mGovernment Services and Adoption: Current Research and Future Direction

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Abstract. With the unprecedented growth of mobile technologies, governments of both developed and developing countries have started adopting mobile services in the form of m-government. While the vendors and practitioners are heavily engaged in this transformation, the scholarly world is lagging to keep pace with the progress and to provide clear theoretical guidance for successful adoption. This paper takes a stock of scholarly publications on m-government adoption since the year 2000 and reports findings and future directions based on meta-analysis of secondary data. The articles were classified into research themes, delivery mode, theory and methods. The paper identifies the dearth of scholarly work and calls for more in-depth work to make important contribution in this area.

Keywords: mGovernment, literature review, Web-based, Non-web based (SMS), Public Sector ICT, Cross country study, m-services, IT adoption.

1 Introduction

With the wide spread growth of mobile devices in the recent past, consumer activities across the globe began to extend from electronic (e-business, e-commerce, e-government) to mobile (m-commerce, m-government) services. Mobile phones have become an essential personal possession for daily activities with a high percentage of active mobile phone subscribers both in developed and developing world [e.g. Australia, 106.19%, Bangladesh, 63.76%, world approaching to 100% [6,7]. To keep pace with this unprecedented explosion of mobile devices, government of different countries are also seeking to expand their citizen services through mobile technology in the form of m-government [29].

mGovernment has the potential to provide greater access to information for citizens, business organizations and government employees compared to any other channels of information and service delivery because of its convenience, mobility, portability and ubiquitous nature and characteristics. mGovernment services and applications can be 'web-based' and 'non-web based' [19]. Web-based platforms generally are web-portals made to suit mobile applications and m-apps which requires Internet connection; whereas, in the non-web based platforms, short message services (SMS) and interactive voice response (IVR) are used. It has been found in the review that

adfa, p. 1, 2011.

many mGovernment services are delivered through web-based and particularly SMS for non-web based giving more emphasis on the former in developed countries and the latter in developing countries.

This review paper considers m-portals and m-apps as 'web based' and SMS as 'non-web based' for the analysis. Socio-cultural, technical, economic, political factors of developed and developing country context stretch the web-based m-government in developed countries and non-web based (SMS) in developing countries. Internet penetration and access in developing country is still very low compared with mobile penetration and growth. In developed countries, internet penetration is higher than that of developing countries and also the cost to connect is affordable. Scarcity of power supply, both interruption and absence, is also another issue in developing countries. Browsing the web through mobiles will require more frequent charging. Computer literacy rate is also higher in developed countries comparing that of developing, which permits more people in the former to browse web through mobile. Moreover, both developed and developing countries differ in terms of history and culture, technical aspects, infrastructure, internet accessibility and computer literacy [2]. In the developed countries, most of the nations' government and economy developed early, immediately after independence; have more technical knowhow abilities and good infrastructure with high internet access; decent computer literacy rate. These contextual characteristics offer greater variety of mGovernment services in the developed countries mostly through mobile web-based for the mass comparing to non-web based.

On the other hand, the opposite characteristics of developing countries offer various mGovernment services mostly through non-web based particularly SMS. mGovernment development worldwide so far has been uneven and still evolving in some contexts [15],[18]. Success stories and best practices are insufficient in comparison to its wide application and demand. The implementers and practitioner world are still struggling to find a workable model in this area. On the other hand, research on mGovernment is also scarce and in its early stage. It is found from the review that most of the research works on mGovernment have been carried out in the last five years, which shows it is a recent phenomenon. Researchers are yet to address many critical issues surrounding mGovernment, such as security, privacy, trust, user readiness, information overload, user need analysis in different socio-cultural and technical contexts [14,15].

