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Recommendations for M-Government Implementation in Developing Countries: Lessons Learned from the Practitioners

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Abstract. Researchers argue the potential of mobile technologies to bridge challenges of e-government in developing countries. Despite the demand, research on the design and implementation of m-government is still scarce. The current literature hardly provides comprehensive recommendations for implementing such services in developing countries. This paper aims to bridge the gap by examining the challenges of m-government services from the m-government practitioners of developing countries. Also, it explores the solutions applied by the practitioners to address the challenges. To achieve these goals, online questionnaire and interviews techniques were used to collect data. MAXQDA tool was used to analyze raw data, and we applied the PESTELMO method to categorize the challenges. Results show that designers are facing problems related to requirement engineering, stakeholder management, budget allocation and technology standards. We provide recommendations to improve m-government designs in the future to ensure accessibility and sustainability of services. The recommendations are applicable to government organizations and practitioners of mobile public services.

Keywords: m-government, m-government design and implementation, recommendations of m-government services, m-government challenges.

1 Introduction

Researchers argue that the dissemination of mobile devices in emerging economies is far greater than desktop and other ICT devices for accessing public services, also known as e-government devices (see statistics of mobile users in Africa¹ and [CITATION Uni12 \l 1033]). The massive increase of mobile penetration in such countries strengthens the connectivity of government to people [CITATION UN10 \l 1033]. People can now access public services via mobile devices, also referred to as m-government [CITATION Kus03 \l 1031]. M-government tackles existing challenges of e-government such as the digital divide, immobility nature of e-government devices and a high cost of the devices and infrastructure in developing countries [CITATION OEC11 \l 1033 \m Uni12 \m Eur15].

Whilst for a developed nation, where all ‘e’ and ‘m’-government services are assumed to be available everywhere, the same cannot be said of emerging economies [CITATION OEC11 \l 1033 \m Zef11]. In the latter, e-government infrastructure may exist in urban areas; large areas of potentially barren rural areas are better and more effectively served by m-government. To accomplish this, a guidance to cope with prevailing country context such as political, economic and environmental conditions during design process is imperative.

The literature presents challenges of m-government services; these include challenges reported by end-users (cf. [CITATION Isa17 \l 1033]), which are the results of poor designs implemented by designers, developers and architects of m-government services, also referred to as m-government practitioners in this paper. These practitioners are the key players in designing the services. They are expected to understand objectives, examine functional requirements of services thoroughly and derive non-functional requirements that contribute to smooth operation of application and services [CITATION Isa183 \l 1033]. Since these practitioners are playing a major role, it is essential to identify and analyze their challenges which leads to poor designs. Such investigation of designers’ challenges is scant in the literature at the point of writing this paper.

This paper presents part of the results of ongoing research in the design of m-government services in developing countries. The paper addresses the gap in the literature by conducting an empirical study from m-government practitioners to identify encountered challenges during the design process. The paper also explores solutions used to overcome the challenges. The objectives of this paper are narrowed into two research questions: *What are the challenges faced by the m-government practitioners which results to poor design and poor service usability? What recommendations can be provided to the practitioners to address the identified challenges?*

This paper contributes to the literature by providing empirical findings from m-government practitioners of developing countries. The paper proposes recommendations that can guide m-government practitioners in the design process. The reminder of the paper is as follows: Section 2 presents related work of m-government challenges and recommendations. Section 3 outlines research design applied to answer research questions whereas section 4 illustrates results from empirical study. Section 5 introduces set of recommendations to improve m-government services. Subsequently, research implication and conclusions are communicated in section 6.

¹ <https://www.gsma.com/mobileeconomy/sub-saharan-africa/>

2 Literature Review

According to the UN global e-government surveys, mobile devices are prominent in promoting equal access to service for citizens living in remote areas [CITATION Uni12 \m Uni14 \m UN18 \l 1033]. The previous survey unveiled the significance of broadband technology for sustaining e- public services in low economy societies[CITATION Uni163 \l 1033]. This is because the technology is cheaper than the previous e-government sophisticated connections. Also, Zefferer and Teuf pointed out the significance of a well-established mobile network infrastructure in enhancing communication between governments of developing countries and their people[CITATION Zef11 \l 1033]. Mobile devices such as cellphones were already successful used in these countries to transfer money (see in [CITATION Hug07 \l 1033]), thus, citizens are familiar with the technology. Therefore, developing countries should focus on delivering their services via mobile devices to promote Sustainable Development Goals² (SDGs) and overcome e-government challenges.

