise digital service delivery by working towards greater universal access, but it also highlights previous objectives that were mentioned in earlier legislation, thus harmonising the electronic and telecommunications policy environment (Blom & Uwizeyimana, 2020:210; DTSP, 2017:14).

Hence, the strategy mentions the need to focus on digital skills development both in government and in the general public; connectivity costs; the deployment of relevant ICT infrastructure; the creation of local content and services; as well as the establishment of institutional mechanisms that oversee the coordination of the digital government program (DTSP, 2017: 15 & 21). Similarly, the broadband policy states that South Africa can make strides with its digital service delivery mandate if it speeds up its broadband project, given the relationship between the Internet and broadband connectivity (Manda & Backhouse, 2016:231; Thakur & Singh, 2013:43). Broadband internet is essential for the promotion of digital connectivity, as it enables greater use of the Internet and the ability to utilise “feature-rich” applications and services that are present in m-government (Manda & Backhouse, 2016: 228 & 231). Therefore, the policy seeks to move the country towards universal access through broadband connectivity by 2030, while improving Internet access for all citizens, particularly those in rural and underserved communities (Kassongo, Tucker, & Pather, 2018; 2: Manda & Backhouse, 2016:232; DOC, 2013:19; Gillwald, Moyo and Stork, 2012:8). The policy also prioritises the redressing of the digital divide and highlights the related issues of availability and affordability, because the high costs of broadband make broadband services inaccessible to most citizens (Manda & Backhouse, 2016:232).

3.3 Stakeholder

South Africa’s m-government project is a multi-stakeholder collaboration between a handful of government departments and non-governmental bodies (DTSP, 2017:30). The South African government believes that assigning different jurisdictions to different stakeholders will promote greater innovation and oversight throughout the various tiers of government and stages of digital program implementation (Blom & Uwizeyimana, 2020:211). South Africa’s tiered

system (National, Provincial and Local Governments) makes itself felt in m-service delivery, as each tier facilitates its respective deployment of m-services; however, this is often done in collaboration with non-governmental bodies who typically provide technical know-how.

3.3.1 Government departments

The Department of Public Service and Administration (DPSA) is generally tasked with transforming governmental processes. Therefore, in the context of m-government, the DPSA is responsible for overseeing the transformation of public services using ICT through the formulation of an e-government (which includes m-government) policy, while establishing norms and standards that will uphold South Africa's digital ecosystem (DTPS, 2017:33; Dlamini, Ngobeni, and Mutanga, 2010:1; Cloete, 2012:131; Jantjies, 2010:38; Farelo & Morris, 2006:6). Accordingly, it was the DPSA, together with the State Information Technology Agency (SITA) and the Centre for Public Service and Innovation, that developed the 2017 e-government strategy and road map. The Department of Communication and Digital Technologies (DCDT) is also predominantly responsible for formulating policies and strategies that leverage technological innovations, such as mobile and data innovations (DTPS, 2017:33; Cloete, 2012:133). Beyond that, DCDT is tasked with overseeing the deployment of ICT infrastructure, particularly in previously underserved areas, as well as ensuring that the government complies with the ICT standards and measures that have been enacted (Jantjies, 2010:39; Dlamini et al, 2010:1).

3.3.2 Regulatory institutions

Since the inception of its ICT policies, the South African government has always prioritised collaboration, particularly in the area of procurement and deployment. Regulatory institutions such as Council for Scientific and Industrial Research (CSIR), Technology Innovation Agency (TIA) and Universal Service and Access Agency of South Africa (USAASA) have therefore been established to foster and coordinate innovation in the public sector (Motloun, 2022:73; Mosehlana, 2018: 696.). SITA is tasked with coordinating the deployment of e-government. Therefore, it is responsible for the research, procurement, application and preservation of IT in the public sector. In terms of industry regulation, the Competition Commission of South Africa (CCSA) is responsible for investigating cases of collusion and other exploitative tendencies which has previously included mobile network operators. The USAASA is one of the many

agencies that is directly involved in the prioritisation of ICT and the improvement of national access to ICT services (Motloun, 2022:70). It aims to expand rural ICT access and licensing requirements in underserved areas, in line with South Africa's universal access mandate. The Office of the Government Chief Information Officer (OGCIO) and Government Information Technology Officer's Council (GITOC) were established to proactively seek ways in which the government could better apply ICT for internal administrative applications and general government service provisioning to citizens and businesses. Thus, they are also responsible for the consolidation and coordination of IT initiatives in government, including m-government, to enable service delivery (Coetzer, 2022:49).

3.3.3 Research Institutions

Research institutions like universities, are driving evidence-based technology development choices for m-government in South Africa either through academic departments or community engagement initiatives (Venter, Craffert, Van Greunen, Veldsman, Candi and Sigurdarson, 2019: 39). Parastatals such as the Human Science Research Council (HSRC) and CSIR also provide research support related to m-government projects. However, parastatals often partner with the private sector and other research bodies to provide an objective diagnosis of requirements for the m-government infrastructure landscape in SA (Venter, et al, 2019: 39).

3.3.4 NGOs/ civic intermediaries

International and national non-governmental organisations (NGOs), community-based organisations (CBOs), and religious organisations are also involved in the deployment of m-government projects in South Africa (Venter, et al, 2019: 39). These organisations tend to have their ears to the ground, and therefore have a better understanding of citizen and community needs, thus providing critical insights into m-government programs. Foundations, on the other hand, often have the financial means to provide donor funding for m-government projects that align with their objectives and vision (Venter, et al, 2019: 39).

3.3.5 Private Sector

Public-private partnerships are important within the context of m-government, where infrastructure can become obsolete. By collaborating with the private sector, the government seeks to reduce the otherwise high cost of infrastructure deployment, maintenance and delivery (Blom & Uwizeyimana, 2020:216; Thakur & Singh,2013:42; DTPS, 2009:27). Mobile network operators play a crucial role in South African m-government programs. These privately owned MNOs, except Telkom, which is partly owned by the government, provide the needed mobile

and Internet services for m-government deployment (Gillwald, Mothobi, & Rademan, 2018.:65; Unicef, 2012:10).

The multiplicity of stakeholders in this environment has the ability to bring in various intel and know-how, but they also have the potential to encourage a haphazard m-government landscape. Therefore, a crucial issue to be addressed by policy is the cooperation and collaboration among all stakeholders, as well as the harmonization of their efforts (Motloun, 2022:73).

3.4 Skills

Digital skills are necessary for citizens to fully participate and benefit from digital public services. Although South Africa has a high mobile penetration rate, it does not necessarily equate to a high prevalence of advanced digital skills amongst its citizens (Lesame & Seti, 2014:332; Shava, 2022:83; World Bank, 2019:49; Bornman, 2016:276). In fact, many citizens, particularly the elderly and uneducated, still lack operational and strategic digital skills that would enable them to access the full benefits attached to m-services (Shava, 2022:83; Aruleba & Jere, 2022:2; Phokeer, Densmore, Johnson and Feamster, 2016:8; Chisango & Lesame, 2017:52). Therefore, a large portion of the population is limited to using mobile phones primarily for basic communication and entertainment (Bornman, 2016:276; Chisango & Lesame, 2017:52; Ramburn & Van Belle, 2011:33; Nkosi & Mekuria, 2010:5).