In this paper, we attempt to review articles on mGovernment services published from the year 2000 to date in order to provide the current landscape of scholarly work on mGovernment services and also to propose future directions. This paper presents a review of 48 relevant articles that exclusively focuses on m-government, synthesized and shortlisted from wider range of literature. The main purpose of this paper is to critically evaluate previous m-government research to develop a comprehensive understanding towards its trends, limitations and opportunities for future research. The paper is structured as follows. In the next section, it introduces mGovernment applications and services. Section 3 outlines the method and approach used to extract the data from the literature review. Section 4 provides the findings in terms of research themes and focus, delivery mode and theoretical frame of knowledge. Section 5 provides an analytic discussion and future direction followed by limitation and conclusion at the end.

2 Overview on mGovernment

Mobile Government or mGovernment is conducted over mobile or wireless networks which extends the reach of e-government for public service delivery. mGovernment also includes the strategy and its implementation of all kinds of wireless and mobile technology, applications and services by the government or public institutions for the purpose of providing information and services to the citizen, business world, non-profit organizations and for themselves [11], [13,14]. Fig. 1 shows four major domains of mGovernment: m-administration, m-communication, m-services and m-democracy [3], [11], [13], [32]. mGovernment can be again classified into four types in terms of its interaction between entities. These are mGovernment to citizen (mG2C), mGovernment to business (mG2B), mGovernment to employee (mG2E) and mGovernment to government (mG2G) [3], [13], [23].

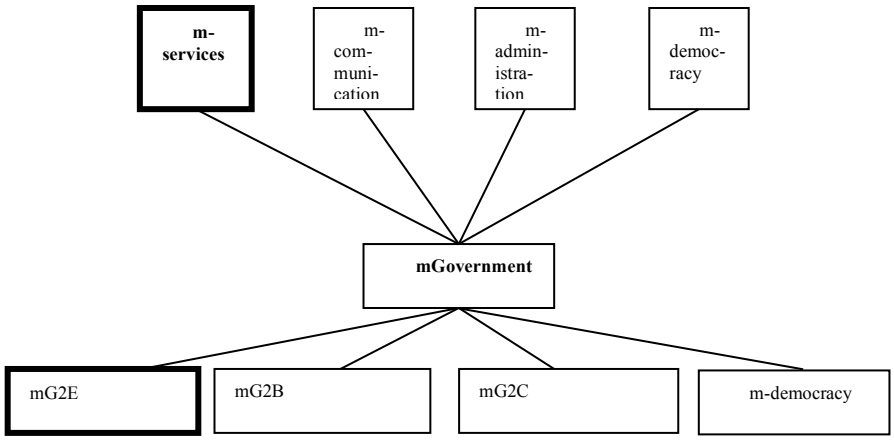


Fig. 1. mGovernment domains and levels

Out of above stated classifications, 'm-services' and 'mG2C' categories appear to be most important one in terms of its wide application and scope (highlighted in fig. 1, referred from table 1). Currently different governments of the world are offering variety of m-government services and applications. Table 1 depicts the list of various m-government application and services in different parts of the world. As a part of the m-government overview, the purpose of this table is to provide idea of variety of mGovernment services to the readers. To broaden the list, examples from [8] published books on mGovernment were also used. To gain further insight and a comparison, the table includes the column with examples of both developed and developing countries where these services are adopted and used. For the sake of this study 'Advanced economies' identified by IMF has been considered as 'developed countries'.

Table 1. List of mGovernment application and services offered by developed and developing countries