Developing countries responded to the call by introducing mobile public services in their societies. For example, USHAHIDI app is evidenced in Kenya to provide real-time information and quick response to communities during disasters through ping technology³. In Tanzania, citizens pay taxes and utility bills such as water and electricity via mobile transactions⁴; this improves the quality of service by saving time unlike cash payments. Likewise, India developed mobile public services ranging from information provision, interaction, transaction and engagement services in order to increase the efficiency and effectiveness of service delivery⁵.

Despite these initiatives in developing countries, several challenges exist on service design and implementation. For instance, research conducted in India on m-government revealed a lack of m-government strategy, poor awareness of services and a high cost of smart phones as challenges which hinder the adoption of the services [CITATION Sar13 \l 1033]. These challenges are similar to results from a study conducted in Sub-Saharan countries on m-government design that further determined poor security, a lack of predefined legal standards and poor collaboration and cooperation among public and private sector as bottleneck of m-government implementation [CITATION Mun14 \l 1033]. Our previous study categorized existing challenges of m-government design and implementation from literature comprehensively and urged the need to address them[CITATION Isa17 \t \l 1033].

The design and implementation of m-government services require a strategy which includes understanding the stakeholders of the services, particularly users, service provider and practitioners. Isagah and Wimmer pointed out the influence of practitioners to the usage of services since they are responsible in making major design decisions such as determining requirements and design characteristics[CITATION Isa183 \t \l 1033]. Their study also indicated the need for a well-designed back-end infrastructure to support the smooth delivery of government services. Their argument complements the previous study which stressed a need for a good foundation of ICT infrastructure and systems (e-government systems) for successful m-government implementation [CITATION Kum071 \l 1033]. Henceforth, m-government practitioners require both front-end (mobile application development) and back-end (information systems) to deliver successful services.

Despite the importance of m-government practitioners in the implementation of services, the current literature lacks research from the designers' perspective [CITATION Lön161 \l 1033]. The literature comprises m-government opportunities, drivers, challenges and design approaches such as framework and guidelines reported by end-users and service providers (see in[CITATION Bak14 \m Isa17 \t \l 1033]). Also, m-government practitioners lack a comprehensive knowledge of addressing the requirements[CITATION Isa183 \t \l 1033]. Thus, there is a need for identifying the challenges faced by these practitioners and exploring them in order to propose solutions. This paper bridges the gap by conducting such a study in the developing country. Accordingly, it proposes recommendations for improving m-government services. The objectives of this paper were achieved by applying methods elaborated in the next section.

3 Research Methods

This paper presents insights from the m-government survey which was conducted to study the design and implementation of m-government services. The target group was m-government practitioners from developing countries. We deployed mixed approaches to achieve the objectives: an online questionnaire and a follow-up interview protocol. The former aimed to investigate the crucial requirements, design approaches and challenges of m-government services. The questionnaire consisted of closed and open questions. It explored demographic details, designers experience on m-government services, m-government service design approaches, requirements of m-government services, challenges of m-government services and recommendations for m-government design. The questionnaire was set online using Lime Survey tool, and the link was shared via email to experts spotted online and in conferences, group email lists, and professional forums such as LinkedIn and Twitter. Fifty two (52) m-government practitioners responded to the online survey.

² <http://www.un.org/sustainabledevelopment/>

³ <http://www.itwebafrica.com/mobilex/309-kenya/231649-kenya-terror-attack-ushahidi-develops-emergency-app>

⁴ <https://www.tanzaniainvest.com/mobile-money>

⁵ <http://vikaspedia.in/e-governance/mobile-governance/mobile-governance-in-india-1>

Results from the online questionnaire were used to formulate interview questions. The aim was to deepen the understanding of m-government requirements from respondents and explore stakeholder management. Thus, interview participants were from respondents of online questionnaire. Twenty eight (28) respondents were willing to participate in the interview. We chose eighteen (18) experienced respondents (who have designed more than five services) from the list and reached them via email. The email included interview questions which respondents could respond via email or by scheduling the interview. Twelve (12) participants acknowledged the request and took part in the interview via Skype call and in person. We recorded the interviews and transcribed data for analysis. The transcribed documents were sent to respondents for content approval to ensure data reliability and validity.