Additionally, illiteracy remains an issue that is exacerbated by government websites and communications that are predominantly in the English language (Motloun, 2022:87; Gillwald, et al, 2018: 87). This contributes to the exclusion of people who could use technology if they understood the language being used (Motloun, 2022:152). Nevertheless, the growing mobile subscription and ownership rate indicates that illiteracy does not deter South Africans from using and accessing mobile phones, as citizens are able to find alternative ways to learn how to access certain services without having to fully understand the language of instruction. (Makwembere & Garidzirai, 2021: 5; Bornman, 2016: 273; Ogunleye & Van Belle, 2015: 5). For instance, the high penetration of mobile phones means that many people are able to rely on their social networks for assistance (Chisango, 2014:52; Ramburn & Van Belle, 2011:33).

3.5 Infrastructure

Researchers agree that one of the critical aspects needed for a successful m-government program is a robust and reliable ICT infrastructure (Tungela & Iyamu, 2019: 1512; Thankur,

2013: 48; Jantjies, 2010: 40). However, the history of South Africa created a telecommunication network that embodied racial duality and skewed the manner in which telecommunication infrastructure was established in the country (Aruleba & Jere, 2022:3). For example, rural townships had a total absence of telecommunication networks, while telephone infrastructure deployed in urban townships dominated by black people was not adequately provided or maintained (Aruleba & Jere, 2022:3; Mashinini, 2008:127). Alternatively, neighbouring urban areas dominated by white citizens had sophisticated and well-maintained infrastructure (Aruleba & Jere, 2022:3; Mashinini, 2008:127). Therefore, it has become critical for the democratic government to invest in telecommunications infrastructure and technologies such as deployed fixed, mobile, wireless broadband, fibre optic networks, enhanced services over copper (such as digital subscriber lines, ISDN), and cable solutions to provide digital connectivity to previously underserved communities (Tungela & Iyamu, 2019:1512; Backhouse, 2017:3; DTSP, 2009:27).

To this effect, South Africa has made considerable investments in infrastructure (Tungela, and Iyamu, 2019: 1512). South Africa's mobile network operators have afforded 99.5% of citizens 3G mobile broadband network coverage and 85.7% 4G, indicating that South Africa has close to 100% mobile broadband coverage (Blom & Uwizeyimana, 2020:216; World Bank, 2019:12; Naidoo, 2012:64). The e-government strategy further states that the country has a mobile penetration rate of 100%, with a 91.2% smartphone penetration rate, according to a report by the Independent Communication Authority of South Africa (ICASA) (ICASA, 2020: 33). This extensive mobile phone ownership has created a shift from fixed-line broadband to mobile broadband, as it is estimated that only 23.5% of South Africans access the Internet through computers at home, while the majority of the population use mobile phones for Internet access (Geerds, Gillwald and Enrico Calandro, 2016:14; Donner, Gitau and Marsden, 2011:576). Thus, South Africa's mobile broadband provides the dominant means of Internet access making m-government a better vehicle for Internet-based service delivery (Gillwald et al, 2012: 15)

Nevertheless, the state of South Africa's infrastructural deployment remains 4; Tungelards urban and metropolitan areas (Reddick, Enriquez, Harris, & Sharma, B., 2020: 4; Tungela, & Iyamu, 2019: 151). The low population density and high deployment costs discourage private investments, creating little or no commitment to connecting areas that include smaller towns and rural areas (Reddick et al, 2020:3). This is reflected in only 45% of the rural population having Internet connectivity, compared to 63% in urban areas and 67 % in metropolitan areas (Blom & Uwizeyimana, 2020: 216). Similarly, the government's free Wi-Fi hotspots tend to be

confined to metropolitan and urban areas as well as their surrounding peri-urban areas, meaning that rural areas have to rely solely on mobile broadband (Tungela & Iyamu, 2019:1513; Geerds et al, 2016:13; Lesame & Seti, 2014:339; DOC, 2013:39). Nonetheless, holistically, South Africa has made considerable investments in the relevant infrastructure needed to allow more citizens to access the Internet and data-driven services, particularly those delivered through mobile phones (Kassongo, et al, 2018: 1; Maumbe & Taylor, 2007: 5).

3.6 Affordability

A key component in achieving universal access and usage is affordability. The 2017 Research ICT Africa (RIA) After Access Survey found that South Africa's income disparities led low-income earners to pay a significantly high proportion of their disposable income to access the Internet, data services and products (Gillwald et al, 2018:109). Therefore, the total cost of ICT ownership serves a significant barrier to the adoption of digital services in South Africa (Venter, et al, 2019: 26; Gillwald et al, 2018: 109). First, those who are able to access mobile phones often buy basic feature phones because of their low income, while high-income individuals own more advanced smartphones, creating a situation where lower-income individuals can only access mobile services that are signal- and voice-based (Chisango & Lesame, 2017:55; Ramburn & Van Belle, 2011:32, 20). Second, low-income individuals who are able to access smartphones use mobile data services scarcely, while high-income individuals are able to use these services more extensively, creating differential usage (Ramburn & Van Belle, 2011:32; Gilham & Belle, 2005:482). While the CCSA and ICASA have recently committed to creating greater competition within the South African MNOs market to reduce data pricing, South Africa continues to have some of the most expensive data on the continent (Aruleba & Jere, 2022:3; Shava, 2022:83; Lesame & Seti, 2014:336). Therefore, the widespread ownership of mobile phones in South Africa cannot be associated with extensive usage, especially for data-based services (Bornman, 2016:273).

Nevertheless, South Africa's growing data subscription, SIM penetration and mobile penetration rate illustrate that South Africans are not entirely deterred from using mobile services (ICASA, 2020:40; Gillwald, Mothobi, & Rademan, 2018: 20). ICASA found that mobile data subscriptions increased by 18.8% from 65 million in 2018 to 78 million in 2019 (ICASA, 2020:38). Furthermore, South Africa's prepaid mobile phone subscription rate was 82 million in 2019, while post-paid subscription was 14 million, illustrating how citizens across

the income spectrum are able to find suitable alternatives that enable them to access mobile services (ICASA, 2020:38; Phokeer et al, 2016:7; Gillwald 2012:28). Additionally, at citizen level, individuals can generally afford to purchase mobile technologies compared to PCs, laptops and fixed-line packages, which are more expensive than mobile packages (ICASA, 2020:38; Geerds, et al 2016:28; Organisation for Economic Co-operation and Development, 2011:26). Thus, the relative affordability of mobile devices and technologies explains the increase in mobile phone penetration and creates a compelling case for the use of m-government in South Africa.

3.7 Summary

Policy and legislation play an important role in governing the digital environment. To this end, the South African government has enacted relevant ICT policies that uphold the development of digital service delivery systems that encourage universal access. The rollout of infrastructure and technology throughout the country by multi-stakeholders, both in the public and private sectors, is aimed at reducing this divide. However, South Africa continues to experience a digital divide since those living in rural and marginalised areas are left behind, due to a variety of issues such as affordability, poor skills and literacy levels. Nevertheless, mobile phones are the most used technology for Internet access in South Africa, making them a potential conduit for ensuring wider universal ICT access.

Chapter 4 Methodology

4.1 Introduction

This chapter revisits the research question. It presents the research paradigm and methods, and the significance of employing a systematic literature review approach. The chapter also presents the justification for data collection techniques, research instruments, and data-gathering processes. The data analysis tools used in this research are presented, followed by their limitations and a summary.