mGovernmnet services	Examples	Developed Countries	Developing countries
mG2C services			
Tourism and recreation services		Canada, Estonia	Bahrain
Information services	Contact information of Member of Parliament; public office address, assessment of services, comments with other citizens leveraging on a social check-in paradigm; lost and found, missing people; job related information, tender information, Information about different services to President or mayor, mGovernment portal, limited drinking water supply related information; agricultural price related information	Canada, Italy, The Republic of Korea, Sweden	Philippines, Brazil, Oman, Mexico, Turkey, Malaysia, Rwanda, Uganda, Sri Lanka
Hazard related services	Fire fighting, flood dangers; emergency alert services / security warnings; earthquake monitoring information, weather and natural disaster	USA, UK, Canada, Denmark	China, Mexico, Turkey, Italy, Hong Kong
Voting services	General election information, results of election, voter registration, finding polling station for voting	UK, France, Estonia	Indonesia, Kenya, Venezuela, Malaysia
Transportation services	Traffic flow, city maps, ferry, bus, metro schedules and services, guide to city services, ticket payment, vehicle detailed system, traffic offence; parking facilities, season parking, parking payments; street incidences; train mobile web services, drivers' m-portal, alerts of delay in public transport; m-	Spain, Finland, Singapore, Canada, Estonia, UK, Italy, Australia, Austria, Japan, Sweden, Korea	Turkey, Indonesia, Saudi Arabia, Kenya

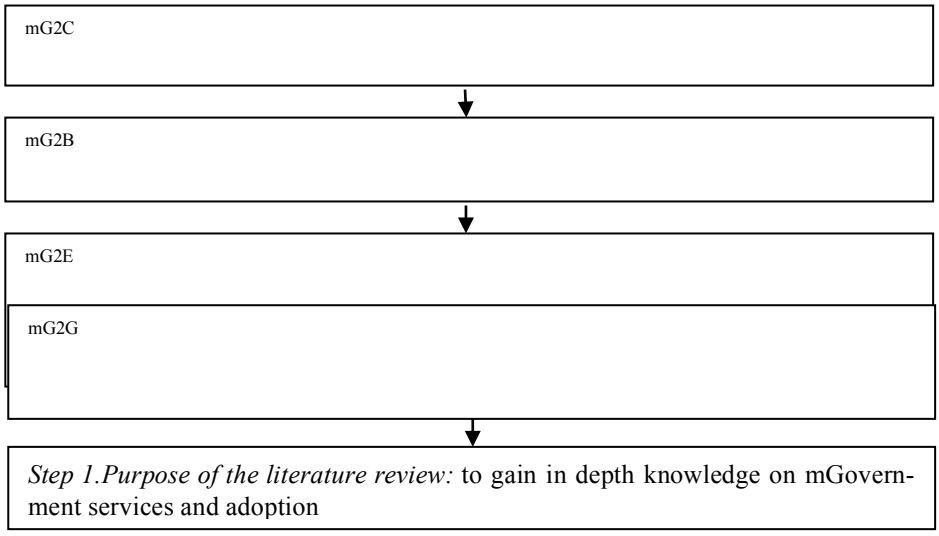
	parking		
Law enforcement	Information on policies, laws/regulations, statistics, URL of the public organization	The Republic of Korea, USA	
Tax services		Spain, Singapore, Ireland, Norway, Korea	China, India, Africa, Japan
Health services	Medical appointment scheduling & cancellation and alert, m-hospital	Spain, Malta, Finland	Africa, Saudi Arabia
Education services	School services, exam results, scholarship decisions, m-library	Italy, Malta, Finland	South Africa, Philippines, Saudi Arabia, Hungary, Africa
Criminal offence services	Reports relating crime, illegal waste deposits, corruption, complaints about govt. agencies' actions, parking offences; police services offences; tract suspect' move, m-police	Germany, the Netherlands, Malta, Korea	Tanzania, Philippines
Other services	Baby care; take-off and landing at airports, airport information; emergency cash transfer; Id card and passport related services; license renewal services; anti pollution	USA, Spain, Canada, Singapore, Finland	Malawi, Kenya, Philippines
mG2G services			
	Fire department mobile inspection services; Traffic and earthquake information system; Disaster management information systems; agriculture services, insecticide control	Ireland, USA	Brazil, Turkey, Bangladesh
	Electoral data process	Spain	
	Information on failure alerts, maintenance status and results	Korea	
mG2B			
	Agribusiness		Brazil, India, Uganda, Ghana

	Business support services	The Republic of Korea	
	Inspection and reporting information	USA	
mG2E			
	Mobile field inspection system	China	China
	m-signature	Spain	

As reflected in table 1, examples from handful countries from both developed and developing countries are documented in the literature which is far less than its actual application and growth. A wide ranging innovative approaches and applications in many developed and developing countries are not studied and captured for further knowledge building and sharing. The absence of contextual knowledge provides an opportunity for researchers to tap into this important area. Application in mG2G, mG2E and mG2B services are also scanty, which is another niche area for further exploration.

