

Mobile User Satisfaction and Usage Analysis Model of mGovernment Services

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Abstract: *Efficient and effective management is considered the crucial factor that decides the success or failure of any mService project. This paper is one step in a research project that attempts to measure the effectiveness and efficiency of mGovernment services. In order to achieve as precise a measurement as possible, services are analysed from the perspective of the mGovernment users to their root components. Mobile-user-centric government makes satisfying citizen and business needs the centrepiece in its planning so as to create communities of networked users, not just portals, for individual users. As a preparatory step for a real-world opinion survey, this paper analyses and defines mobile user's needs covering the satisfaction and usage of mGovernment services. The outcomes are indicators that are translated into metrics which are, in turn, interpreted into questions used to measure the effectiveness of existing or proposed mServices.*

Keywords: mGovernment, effectiveness, evaluation, mobile, services, systems, management.

1. Introduction

Electronic Government (eGovernment) involves the automation or computerization of existing paper-based procedures that is prompting new styles of leadership, new ways of debating and deciding strategies, new methods of transacting business, new techniques for listening to citizens and communities, and new strategies for organizing and delivering information (W'O Okot-Uma, 2001). Mobile Government (mGovernment) may be viewed as a subset of eGovernment. It stands for the use of mobile and wireless communication technology within the government administration and in its delivery of services and information to citizens and firms (Östberg, 2003). On the other hand, mGovernment should not be viewed as a new type of government, rather a new 'tool' for government. Mobile communications and Internet technologies are enabling access to new eGovernment services at anytime and from anywhere. In order to decide the success and failure factors of any mobile Government (mGovernment) service project, service engineering has to cope with the requirements of the individuals, and sometimes the conflicting interests of particular roles of involved government officials (Albayrak, Wohltorf, Fricke, Heßler, & Noubissi Noukumo, 2003). Accordingly, based on the effectiveness evaluation study by (El-Kiki & Lawrence, 2005), this paper elaborates on the mobile users' satisfaction and usage analysis of mGovernment services where benefits are the gains, and also the driver s, which mobile users obtain from utilizing an mService. Mobile - users' satisfaction is a result of having their needs fulfilled by the service as it is used. In order to ascertain levels of mobile users' satisfaction, these needs have to be analysed and investigated.

In their technical report, Centeno et al. (2004) state three trends in public needs for eGovernment services, namely needs related to: service provision, service delivery, and service access; where each trend had its related needs. El-Kiki & Lawrence (2006a) classified those needs according to the originating back and front offices. In fact, mobile users' needs mentioned hereafter are fulfilled by both offices, and accordingly

their analysis is essential, in not only measuring the effectiveness of an mService but also, in specifically describing and distributing tasks between the two offices.

The 'Multi-Perspective Effectiveness Evaluation Methodology for mGovernment (MPE²M-mG)' (El-Kiki & Lawrence, 2005) translates mobile -user's goals into metrics which are the core elements to be considered when (re-)engineering a mobile service . The purpose of this paper is to elaborate on this evaluation methodology and to build further upon the existing body of research, which is explored in the following section. This is achieved by providing a new conceptual model on how mobile-user satisfaction is defined and analysed in order to measure the service usage and accordingly its effectiveness in another step of the research. Section 2 of the paper provides a background overview on user satisfaction and usage analysis and Section 3 defines and analyses user's benefits. Section 4 introduces the conceptual model of user's needs for mServices and survey hypotheses while Section 5 outlines the methodology of the study. The survey plan and questions are included in Section 6 and the conclusion and future directions are contained in Section 7.

2. Background on end-user satisfaction and usage analysis

User's satisfaction and usage have been handled by many researchers in the IT, IS and Networking fields and may be defined as the extent to which they believe that the available service meets their needs. Davis (1989) defines perceived usefulness of a service as "the degree to which a person believes that using a particular system would enhance his or her job performance". One year later research by Conrath & Mignen (1990) suggests that the impact of user expectations should be considered when assessing user satisfaction. Further attempts were made to capture the overall post hoc evaluation that mobile users had regarding the use of an IS system coupled with antecedent factors that form this satisfaction (Doll, Raghunathan, Lim, & Gupta, 1995; Henry & Stone, 1994; Torkzadeh & Doll, 1991).