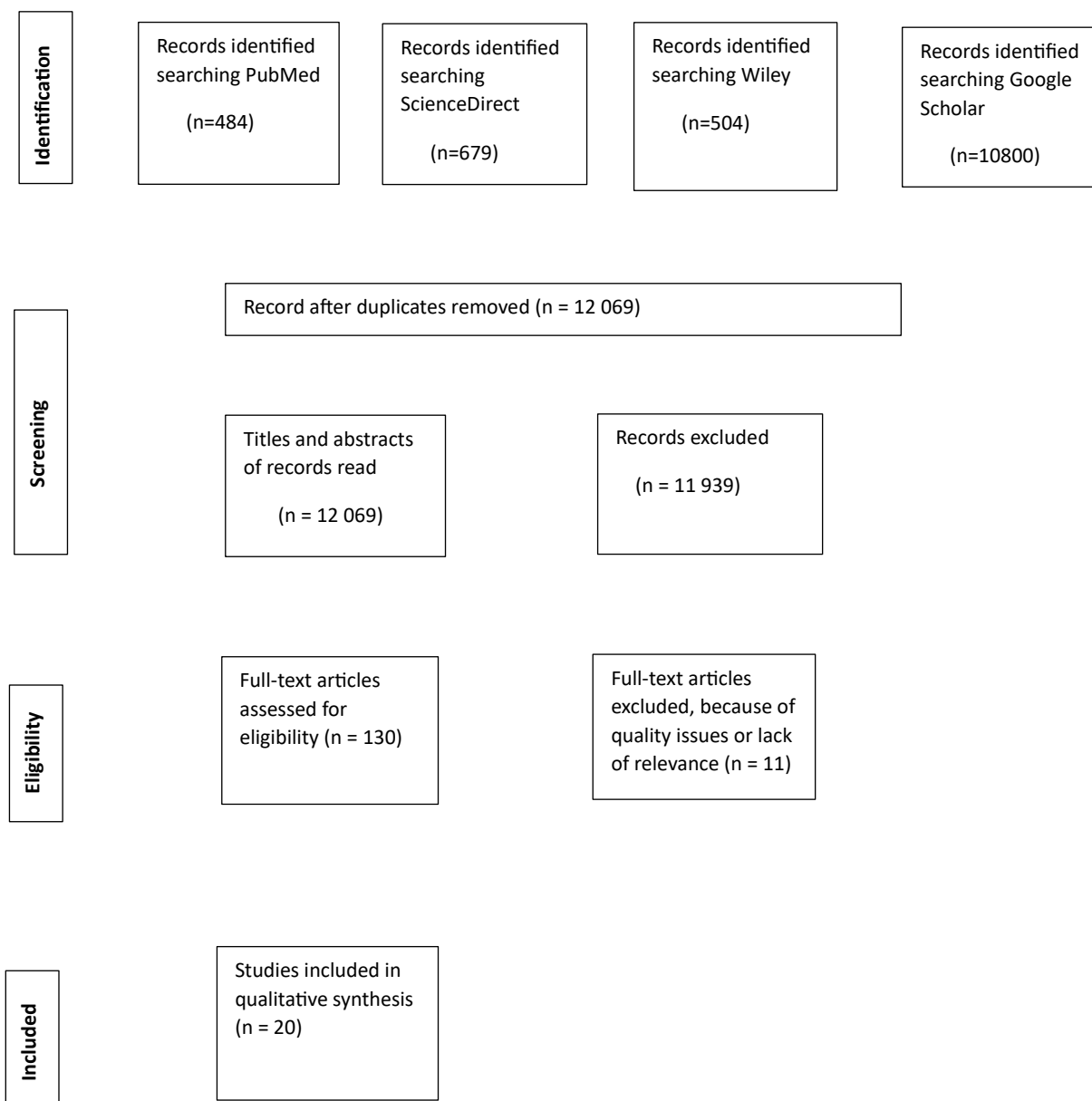


Figure 4.1 Study selection, assessment, and inclusion (presented using the PRISMA flow diagram).

4.2 Research approach

This study adopted the preferred reporting items for systematic reviews and meta-analyses (PRISMA) model to identify, select and critically appraise research related to the evaluation of m-government in South Africa. The PRISMA model is widely used to conduct literature reviews, because it can enhance the quality, replicability, reliability and validity of these reviews (Xiao & Watson, 2017:109). The following sections describe study identification, study selection, data extraction and data synthesis.

The entire systematic literature review (SLR) process, including the literature search, data extraction, analysis and reporting is tailored to answer the research question (Xiao & Watson, 2017:109). Therefore, this SLR is used to answer the following questions: How do South African m-government projects fair when it comes to motivation, skills, material and usage access? What access barriers are present within South Africa's mobile government?

4.3 Identification of studies and search strategy

The literature search finds materials for the review, therefore, an SLR depends on a systematic search of literature in multiple databases, because no database includes the complete set of published materials (Xiao & Watson, 2017:103). Therefore, the review searched for and examined English-language articles or materials published between 2012 and 2022, which were available via the prominent digital libraries and databases ScienceDirect, PubMed, Wiley and Google Scholar, which were used to minimise the risk of omission. Google Scholar is a very powerful open access database that archives journal articles as well as "gray" literature, ensuring a thorough and far-reaching search of potentially important studies (Xiao & Watson, 2017:103; Okoli, 2015: 905).

The search strings were based on contextualized keywords and composed of concepts related to the research questions. The search strings included: Pubmed "mHealth South Africa." ScienceDirect "mobile government South Africa" 679. Wiley mobile government AND South African AND education AND access or digital divide 504. Mobile government AND South Africa AND municipality AND access OR digital divide.

Furthermore, the search limited the results to specific research disciplines to identify the most relevant search results. ScienceDirect uses different divisions of research disciplines and subjects, thus, a search for one includes social science material.

4.4 Study selection and eligibility criteria

The SLR was careful not to exclude studies unreasonably that could be significant to the general body of knowledge on the topic (Okoli, 2015: 905). Articles were screened and selected based on the following inclusion and exclusion criteria:

Inclusion Criteria	Exclusion Criteria
Articles, journals and conference proceedings about South Africa’s m-government implementation ▪ Articles, journals and conference proceedings about South Africa’s m-government challenges, opportunities, obstacles, barriers, success and failures.	Duplicate articles journals and conference proceedings ▪ m-government implementation outside of South Africa ▪ The excluded papers were incomplete opinion pieces and books.

Table 4.1 Exclusion and inclusion criteria

4.5 Data extraction and synthesis

The search was conducted in October 2022 and returned 1667 articles (484 results on PubMed, 679 results on ScienceDirect, and 504 results on Wiley). A search on the Google Scholar database was later conducted, and several search results that had already been identified through Wiley, ScienceDirect and PubMed also showed up. Google Scholar returned a large number of results even after the calibration of the search string. Following the revision of titles, abstracts, and full texts to identify articles that adhered to the inclusion and exclusion criteria, 20 relevant studies were extracted and included in the synthesis.

The process of data extraction and synthesis was performed by reading each article carefully and writing down the relevant items into Microsoft Excel spreadsheets. The data that were extracted are detailed in Table 4.2, and it includes the study ID, bibliographic references, type of m-service offered, mobile technology channel, study area, province, notable successes, challenges and access barriers.

No.	Field	Utilisation/ Project	Channel	Province	Noted Access Measurements and Barriers
1 ¹	Health	Momconnect, CovidConnect	App. SMS [one way]	National	Large population coverage. Select beneficiaries. NDOH support. Multistakeholder implementation.
2 ²	Education	Study of 450 students and 150 Teachers in High Schools	Tablet	Eastern Cape	Inadequate network connectivity. High cost of acquiring ICT facilities. Failure of the government to provide incentives. Lack of proper training.
3 ³	Education	ICT4RED	Tablet	Eastern Cape [rural]	Government support. Teacher skills training. Pilot deployment. School WiFi & server installations by program. Multistakeholder implementation.
4 ⁴	Various	SARS, DOE Matric Results, DHA Marriage status	SMS	National	Vibrant pilot implementation. Lack of m-government policy. Lack of project awareness - raising.
5 ⁵	Health	Cell-Life MAMA SMS, Project Masiluleke, SIMPill, MomConnect	SMS, App	Not Stated	Highest percentage of mHealth initiatives in Africa.
6 ⁶	Education	Study of 6 English teachers	Tablet, App	Limpopo	Government provision of ICT (tablets). Lack of training.