3 Method

We performed a systematic approach prescribed by Okoli & Schabram (2010, p.7) [25] to conduct the literature review on mGovernment services adopting studies from a range of IS Journals and conference papers (fig. 2). Data extraction was carried out using a guide-sheet, highlighting criteria to screen out the 'research themes', 'approaches' and 'out of scope' study. Key words used in the search were "mobile government", "mGovernment", "m- government" to search the relevant articles covered a period of 2000 - Present (Sep, 2013). Also, the Boolean characters 'AND/OR' were used in different combination of 'citizen', 'services', 'adoption' with the key words. These keywords were selected because mG2C is the dominantly used services among the four offered levels (refer table 1).



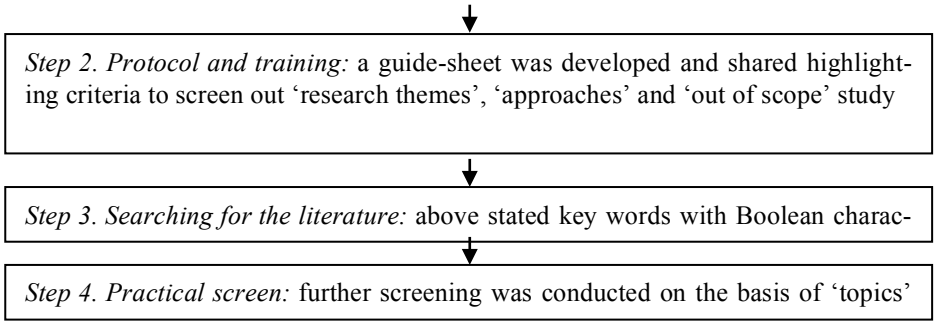


Fig. 2. Stepwise systematic guideline followed to conduct the literature review

Articles screened, selected were then organized for further analysis. A content analysis was conducted to extract mGovernment research themes based on a conceptual framework (a granular categorization) [30]. Then framework and theoretical part on previous mGovernment research work was examined through the categories of theoretical frame of knowledge adapted from [4]. The analysis under study was used to examine the presence or absence of theories on accumulation of and consistency in knowledge in mGovernment studies.

4 Findings

Findings and observations from the analysis of meta data are presented in the following sub-sections.

4.1 Research Themes and Focus

Majority of the studies focused on design and implementation (48%) followed by context-based (21%) studies out of the four themes we considered (table 2). High percentage of design/implementation study is not surprising as m-government is still at its primary stage of innovation and development. While most of these studies did not have a strong theoretical foundation and pure research method, they used some model or schema to address some design issues and describe factors, challenges affecting the design and implementation. Most of the papers describe the general design and implementation issues; however, few papers describe particular issues, such as, design architectural issues for m-police, disable groups. Context theme covers a broad range factors surrounding m-government including m-services or applications related studies. Several contextual challenges and barriers are identified in different studies. [10] identified barriers from the broader organizational, technical, governance and social context. [16] identified factors for m-government management, [12] identified constructs of efficient transaction. Some of these studies tend to overlap with factors affecting design and implementation, e.g. design issues for m-participation [26].