With regard to data analysis, MAXQDA⁶ software was used to analyze quantitative and qualitative data. The data from the online survey was saved in the excel sheet and later exported to the MAXQDA tool for analysis. As for the interviews, transcribed documents were saved in the tool as documents, and we performed the analysis. The MAXQDA tool allowed us to generate codes that represented a particular context along the analysis. For example, a code challenge was generated to store all constraints of the of m-government services. These challenges were also categorized into other subcodes by using PESTELMO (Political, Economical, Socio-cultural, Technological, Environmental, Legal, Managerial and Organizational) factors[CITATION Placeholder8 \l 1031]. The method is used to structure the recommendations as well.

Since this paper focuses o the challenges and recommendations of m-government, we communicate results related to the objectives in the next section.

4 Results from the Questionnaire and Interview, and Discussions

A total of fifty two (52) respondents participated in the online survey. These participants answered at least ten (10) out of the fourteen (14) given questions. Among the (14) questions, few of them were optional. The demographic details of the respondents presented in this paper include country of residence and experience in designing m-government services. The former aims to inform the reader the origin country of respondents whereas the latter investigated the experience of the respondents in designing m-government services to support the reliability and validity of data. Respondents country of origin had no effect as the study focus on design processes which is mostly influenced by the experience. The questions were as follows.

- *In which country do you reside?*

Respondents were from the following countries along with the number of respondents: Tanzania (11), India (9), South Africa (5), Turkey (5), Uganda (5), Kenya (4), Brazil (3), Nigeria (2), Malawi (2), Pakistan (2), Afghanistan (1), Albania (1), Lebanon (1) and Uzbekistan (1).

- *How many mobile government services have you designed?*

Forty-two (42) respondents have designed more than one m-government service whereas ten (10) respondents have not yet designed any m-government services. In this paper, we present the challenges of the experienced group.

- *Please mention the utmost five design challenges of m-government services that you have experienced, or you might experience along your work*

The question aimed to understand challenges of m-government design and implementation depicted in Table 1.

Results from the online questionnaire were investigated further in a follow-up interview by identifying challenges that arise in addressing requirements of m-government services identified in[CITATION Isa17 \t \l 1033]. For each requirement, respondents were asked the following question.

- *What are the challenges of addressing (requirement) of m-government services?*

Error: Reference source not found depicts results from the respondents regarding challenges faced when addressing requirements. We further asked requested respondents to provide solutions to the challenges identified for each requirement. The question posed was: *What are the proposed solutions to overcome the challenges identified in the previous question?* Their feedback is presented subsequently for each requirement along with the number of respondents.

Usability: All respondents (12) indicated the need for stakeholder inclusion and engagement in deriving service objectives, requirements, and performing other important activities in the design process. The respondents also emphasized the significance of a rigorous pilot test to solve most of the challenges. Likewise, there is a need for service awareness (7 respondents) and the use of special code for government services (6 respondents) to promote the adoption of services in the society.

Table 1. Challenges of m-government design reported by respondents of the online questionnaire (N=42)

PESTELMO factors	Challenges along with number of experienced respondents
Political challenge	Lack of support from the government (7)
Economic challenges	Insufficient funds to support the design (8)
Socio-cultural challenges	Lack of user requirement (30) Poor user involvement (10)

⁶ <https://www.maxqda.com/>

PESTELMO factors	Challenges along with number of experienced respondents
	Poor user friendly applications (4) User illiteracy (20)
Technological challenges	Lack of service accessibility (10) Unclear measures of scalability (10) Poor user interface design (42) Improper measure for ensuring service performance (20) Poor security mechanisms (20) Incompatibility of applications in different devices (42) Unreliable infrastructure which leads to failure of network and low bandwidth (31) Poor integration measures (15) Lack of standards for sharing information (28) Poor content presentation (30) Lack of predefined standards for designing m-government services (35)
Managerial challenges	Poor communication among stakeholders (2) Government bureaucracy, which leads to failure to meet deadlines (20) Lack of understanding Term of Reference (1)
Organizational challenges	Lack of experts in the design and implementation of m-government services (8)

Interoperability: Four (4) respondents demanded interoperable layer that will store all the information from subsystems and provide authorized data to connected subsystems. Six (6) respondents revealed the need for data sharing standards that can be commonly used to design m-government services. Along with standards, collaboration and cooperation of stakeholders in the designing process is crucial (2 respondents).