¹ Cachalia, F. and Klaaren, J., 2022. Digitalisation in the health sector: A South African public law perspective. *Potchefstroom Electronic Law Journal/Potchefstroomse Elektroniese Regsblad*, 25(1-25).

² Ojo, O.A. and Adu, E.O., 2018. The effectiveness of Information and Communication Technologies (ICTs) in teaching and learning in high schools in Eastern Cape Province. *South African Journal of Education*, 38(1).

³ Botha, A. and Herselman, M., 2013, November. Supporting rural teachers 21st century skills development through mobile technology use: A case in Cofimvaba, Eastern Cape, South Africa. In *2013 International Conference on Adaptive Science and Technology* (pp. 1-7). IEEE.

⁴ Algeo, L., 2012. *Citizen Inclusion for all: Enhancing South Africa's e-Government Strategy with an m-Government Framework* (Doctoral dissertation, University of Birmingham).

⁵ Ojo, A.I., 2018. mHealth interventions in South Africa: a review. *Sage Open*, 8(1), 1–8.

⁶ Bejrajh, V. and Themane, M., 2022. Using Smartphones in Teaching English to Secondary School Students in South Africa. *Interdisciplinary Journal of Education Research*, 4, pp.76-90.

7 ⁷	Education	Study of 17 schools	Smart Phones	Limpopo [rural & peri urban]	Lack of funding. High cost of internet access. Discrepancies between rural and urban students. Lack of detailed m-learning policy.
8 ⁸	Education	Study of 197 teachers in 24 schools	Tablets	National except for Mpumalanga and Western Cape	Lack of teacher training. Lack of government ICT provision in rural areas.
9 ⁹	Education	DrMath – Mthuto, MELFA	App	National	Lack of teacher training both rural and urban. Collaboration, Multilingual applications.
10 ¹⁰	Education	Study of teachers in 34 secondary schools	Tablet	Tshwane	Lack of internet access in classrooms. Lack of funding. Power failures and low network coverage. Student distracted by technology. High data cost. Student digital illiteracy. Lack of ICT security. Discrepancies in the selection of schools to receive government provided ICT.
11 ¹¹	Health	MomConnect; Cell-Life MAMA	SMS, USSD, Voice	National	Free, high facility coverage, poor network coverage, integration of information systems to support MCH clinical services, strong government support and partnerships, limited language diversity.
12 ¹²	Education	ICT4RED	Tablet	Eastern Cape [rural]	Teacher training. Pilot and co-creation implementation. Government support and provision of resources (tablets and servers). Donor funding. Open source.

⁷ Beyers, L.J.E. and Hlala, S., 2015. E-learning Evaluation in the Department of Education Limpopo Province. *Journal of Communication*, 6(1), pp.164-171.

⁸ Mwapwele, S., Marais, M., Dlamini, S. and Van Biljon, J., 2019, May. ICT support environment in developing countries: The multiple cases of school teachers in rural South Africa. In *2019 IST-Africa Week Conference (IST-Africa)* (pp. 1-12). IEEE.

⁹ Jantjies, M. and Joy, M., 2016. Lessons learnt from teachers' perspectives on mobile learning in South Africa with cultural and linguistic constraints. *South African Journal of Education*, 36(3). 1-10

¹⁰ Padayachee, K., 2017. A snapshot survey of ICT integration in South African schools. *South African Computer Journal*, 29(2), pp.36-65.

¹¹ Kabongo, E.M., Mukumbang, F.C., Delobelle, P. and Nicol, E., 2019. Understanding the influence of the MomConnect programme on antenatal and postnatal care service utilisation in two south African provinces: a realist evaluation protocol. *BMJ open*, 9(7), 1-9.

¹² Isaacs, S., Roberts, N. and Spencer-Smith, G., 2019. Learning with mobile devices: A comparison of four mobile learning pilots in Africa. *South African Journal of Education*, 39(3).1-10.

13 ¹³	Health	MomConnect	SMS [2 way], USSD	National	NDoH endorsement. Integration into the health system. Donor funding,
14 ¹⁴	Education	MobilED, Dr Maths, HaDeDa,	SMS, App	Gauteng	Gauteng government commitment. Not multilingual for the most part. No training. Limited tangible government support. Lack of comprehensive m-learning policy. High data cost.
15 ¹⁵	Education	Individual interviews (teachers) and focus group interviews (learners)	Tablets	Tshwane	Lack of student training. Inadequate teacher training. Discrepancies in device distribution. Inadequate internet connectivity at school. Distracted students.
16 ¹⁶	Health	MAMA, ChildConnect; MomConnect, MalariaConnect, Covi-id;	SMS; App	National	Literacy and Multilingualism barriers esp. in rural areas. High cost of mHealth for facility. Understaffed and poor health services. Intermittent internet connection. Limited funding and relatively high implementation cost. High cost for individuals accessing health services via mobile applications. Insufficient health financing impacting the utilization of mobile health applications esp. rural areas. Lack of adequate access to phones and tablets that could support health applications. Lack of interoperability of digital tools. No awareness raising.
17 ¹⁷	Health	Ward-Based Outreach Teams	App, tablets	North West [rural]	Lack of integration of new technology with existing information systems. Lack of

¹³ Barron, P., Peter, J., LeFevre, A.E., Sebidi, J., Bekker, M., Allen, R., Parsons, A.N., Benjamin, P. and Pillay, Y., 2018. Mobile health messaging service and helpdesk for South African mothers (MomConnect): history, successes and challenges. *BMJ global health*, 3(Suppl 2), p 1-6.

¹⁴ Lawrence, D., 2016. Students' experiences of using mobile phones for Afrikaans vocabulary development. *Journal for Language Teaching*, 50(1), pp.79-101.

¹⁵ Msiza, G.M., Malatji, K.S. and Mphahlele, L.K., 2020. Implementation of an e-Learning Project in Tshwane South District: Towards a Paperless Classroom in South African Secondary Schools. *Electronic Journal of e-Learning*, 18(4), pp 299-309.

¹⁶ Mbunge, E., Batani, J., Gaobotse, G. and Muchemwa, B., 2022. Virtual healthcare services and digital health technologies deployed during coronavirus disease 2019 (COVID-19) pandemic in South Africa: a systematic review. *Global Health Journal*.102–113.

¹⁷ Tshikomana, R.S. and Ramukumba, M.M., 2022. Implementation of mHealth applications in community-based health care: Insights from Ward-Based Outreach Teams in South Africa. *Plos one*, 17(1), p.1-15.

					sustainable funding. Lack of appropriate leadership. No co-creation. Adequate training. Poor internet connectivity. Discontinued pilot.
18 ¹⁸	Municipal Services	Mobi-SAM	SMS, App	Eastern Cape	Pilot deployment. Co-creation & multistakeholder implementation. Training for municipal workers and citizens. Integration into municipal strategy. Government resistance.
19 ¹⁹	Municipal Services	Mobi-SAM	App, SMS	Eastern Cape	Co-design. Pilot deployment. Training provided. Inadequate municipal responsiveness.
20 ²⁰	Health	MomConnect	USSD, SMS	National	High cost of data. Inadequate internet connectivity. Unreliability of USSD. Inadequate training for health workers. No pilot. Smooth integration process. Donor funding. Subsidised services. High literacy rates. Government support. Multilingual mobile channels.