However, researchers found less interested to focus on m-government adoption study. The limited studies includes identification of various determinants of adoption and attempted to extend the existing individual adoption models such as TAM, TRA, TPB, UTAUT , DOI except one mathematical model with wider dimensions by [17] and a case study by [9]. Four studies specifically used required 'theoretical framework' [20,21], [28], [31] to identify the constructs. Two articles [9], [17] identified factors affecting adoption of mGovernment discussing appropriate methodology but without using any theoretical framework. 'Impact' and 'evaluation' studies were combined together, where impact assessment tools described in the study were also included in this category apart from actual assessment. The focus and attention in this area is low, which limits our understanding of m-government potential and broader impact for the government and societies. Only two studies make use of a derived framework, out of which one applied grounded theory. Studies identified performance assessment criteria or developed a model for mGovernment assessment. One study utilized task-technology fit framework to assess the performance.

Table 2. Various themes and focus of mGovernment services and adoption related papers

Themes	Frequency (%)
Design/implementation (D/I) - dealt with the design and implementation of mGovernment (such as mGovernment in agriculture, payments, banking etc.)	23 (48%)
Adoption (A) - dealt aspects of mGovernment adoption, such as its factors, processes, barriers	8 (17%)
Impact and evaluation (IE)- report actual assessment while implementing mGovernment or developing mGovernment service measurement framework; and evaluate the success and performance of mGovernment	7 (14%)
Context (C) - examine mGovernment issues from technical, organization, or social contexts and also include broad mGovernment related issues such as detailing mGovernment services, mGovernment applications, mGovernment management.	10 (21%)

From technological perspective, m-government services can be offered through both 'web-based' and 'non-web based' (SMS) medium [19]. However, most of the mGovernment services make use of a broader spectrum of technologies being available on mobile phones rather relying only on web based e-government services [24]. In order to determine the degree of emphasis of 'web-based' or 'non-web-based' approaches and to understand their comparative use in developed and developing countries, we had to select only those papers (29 in this case) where country names were mentioned. We found that 42% of 'web-based' and 58% of 'non-web' mGovernment services discussion mentioned in the studies (Fig. 3). The degrees of emphasis are classified based on the volume of discussions on 'web-based' or 'non-web based' in the articles. Each article was marked independently on 'web-based' and 'non-web based' services

through separate columns identified with ‘x+’ for high emphasis; ‘x’ for mid emphasis and ‘x-’ for low emphasis.

Degree of emphasis	Developing Country (Web)	Developing Country (SMS)	Developed Country (Web)	Developed Country (SMS)	Web-based & Non-web based (SMS)
High emphasis	7%	21%	15%	3%	Web-based (42%)
Medium emphasis	3%	14%	3%	3%	And Non-web based (SMS) (58%)
Low emphasis	7%	7%	7%	10%	

Fig. 3. Degree of emphasis on web-based and non web-based m-government services in developing and developed country

It can be conjectured that m-government adoption in developed countries are happening as part of e-government maturity and expansion of its existing service channels, whereas in developing countries m-government adoption seem to be following a different adoption curve skipping several generation of technology. Many applications in the area of m-government in developing countries emerged out of local need and innovation. For example, the digital sugarcane procurement system, e-Purjee was established in Bangladesh to replace paper-based supply process communications with a SMS based digital method. Comparing traditional paper-based system, e-Purjee allows timely delivery of purchase order to 1500,000 sugarcane growers and also timely delivery of sugarcane to the mills creating win-win situation (also profit for farmers and almost double the production of all the mills in 2010 comparing previous year output) [5].

4.2 Theoretical Frame of Knowledge

Following the categories of theoretical frame of knowledge provided by [4], we examined the research approach of m-government research as per Table 3. There were situations where a paper had more than one elements of the theoretical knowledge framework, in that case only the highest frame of knowledge was recorded.