Integration: All respondents indicated a need for organizations must plan the process, identify risks and mitigation strategies before integration. Additionally, two (2) respondents urged designers to build *e* and *m*- government as one system to ease integration processes.

Scalability: Five (5) respondents highlighted a need for testing the service in a similar number of expected users. Such an approach will help designers to understand scalability constraints at early stages. While observing expected users, four (4) respondents stressed not scaling beyond boundary, i.e., services are provided to the target group. Also, there is a need of infrastructure update to facilitate scalability (3 respondents) and a continuous monitoring of peak times (3 respondents) to provide reliable solutions to scalability.

Table 1. Challenges of addressing requirements of m-government services reported by interview respondents (N=12)

Usability	
Economic challenges	A lack of budget for designing m-government services (6) High cost of smart phone, which leads to inaccessibility of data channels (5)
Socio-cultural challenges	Illiterate users who cannot contribute to designing (5) A lack of service awareness to citizens (12)
Technological challenges	Unreliable m-government infrastructure (7) A lack of usability standards at government level (8) A difference in mobile technology capabilities such as screen size variation and different resolutions (10) Poor content presentation (3)
Managerial challenge	Service inaccessibility due to poor collaboration among network providers (12)
Interoperability	
Technological challenges	A lack of common standards for sharing data (10)
Managerial challenge	Poor willingness of sharing information among departments (8)
Organizational challenge	A lack of skilled labor who understands the context of interoperability (12)
Integration	
Technological challenge	A lack of integration measures in government departments (10)
Managerial	A lack of coordination and coordination among departments in

challenge	determining types of standards for integration (6)
Organizational challenge	A lack of experts to address the requirement (5)
Scalability	
Technological challenge	Poor infrastructure such as outdated hardware and software (8)
Organizational challenges	A lack of skilled set within an organization to address the requirement (6)
Security and Privacy	
Technological challenge	A lack of guidance to support the section of security measures for m-government services (7) Unreliable infrastructure, which threatens the security of services (5)

Security and privacy: All respondents indicated a need for training designers on new security measures and privacy techniques. Training produce informed practitioners regarding the requirements. Three (3) respondents further pointed out the use of cloud technology to secure services for countries which cannot afford security physical infrastructure.

The illustrated challenges in Table 1 and Error: Reference source not found rationalize the challenges of m-government services pointed out by researchers from developed and developing countries (see summary of challenges in[CITATION Isa17 \t \l 1033]).

In Table 1 respondents have not pointed out environmental and legal challenges. This is because the respondents either do not encounter or not aware of such challenges. Looking back to our previous study, similar respondents called for m-government design approach that considers legal aspects when they were asked to provide recommendations for m-government design framework[CITATION Isa184 \t \l 1033]. Thus, respondents are aware of legal implication to service implementation. Henceforth, this paper argues on the need for having clear regulations and legislation on the design and implementation of m-government services that practitioners must be aware of and abide by them.

From Table 1, the most reported challenge is poor user interface design. This obstacle arises from the lack of predefined standards for designing m-government services which is also advocated by interview respondents, cf. Error: Reference source not found. Also, the incompatibility of applications in different devices is one of the most reported challenges. This is because m-government practitioners lack a clear approach to design services [CITATION Isa183 \t \l 1033]. There is a need for guiding them in choosing proper technology depending on the type of service and target group.

Furthermore, challenges reported in the empirical study reveal the need for a well-design back-end process (ICT infrastructure) to provide effortless integration of mobile technology to the available services. The challenges unveil further the potential of other environmental factors related to political, managerial and organizational context to support the adoption of technology. Thus, the next section present recommendations which consider multiple views that can improve the design of m-government.

5 Recommendations for successful design and implementation of m-government services

From the discussions in a previous section, this paper presents a set of recommendations to improve the design and implementation of m-government services in developing countries. The recommendations are categorized by PESTELMO method as follows.

1. *Political recommendations:* We recommend political leaders and representatives to support the implementation of m-government services (cf. Table 1). The support includes promotion of m-government campaigns in societies; provision of enough budget to complete the project and sustain it; formulation of policies, and promotion of m-government strategy which should be implemented in organizations.
 - We recommend m-government practitioners to consider available policies in government or organizations to ensure the support from top leaders and service sustainability.
2. *Economic recommendations:* Based on the findings from Table 1, Error: Reference source not found and desk research, we recommend
 - Government or organization to have a repository for storing documents and solutions so as to allow reusability of materials for cost saving.
 - Government organizations to deliver their services via affordable mobile channels such as signaling channel (SMS and USSD). These channels are compatible to all mobile devices and do not require internet connectivity to access information.
3. *Socio-cultural recommendations:* The political recommendation highlighted in this paper contributes to solving socio-cultural challenges, i.e. promoting awareness of the service to people. Also, we recommend:
 - The government organization to provide training to end-users. Provision of such training at an early stage helps to understand end-users needs and address them.