Table 4.2 Overview of information collected about each of the selected articles

4.6 Limitations

This study has some limitations. The research is limited in time and design scope, as the literature review primarily consisted of mHealth and m-learning studies that were published within a 10-year span. Oversight on the part of the author in selecting studies for inclusion in this review is also not improbable. Additionally, m-government is a new area of research with limited studies that have been carried out. Moreover, studies that are present, focus on m-government as a general concept, rather than its relationship to service delivery access. Therefore, even fewer studies focus on government and service delivery in South Africa. As a result, this study cannot be seen as a thorough and complete literature review of the current m-government literature but should rather be regarded as an assessment of the m-government's potential to facilitate service delivery in South Africa.

¹⁸Pade-Khene, C., 2018. Embedding knowledge transfer in digital citizen engagement in South Africa: Developing digital literacy. *Reading & Writing-Journal of the Reading Association of South Africa*, 9(1), pp.1-9.

¹⁹ Thinyane, H., 2017. MobiSAM: Reflections from a four-year case study using technology to increase public participation in local government in South Africa. *The Journal of Community Informatics*, 13(1), pp.25-49.

²⁰ Ezezika, O., Varatharajan, C., Racine, S. and Ameyaw, E.K., 2022. The implementation of a maternal mHealth project in South Africa: Lessons for taking mHealth innovations to scale. *African Journal of Science, Technology, Innovation and Development*, 14(7), pp.1798-1812.

4.7 Summary

The PRISMA model was used to identify, select and synthesise relevant studies – twenty unique studies to answer the research questions regarding m-government implementation in South Africa. Figure 4.1 summarises the research methodology.

Chapter 5 Findings and Discussion

5.1 Introduction

This chapter provides an analysis of the twenty studies from the SLR. The findings attempt to respond to the research questions and address the research objectives. Digital inclusion factors are examined, and a discussion is presented on emergent access barriers. Finally, a summary concludes this chapter.

5.2 Identified m-Government programs in South Africa

5.2.1 Education

A plethora of m-learning applications have been developed and deployed in South Africa. Algeo (2012) mentions one of the only national-scale m-learning initiatives, which is the SMS notification of matric results. While Lawrence (2016), Jantjies and Joy (2016) point out a number of m-learning platforms that have been deployed sporadically across the country. Lawrence (2016) highlights MobileED and HaDeDa, which are both audio-based m-learning applications. MobileED was designed to provide learners with feature phone access to the Internet. An audio Wiki platform was created where learners could send an SMS with a search term to Wikipedia, and the server then responds with a return call where the article is read using a speech synthesiser. HaDeDa, on the other hand, enables teachers to create a spelling list in English or Afrikaans, which the application would sound using multiple text-to-speech engines. Mathematics m-learning tools were also mentioned by Jantjies and Joy (2016) as well as Lawrence (2016). Dr. Maths is noted as a CSIR supported platform that enables learners to access real-time math tutoring in English, while mThuto allows high school learners to access different customised mathematics mobile resources such as class notes.

5.2.1.1 Motivation Access

Jantjies et al (2016) and Bejrajh and Themane (2022) found that South African teachers were not motivated to use mobile technology in the classroom. First, the teachers believed that they were too inexperienced and lacked the appropriate knowledge to facilitate and support learning using tablets. Second, teachers also felt that they were too old to learn how to use these technologies, and therefore they were anxious to attempt using m-learning applications for fear of failing or making mistakes in the class. In contrast, Bejrajh and Themane (2022) noted that

the presence of mobile technologies in the classroom brought about a new and positive attitude towards learning for learners.

5.2.1.2 Material Access

Isaacs, Roberts, and Spencer-Smith (2019) together with Botha and Herselman (2013) focus on ICT4RED, an m-learning program that was implemented by the CSIR Mereka Institute. The program would serve as a test-bed to garner appropriate insight on how government could create a holistic, digital education system that would later be replicated in other provinces. The schools involved in the ICT4RED pilot were from the Cofimvaba School District in the Eastern Cape, and they were provided with tablets, a local Wi-Fi network, a content server and a charging and safe storage station (Isaacs et al, 2019; Botha et al, 2013). Isaacs et al (2019) explored how these materials enabled schools not only to minimise Internet costs, but also to create an Internet-like experience via servers.

Scholars such as Msiza (2020) and Beyers (2015), are adamant that South African m-learning programs cannot be successful, unless all the learners at every school are allocated tablets and ICT. However, according to Beyers (2015), Padayachee (2017) and Msiza (2020) this is not always the case. The authors indicate that South Africa's m-learning program is generally plagued by high material distribution discrepancies, where some schools are provided with tablets and relevant ICT devices to facilitate program implementation, while other schools are not. This affects the quality of m-learning as teachers, especially in rural areas, often have to resort to using their own tablets, mobile phones and data to access material for lessons or any other m-learning tool that will enhance the learning experience (Mwapwele, 2019; Padayachee, 2017; Msiza, 2020). Another material access issue that has developed in South African schools is theft of the devices (Padayachee, 2017; Msiza, 2020).

5.2.1.3 Skills access

Various researchers such as, Ojo and Adu (2018), Bejrajh and Themane (2022), Jantjies, et al (2016) and Mwapwele, Marais, Dlamini, and Van Biljon (2019), noted that teachers in both rural and urban schools, complained about a lack of adequate training in m-learning programs. For instance, Msiza, Malatji, and Mphahlele (2020) indicated that the teachers in their study only received one-week training, which was not adequate to help them master the skills or have the ability to transfer knowledge to students. According to Mwapwele et al (2019) and Beyers

et al (2015), urban teachers are in a better position to use digital learning methods, even when there is minimal training, whereas rural teachers are not. Rural teachers are cited as having to rely on family and friends, faith groups, and businesses selling and fixing ICTs in the community to supplement their training. Furthermore, Msiza et al (2020) and Padayachee, (2017) warn that while teachers may receive training, albeit inadequate, learners do not receive any training. Most m-learning projects assume that all learners can use the tablets. Thus, learners are often required to depend on baseline knowledge acquired through mobile phone usage. However, the authors further note how this disadvantages rural learners or learners from relatively deprived backgrounds that have had limited exposure to mobile technologies and were often using certain devices for the first time.

On the other hand, Isaacs et al (2019) and Botha et al (2013) demonstrate how ICT4RED provided adequate training for teachers, instructional tutors, and district officials, through a mixed learning environment that included in-person training workshops, online collaborative spaces and support programs. The initiative also offered a professional development program that provided teachers with professional training modules.

5.2.1.4 Usage Access

Studies by Mwapwele et al (2019), Lawrence (2016), Jantjies et al (2016), and Bejrajh et al (2022) indicated prolific and varied m-learning usage by teachers, especially in rural schools. These teachers use various m-learning platforms to stimulate learning and participation. For example, teachers used WhatsApp to enhance collaborative engagement, and learners could also watch videos for English or drama lessons to stimulate effective classroom discussions. Additionally, teachers used audio recordings for listening comprehension in English, or they provided homework that required the use of online videos and textbooks for research (Jantjies et al (2016) and Bejrajh et al (2022)). Thus, teachers were able to overcome the limitations of traditional teaching methods. Nonetheless, Lawrence (2016), Beyers et al (2015) and Ojo et al (2018) state that learners are often distracted by the presence of mobile technologies, and they sometimes use these technologies for non-educational purposes.