Table 3. mGovernment research work according to theoretical frame of knowledge - Adapted from [4]

Categories	Frequency (%)
Theory based (theory used either to apply or test)	5 (10%)
Framework based (framework used taking from a body of theoretical work)	7 (15%)
Model based (model presented without referring any deeper frame of knowledge)	4 (8%)
Schema based (schema of techniques are highlighted)	7 (15%)
Concept based (some concept is used such as, micro/macro payment, m-participation)	3 (6%)
Category based (presented list of factors or a set of categories only)	7 (15%)
Non-framework-based (no use of any perceptible framework of knowledge; provides a set of data and ideas)	15 (31%)

Table 3 shows a highest percentage of research works on m-government are non-framework-based, which may be acceptable at this stage being m-government relatively a new and growing area. Only twelve (25%) articles are theory and framework based which indicates that majority of the scholars have attempted to present what is happening in mGovernment rather offering any understanding of why is happening. 39.6% papers (both 'non-framework-based' and 'model based') lack coherence and accumulation of knowledge due to their absence and inadequacy of developing common base for further work.

4.3 Methods Followed

Of the reviewed papers, twenty five articles (58.30%) did not have any specific 'method(s)' or 'methodology' section. Among the rest twenty-three articles, three papers [17], [21,22] embedded the method discussion under heading 'materials and methods', 'empirical section', 'sampling' respectively. Survey method was used in 20.8% of the studies whereas case study was done in 6.2% of the papers. Two papers used both survey and interviewing which we considered under survey method. Moreover, there were technical papers and mathematical modeling papers which have been grouped as 'others' along with a paper used meta-synthesis method.

5 Discussion and future directions

The in-depth literature review and meta analysis of existing data provided a good insight on m-government research landscape. It was evident that present research works on mGovernment services and adoption are still scattered and in its preliminary

stage. We noticed that much of the research works in m-government are done from the year 2010 onwards, which indicates it is a recent and emerging phenomena.
In order to bring the coherence in knowledge accumulation in m-government arena, future studies should attempt to apply or test proper theoretical framework and preferably not mix 'web-based' and 'non-web based' m-government services, especially in adoption studies. IS adoption theories were not applied or tested at the individual or organization level adoption studies. It is also found that there are lacks of interpretive research in adoption studies, where 75% of the adoption studies applied quantitative research method focusing on answering 'what' questions. Often constructs were used without proper justification of their inclusion, for example Mohamedpour, Faal & Fasanghari (2009). On the other hand, some studies adapted constructs from several IS adoption theories and justifies the adoption but does not empirically test the model, for example Wang *et.al.,* (2011). For the impact and evaluation study, in different contexts, longitudinal research design can be proposed. Action Design Research (ADR) can also be a relevant for this type of evaluation study which carries out iterative process in a target environment intertwining the building of the IT artefact, intervention in the organization and evaluation [27]. Future adoption studies should be conducted both at the individual and firm level using appropriate theories for example, TOE framework by Tornatzky & Fleischer (1990) or UTAUT theory by Venkatesh et.al. (2003) or institutional theory by Scott (1995). At the individual level, the newly derived UTAUT2 theory of Venkatesh, Thong and Xu (2012) may also be relevant in different contexts for mGovernment adoption. In order to find out the 'why' association in different contexts among the human and non-human actors considering the 'social' and the 'technical' as inseparable, Actor-Network-Theory (ANT) by Callon (1991); Latour (1996); Law (1992) can be a good candidate. Moreover, the involvement of multiple stakeholders: different governmental agencies/ department, telecommunications carriers, supporting value chain members and most importantly, the citizens who are the ultimate end users [1] may be included in future studies to gather rich insight from multiple perspectives.

6 Conclusions and limitations

mGovernment will continue to grow both in developed and developing countries through 'web-based' and 'non-web-based' services especially in the mG2C level. But only a handful of rigorous research have addressed some of the challenges and problems surrounding m-government services and its adoption. Information System researchers are requested to engage in more empirical and theory building research in this area in order to make valuable contribution. A very noteworthy issue is to separate the 'web-based' or 'non-web based' mGovernment services which will provide further scope for detail analysis and understanding of adoption trajectories. The review excludes papers written in other languages and disciplines such as, public administration.

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