- The use common channels that are already accepted by users in the community to ensure the acceptance of the services.
 - End-users to participate in pilot test to ensure a target service meet their needs.
4. *Technological recommendations*: This category provides the recommendations as follows.
- We recommend the adoption of defined standards for delivering public services via mobile technologies. The standards include user interface and content presentation of data channels, user interface and content presentation of signaling channels, and the use of specific codes (for SMS and USSD) for accessing government services.
 - Practitioners are recommended to conduct usability tests to tech-savvy and non-tech-savvy people. This approach helps to draw a mutual conclusion on revising the usability requirement and it increases service acceptance.
 - It is recommended to use a cross-platform framework when designing data channels such as mobile apps to ensure compatibility.
 - We recommend the government to formulate standards that should be commonly used in organizations to establish reliable back-end processes. These include principles, guidelines and formats. Such standards should assist m-government practitioners in organizing data and infrastructure to the ease sharing of resources, easy integration and scalability.
 - Government organizations are recommended to update their infrastructure to keep up with the latest security measures and ensure the performance of services.
 - Designers are recommended not to scale beyond the scope.
 - Designers are recommended to explore the infrastructure of organization and target user to determine type of channels that can be delivered through available infrastructure
5. *Environmental recommendations*: We recommend
- The use offline techniques to ensure that apps and services work when there is no connectivity. Information to be processed can be uploaded when devices regain the connectivity. Such techniques overcome the environmental nature and geographical restrictions of developing nations.
 - Designers to use technologies and other resources that have no effect on the environment when implementing m-government services.
6. *Legal recommendations*: We provide recommendations as follows.
- Government organizations must have a legal framework in place. The framework should provide a common understanding of m-government legislation and regulations, legal implications of m-government services.
 - Designers should abide to legal framework entities throughout the design process so as to ensure service acceptance and sustainability.
 - End-users must understand the legal implication of a service concerned. The service provider is required to create this awareness to end users before deploying the service in the user environment.
7. *Managerial recommendations*: The recommendations in this level are:
- Government organs and departments, and private sector are recommended to cooperate and coordinate in implementing m-government services. Through their cooperation and coordination, challenges related to addressing the requirements will be reduced. Also, the cooperation and coordination reduce application and service redundancy within an organization.
 - M-government practitioners must identify all parties related to the service (public and private) and engage them in the designing process.
 - Stakeholders of m-government services must be committed to the design process to ensure completion of project on time.
8. *Organizational recommendations*: We provide the following recommendations.
- Government organizations should provide training and workshop to their employees to update them with new technologies related and associated risks.
 - Government organization delivering its services via mobile devices is recommended to have its back-end processes well planned and organized to support a smooth integration of mobile technology for service delivery.
 - Government organizations should have clear goals and derive specific objectives related to the service goal, and handle them to the concerned m-government practitioners.

6 Conclusions

M-government implementation is potential in developing countries since mobile devices are the most prominent tools for connecting government to its society. The literature presents research on the success factors, challenges faced by users and general recommendations on the m-government services. However, there is a lack of research on designers' side to explore the practices used to design the services and challenges faced. This paper bridges the gap by examining the challenges of m-government designers, explores their ways of addressing the challenges and proposes recommendations for improving m-government services in developing countries.

The paper contributes to the m-government literature by providing extensive recommendations for improving the services from strategic, design and implementations. Such comprehensive recommendations are lacking at the point of writing. Government organizations from the developing countries that require delivering their services via mobile devices can apply the recommendations. These recommendations will help them to improve the design of m-government services by considering important activities that are crucial in the process to produce proposer and useful designs.

The sample size from online survey and interviewees are not large enough to generalize the findings from the developing countries. Therefore, future studies should focus on increasing the sample size to have strong recommendations to government and m-government practitioners of developing countries. Also, future studies should target evaluating the recommendations in m-government projects to assess their application and validity.

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