5.2.2 Health

Kabongo, Mukumbang, Delobelle, and Nicol (2019), and Cachalia and Klaaren, (2022) indicate that South Africa has a vibrant mHealth landscape with about 83–93 existing mHealth

services – the highest in Africa. Many South African mHealth projects have received international acclamations because of their potential to improve health outcomes, particularly in HIV/AIDS and maternal and child health (MCH) areas. These projects include Cell-Life MAMA SMS (MAMA) and MomConnect, which are both MCH initiatives aimed at providing messages to pregnant women to help them improve their health and that of their babies (Cachalia et al, 2022; Kabongo et al, 2019). Other internationally acclaimed mHealth initiatives include Project Masiluleke, a specialised text messaging project aimed at combating HIV/AIDS, as well as SIMPill, a medication adherence solution (Cachalia et al, 2022; Kabongo et al, 2019).

5.2.2.1 Motivation Access

Many factors have led to the success of South Africa's mHealth field, but motivation has played a significant role in the proliferation of mHealth initiatives. Ezezika, Varatharajan, Racine, and Ameyaw (2022) found that South African citizens are motivated to use mHealth tools, especially those related to MCH, because these initiatives have content that the patients truly need during a specific time of their lives.

5.2.2.2 Material Access

Ezezika et al (2022) and Mbunge, Batani, Gaobotse and Muchemwa (2022) explain how limited funding has contributed to many mHealth interventions that have been deployed without giving users the required devices or resources, like Internet access. Therefore, high data cost and the subsequent cost to individuals for both healthcare workers and patients are a challenge that creates disparities in access to mHealth services, especially in rural South Africa. Nevertheless, Ezezika et al (2022) and Mbunge et al (2022), Cachalia et al (2022) and Barron, Peter, LeFevre, Sebidi, Bekker, Allen, Parsons, Benjamin and Pillay (2018), all highlight how South African mHealth interventions predominantly incorporate cost-efficient channels such as SMS and USSD, which enable access to a wider reach of users. Baron et al (2018) and Ezezika et al (2022) highlight how MomConnect is one of the few mHealth initiatives to reduce the cost to individuals by subsidising the costs of SMS and USSD via reverse-billing to MomConnect service providers, rather than to end-users, so they could deliver their services free of charge to the user.

However, Baron et al (2018), Ezezika et al (2022), and Mbunge et al (2022) also state that there are limitations that mHealth projects face when using these cost-effective channels. For

instance, USSD is prone to network and user timeouts, which disrupt services and discourage users. Additionally, SMS not only limits the length to 160 characters, but it also has no economies of scale associated with its cost, making it a significant cost driver. Kabongo et al (2019), Mbunge et al (2022), Baron et al (2018), Ezezika et al (2022) as well as Tshikomana and Ramukumba (2022), cite other material access barriers such as poor network coverage, which can delay the execution of services in some instances. Moreover, some healthcare workers complained about the size of the screen and keypads, creating data entry challenges. Furthermore, Baron et al (2018) note how mHealth programs are not yet able to handle changes to SIM cards, which often leads to the disruption of services or loss of users.

5.2.2.3 Skills Access

Tshikomana and Ramukumba (2022) point out how healthcare workers from the Ward-based Primary Healthcare Outreach Teams (WBPHCOT) mHealth project expressed that they were adequately trained on the basic functionalities and operational processes of the mobile application. Additionally, those who struggled following the training, were able to receive help from their peers through group chats, or by approaching team leaders for additional information. However, Ezezika et al (2022) and Mbunge et al (2022) argue that in most mHealth interventions, healthcare workers experience inadequate training or different levels of training which affects the standard of service delivery.

5.2.2.4 Use Access

All mHealth studies agree that South Africa has a burgeoning landscape, with interventions ranging from client communication, personal health tracking, and on-demand information services. Kabongo et al (2019) and Cachalia et al (2022) further acknowledge that the mHealth initiatives experience a high rate of use. Cachalia et al (2022) focus on MomConnect and states how it is amongst the top five mHealth programs to have globally scaled to over one million beneficiaries, as well as the only program in the world that has attained population-level coverage of more than 60%. Mbunge et al (2022) and Cachalia et al (2022) confirmed that the high use of MomConnect has enabled informed healthcare improvements through its real-time data collection capabilities. Kabongo et al (2019) support this by highlighting a 2016 report that demonstrates the ways in which MomConnect enables patients to manage their health and that of their babies better. Correspondingly, Kabongo et al (2019) noted that the use of MAMA has not only indicated to improve health-seeking behaviour in pregnant women, but it has also

increased the use of skilled birth attendants for delivery and adherence to recommended ANC and PNC visits. Mbunge et al (2022) and Tshikomana and Ramukumba (2022) mention other mHealth interventions, such as WPHCOT and MalariaConnect, which have both encouraged the supervision and monitoring of target diseases. WPHCOT provides healthcare workers with electronic forms for efficient data entry, while MalariaConnect assists in malaria reporting and notifications. Mbunge et al (2022) and Cachalia et al (2022) also found that corona virus (Covid-19) ushered in a plethora of mHealth applications that focus on reporting, contact tracing, predictive analytics, mobile forms, referrals, etc.

5.2.3 Other m-Government Initiatives

South Africa has implemented a variety of m-government initiatives outside mHealth and m-learning. Algeo (2012) mentions the South African Revenue Service's (SARS) SMSs alert and notify citizens and businesses of the status of their tax returns, and he mentions how this m-government component was integrated into the larger e-government e-filing initiative. Algeo (2012) further mentions the Home Affairs SMS notification and querying facilities regarding the status of a diverse range of applications. However, this section focuses on how m-government is used for municipal services. Studies conducted by Thinyane (2017) and Pade-Khene (2018) focus on MobiSAM, an initiative located in the Eastern Cape Province. The MobiSAM application and SMS gateway enable two-way communication, allowing residents to report problems with service delivery issues directly to their local government, and receiving updates on reported cases.

5.2.3.1 Motivation Access

Before the start of the pilot, Thinyane (2017) and Pade-Khene (2018) indicate that a baseline study as well as a needs assessment were conducted to ascertain the key issues and possible constraints. The results indicated that the majority of residents in Makhana were dissatisfied with the level of service delivery, but they also indicated that most residents and municipal officials were already using mobile phone technology and data services (Thinyane, 2017; Pade-Khene, 2018). Therefore, MobiSAM was developed to elevate systemic service delivery issues in a way that was accessible to the majority of the Makhana residents. This approach served as a motivator for residents to use MobiSAM, and Thinyane (2017) confirms that residents and service providers were enthusiastic to have a mobile phone-based communication channel with the municipality. Furthermore, the Complaints and Communications Sections of the

municipality were also enthusiastic to support citizens in reporting problems with service delivery. Nonetheless, both Thinyane (2017) and Pade-Khene (2018) found that other workers in the municipality viewed MobiSAM as a threat and were thus resistant to using the tool.

5.2.3.2 Material Access

Thinyane (2017) analyses how the baseline study informed programmatic decisions. The author describes how the study enabled implementers to identify that 90% of residents in Makana owned a mobile phone, which further assisted in identifying the most popular operating system, and whether residents had access to data services. Based on the results, it was concluded that there was no need to provide mobile phones given the high mobile penetration; however, the initiative deployed MobiSAM using different channels, such as SMS, a mobi-site, a website and a cross-platform application. Nevertheless, this presented issues of differential access, as Thinyane (2017) points out that the mobi-site is dependent on the capabilities of the Internet browser installed on a mobile device, and does not offer full access compared to the desktop website. The author argues that this results in different users that have access to varying functionalities depending on the capabilities of their mobile phone. Likewise, the mobile application can only be fully accessed on smartphones; however, the SMS gateway was developed to provide support for feature phones (Thinyane, 2017).

5.2.3.3 Skills Access

The MobiSAM program incorporated various forms of training for various stakeholders. Thinyane (2017) indicated that staff from the Communications Department were given two months of training on how to use MobiSAM. The training included learning how to register users and how to access reports on service delivery outages, and later progressed to include training-the-trainer, where the staff were taught how to teach other people to use MobiSAM. Both Thinyane (2017) and Pade-Khene (2018) confirmed that the training extended to community development workers (CDWs) or ward liaisons, who were hired by the government to raise awareness about MobiSAM and to assist residents in using the platform. CDWs were provided with the same training content as municipal workers, however, it was only over the course of two days (Thinyane 2017; Pade-Khene 2018).

5.2.3.4 Usage Access

Thinyane (2017) and Pade-Khene (2018) describe how the residents of Makhana Municipality saw the value of the various MobiSAM platforms and thus began using MobiSAM as a point of call for reporting service delivery issues (Pade-Khene, 2018). Similarly, civil societies such as the Grahamstown Residents Association (GRA), Public Service Accountability Monitor (PSAM), and Black Sash (BS), also began inviting MobiSAM as a strategic partner in their civic workshops, as the data gathered from the platform were used to follow up on unaddressed issues or lobby for key services (Pade-Khene, 2018).

5.3 Identified Access Barriers affecting South Africa's m-Government programs

5.3.1 Limited funding and Sustainability

Mbunge et al (2022), Tshikomana et al (2022), Beyers et al (2015), and Botha et al (2013) all agree that mobile technologies were found to be useful in extending care to poor and remote rural South African communities. However, Beyers et al (2015), Ojo et al (2018), Msiza (2020) and Padayachee (2017), warned that the lack of funding for m-government programs threatens to worsen the existing digital divide and continue unequal access opportunities, especially in rural areas. Mbunge et al (2022) explain that digitisation of public services requires a relatively high implementation cost, because programs need to purchase devices and software, adopt and scale up digital technologies and other necessary operations to roll out the programs. However, Beyers et al (2015) and Msiza (2020) and Padayachee (2017) state that not many projects in South Africa have received upfront and consistent investments, which results in a high cost to individuals to access the programs, especially in rural areas. Nonetheless, Isaacs et al (2019) defend South Africa's m-government programs by highlighting that the programs actively target rural and/or peri-urban communities, and furthermore, they attempt to utilise affordable access strategies ranging from low-cost platforms that are accessible on feature phones.

Two studies, namely Mbunge et al (2022) and Barron et al (2018) examine South Africa's sustainability issue. They argue that even in m-government programs such as MomConnect, which have large donor capital, South African m-government initiatives do not have sustainable financing models, therefore, they cannot continue without private or donor funding.

5.3.2 Lack of interoperability and integration of digital tools.

Beyers et al (2015) and Ezezika et al (2022), identified the integration of m-government programs into existing information systems as an enabler for project growth. Nevertheless, Mbunge et al (2022) argued that most of South Africa's m-government solutions cannot interoperate. Baron et al (2018), Ezezika et al (2022), and Kabongo et al (2019) confirmed that MomConnect is one of the only programs designed with integration in mind, and it details how this has contributed to make the initiative a national real-time data collection platform that provides linkages to additional services for over a million patients in over 90% of health facilities in South Africa. Thinyane (2017) and Pade-Khene (2018) also reported how the key data generated by MobiSAM, led to discussions about integrating the tool into the municipality strategy and system.

However, Thinyane (2017) and Pade-Khene (2018) describe the resistance that the tool encountered from key stakeholders such as the CDWs and municipal councillors. They felt threatened by MobiSAM, because they believed it could divert the flow of information around them, thus subverting their authority in their community. Thinyane (2017) defends the civil servants who implement the work of the municipality, and he explains that they supported the program, but it was rather the elected members of the municipality who were resistant. Accordingly, Kabongo et al (2019) demonstrate the importance of m-government programs to be adopted by governmental leadership. The authors, together with Ezezika et al (2022), suggest that MomConnect was successful because it received high-level government support as an official instrument of the state health system, however, few programs are able to do so.

5.3.3 Inadequate policies

Algeo (2012) notes that the implementation of m-government is not guided by a national m-government framework, which the author believes will limit m-government programs, especially in terms of scalability. Other authors, such as Ojo (2018), Msiza (2020), Padayachee, (2017) and Beyers, et al (2015), further examine other areas where m-government is hampered by a lack of adequate legislation. These authors, along with Lawrence (2016), focus on the non-educational use of mobile technologies in classes, which has the potential to stifle m-learning usage access. Thus, they suggest that South Africa should design a policy that guides the monitoring of mobile technologies and allows the enforcement of strict and correct usage of the devices at school by both learners and educators.

5.3.4 Language Barriers

Lawrence (2016), Ezezika et al (2022), Mbunge et al (2022), Jantjies et al (2016), and Mdlongwana (2012) analyse the language barriers that exist in most South African m-government initiatives. The authors conclude that these initiatives are not always available in multiple vernacular languages, but are rather deployed in English, which affects their successful use and integration, especially in rural areas. Ezezika et al (2022) demonstrate that there are projects that have an additional language; however, he confirms that these too encounter language barriers brought on by inaccuracies with the translation. Ezezika et al (2022) and Jantjies et al (2016) further confirm that the multiplicity of official languages, as well as the verification of language translation, have contributed to the success of initiatives such as MomConnect, which is currently administered in nine official languages. Baron et al (2018) and Ezezika et al (2022) also put forward the importance of literacy and how the success of South Africa's m-government programs may also be a result of South Africa's high literacy rates.

5.3.5 Minimal Scalability

Jantjies et al (2016), Isaac et al (2019), Botha et al (2013) and Pade-Khene (2018) identify how South African m-government programs are usually implemented through a pilot model that not only requires conducting baseline studies but is very iterative and incremental in the development and deployment. These authors alongside, Cachalia et al (2022), Thinyane (2017) and Kabongo et al (2019), demonstrate how this model allows for greater stakeholder consultation with a broad spectrum of users including academia, government, private sector, community members, etc. The approach is said to also allow for comprehensive evaluation, which ultimately ensures that the correct tool is designed for both the community and the context and encourages replicability and scalability of the project (Botha et al, 2013; Thinyane 2017).

However, Thinyane (2017) and Tshikomana et al (2022) argued that this is often not the case, as most of South Africa's m-government pilots are neither replicated nor scaled. Kabongo et al (2019) confirm how South African m-government programs either continue with various rounds of iteration or are discontinued, even when they are beneficial. Ezezika et al (2022) and Baron et al (2018) report that MomConnect is the only project in South Africa that has

rapidly reached national scale, and they further reflect on how MomConnect did not follow the traditional pilot model. Instead, it was designed to promote universal coverage and built to scale, which is believed to have enabled its large-scale growth.

5.3.6 Poor state of public services

Three studies argue that some of South Africa's m-government barriers go beyond the limitations of mobile technology itself but are caused by general challenges that are found within South Africa's public service system. For instance, Tshikomana et al (2022) and Mbunge et al (2022) explore how healthcare workers using mHealth tools complain about the poor state of health services, primarily brought on by facilities that have inadequate health infrastructure and staff shortage. Padayachee (2017) on the other hand, details how teachers lamented about the lack of time with respect to workload, interruptions during the school year, as well as power failures.

5.4 Summary

This chapter describes the findings of the study to determine whether South Africa's m-government initiatives are providing access to public services for all citizens. The chapter analyses m-government programs using a digital inclusion perspective. Findings on motivation, use, material and skills access were presented. In addition, key access barriers were discussed. All the aspects discussed in this chapter have been described in greater detail in previous chapters; however, this chapter sought to further analyse the contributors or inhibitors to m-service accessibility in South Africa.

Chapter 6 Conclusion

6.1 Introduction

This chapter concludes by describing how the research questions and objectives are met. Recommendations for policy directions and practical deployment are also discussed. Furthermore, the revisited framework, implications and significance of the research are presented. Finally, future research areas of interest are discussed.

The paper examined whether South Africa's m-government strategy is improving access to public services for all citizens. To respond to the question and to address the objective, a systematic literature review was undertaken. The main findings are as discussed in Chapter 5.

6.2 Conclusions

Since the advent of democracy, the South African government has committed to deliver public services to all citizens. Accordingly, South Africa has successfully leveraged mobile technologies to provide access to public services, particularly in previously underserved communities. South Africa's m-government initiatives have proven to encourage and facilitate the use of mobile technologies for health delivery, learning and civic engagement. However, very few initiatives have been replicated, retained, or reached national scale, despite the success and insights gained. This has created an environment in which the country has a plethora of siloed, ad hoc and small-scale m-government programs that do not provide widespread access points for the larger South African population, thus failing to achieve the m-government objective to provide access to public services for all citizens.

6.2.1 The challenges of South Africa's m-government projects

The results of this review indicate several factors that hinder South Africa's m-government strategy from ensuring access to public services for all citizens. First, the short-term nature of m-government projects demonstrates a lack of long-term government commitment and earmarked funding that hamper the scalability of projects. Without government support, many programs are unable to integrate into larger existing government information systems and strategies, thus diminishing their potential reach. Many m-government programs encounter resistance from government officials who are threatened by the implementation of these initiatives which are often concluded following the pilot stage. The only m-government

program to accomplish virtual universal access is MomConnect, proving that a government-championed model can lead to rapid deployment, integration and scale.

Second, most South African m-government programs receive minimal funding which limits the procurement of relevant devices, infrastructure and services which cause a high cost to individuals accessing m-services. Contrastingly, m-government programs that do receive funding have no significant business model that would ensure sustainability beyond donor involvement, which only continues the cycle of short-term projects that provide access to a siloed community and which fail to reach a larger demographic.

Third, language diversity remains a challenge in m-government programs as most of the tools and services are predominantly in the English language. This contributes to the exclusion of people who could access these services if they could understand the language that is used.

6.2.2 Bridging the digital divide

The study's findings also illustrate that South Africa's m-government programs experience inconsistencies to ensure comprehensive digital inclusion. Although these programs have digital training as a prerequisite, training is not always regarded as adequate by most users. Following training, most users cite how they are often left with a feeling of lacking the necessary operational and strategic digital skills needed to effectively carry out services. This not only limits their ability to use m-government tools extensively, but also leads to differential access where different users have varying levels of skills access within and between various m-government projects.

Similarly, South Africa's m-government programs are further plagued by discrepancies in the provision of hardware and general infrastructure, as certain initiatives are given to devices, servers and Wi-Fi installations, whereas other programs are not. Therefore, those without appropriate materials experience sporadic access owing to connectivity and coverage issues, which are especially prevalent in rural areas. Additionally, South African m-government users often have to rely on their own personal devices, which also contributes to irregular access, due to the high cost of connectivity in the country. Although the South African government has supported the reduction of data prices, data affordability remains a barrier that restricts access for certain users who are only scarcely able to use m-services.

Most of South African m-government programs prioritise using the lowest barrier of entry, namely SMS, which has ensured the extension of m-services to poor and remote rural South

African communities that often only have access to feature phones. Nevertheless, in instances where programs incorporated m-applications that provide a richer G2C interaction, many users were prohibited from accessing the full spectrum of m-services, because they did not have the appropriate device.

6.2.3 Creating the right conditions to enable access to m-government

South Africa currently has no m-government legislation that guides the coordination and implementation of m-government initiatives. However, the government has enacted relevant legislation that has contributed to increased investment in ICT infrastructure and the proliferation of mobile phones in the country. The absence of an m-government policy has not prevented a vibrant m-government project landscape in the country, but it may be contributing to the haphazard implementation.

Nonetheless, South Africa has been successful in creating access points for service delivery through m-government, particularly in rural and marginalised communities. However, its programs currently do not ensure comprehensive access and true digital inclusion, but are rather plagued by issues of differential access, where different members of society have varying levels of access to m-services. Nevertheless, if the key issues of scalability, sustainability and programmatic inconsistencies are addressed, South Africa's m-government program has the potential to ensure greater universal access, digital inclusion, and delivery of public services for all citizens.

6.3 Recommendations

The following recommendations can support greater levels of access and digital inclusion in South Africa's m-government development and deployment:

- Government officials (practitioners in the public sector) need to work on the legal framework that governs m-government to ensure cohesive and integrated implementation of programs.
- Prioritisation of open-source software and open standards could enable an interoperable system that can grow and expand as technology and requirements change.
- Create awareness of the available digital health technologies that could be utilised to access remote m-services through marketing campaigns using signage, adverts and

press releases. A lack of opportunities and outreach among marginalised communities can exacerbate access barriers.

- There is a need for increased budgetary allocation to set up digital health technologies and implement ICT in schools to allow for proper use and effective operation of services.
- ICTs should be integrated into the curriculum of tertiary education and medicine programs to boost the confidence and competence of pre-service teachers and health-care workers.
- A national central portal that can integrate various government programs can help provide more efficient and streamlined m-government access.
- The South African government does not have an integrated monitoring and evaluation system specifically aimed at ICT. The government needs to prioritise evaluating the effectiveness of m-government programs, as the data received from these m-services can assist in generating quick responses, informing decision-making, and strengthening service delivery. An entity should thus be established to monitor these projects at all government levels. This will also help to avoid duplication and assisting with the coordination and improvement of m-services in South Africa, especially since projects are spearheaded by various stakeholders and government departments.

6.4 Future Research

This study was able to add to the body of knowledge by departments the need for this type of research. However, this study proposes potential future research that can be conducted as follows:

- Deeper knowledge of financial models is needed to develop insight to ensure sustainability of m-government initiatives without subsidy from a stakeholder as a long-term investor.
- Further research into the significance of the “government championed” model is needed to better understand what it means for integration and scalability.
- Future research could investigate regional collaboration in mobile services and what it could mean for the multilingual development of m-government applications. There are several clusters of countries in sub-Saharan Africa that share common languages or

common mobile network providers, and more research should be conducted to develop specific strategies that leverage this opportunity.

- Further examination of community Wi-Fi networks near clinics and schools could develop insights for alleviating connectivity issues, particularly in rural areas.

6.5 Research Implications

Due to a lack of studies on mobile government in South Africa, this research provided an in-depth investigation of the accessibility dimension to provide a comprehensive understanding of the related attributes of successful public service delivery through mobile phones. Accordingly, this research also proposed factors for successful m-government implementation. The research outcomes would help guide policymakers and implementers to make informed decisions when considering m-government deployment. Furthermore, the studies that exist on South Africa's m-government are limited to program evaluation, while this research provides a more generalised perspective by identifying and evaluating various m-government services implemented across South Africa. The findings from this research contain significant contextual learning towards the wider adoption of m-government in South Africa.

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