More recent research (Schay, Beach, Caldwell, & LaPolice, 2002) defined nine generic customer service dimensions in a model to be used to assess all types of internal and external customer services and their satisfaction. These dimensions are Access, Choice, Courtesy, Knowledge, Quality, Recovery, Reliability, Tangibles and Timeliness. From this model, the authors deduced and developed our Mobile-User Satisfaction and Usage Analysis Model of mGovernment Services. In mobile government research Carroll (2005) reports that, at present, it appears that users are constructing 'portfolios' of electronic and non-electronic resources to meet their real-time, situated needs as they move from place to place. Carroll (2005) states that mobile users:

select from the vast array of devices, media, applications and non-electronic resources according to their personal preferences, those of their peer group, their perceived needs and purposes for diverse activities in likely situations of use. This portfolio can then provide tailored technological support to the user, be adapted as needs change and aspects of the portfolio can be updated as enhanced technologies become available.

Følstad et al. (2004) defined four user categories according to their interaction frequency with a system and the authors adapted these to suit the research context:

- Core users: who must use the mobile government service as an important part of their work context, e.g. -care workers who are looking after elderly, chronically ill or infirm citizens in their homes, hospitals or nursing homes (Archer, 2005).
- Regular users: who interact with the mobile service in their everyday work, but not as their primary tasks, e.g. managers and secretaries.
- Sporadic users: who have limited interaction with the mobile service in their work or everyday life. These could include citizens paying parking fines via their mobiles or London motorists who must pay an entry fee when visiting inner London for a day for example (Inglesant & M, 2005). Most external user groups may be categorized as sporadic users.

- Technical users (secondary users): who are responsible for the day to day maintenance and updating of the mobile service.

In this research, mobile users are citizens and businesses using the mService and includes core, regular or sporadic users only thereby concentrating on the users of the mobile service rather than its maintainers or administrators at the back office.

3. Mobile- user's goals/benefits definition and analysis

Some of mobile-user's benefits mentioned here are also handled by some eGovernment researchers as 'opportunities'. For example, Ndou (2004) considers reducing the bureaucracy, offering round the clock accessibility and fast and convenient transactions as opportunities for eGovernment to enhance the quality of services in terms of time, content and accessibility. On the other hand, user's goals or benefits are in fact seamlessly interrelated and cannot be significantly separated from each other. Value for money is gained when there is quality of service and efficient transactions rendered. In order to define and analyse these goals they are thus classified into four groups representing the indicator domains in Table 1 found in Section 6.

3.1 Value for Money

As defined by VentureLine (2005) value for money is in the perception of the buyer or receiver of goods and/or services. Proof of good value for money is in believing or concluding that the received goods/services were worth the price paid. Hence, pricing and content are two factors to be considered in this goal:

PRICING: Rieger et al. (2003) consider mobile service pricing as a sensitive field, as wrong pricing could lead to refusal of the new service. To ensure the acceptance of a higher price for mobile services compared to regular services, the advantages for the user must be clarified and promoted. Especially when entering the market with newly developed services, their value has to be mediated in order to create acceptance for certain prices among the users. For citizens, mobile government services are sometimes of a punitive nature such as paying for speeding fines so it is vital that the citizen is not further irritated by poor quality of service. In fact as many of the services will not be available for free, a certain quality of service (QoS) must be ensured; otherwise the users would get frustrated, paying for services that do not meet their expectations. The Helsinki Train and Tramline Mobile ticketing SMS system has been successful because of its pricing structure. In Helsinki, for any mode of transport, a normal single ticket costs €2.00, whereas the mobile ticket costs EUR 1.90 (prices in February 2005). However, even cheaper single tickets are available for the tram. Payment is easy as no cash is needed (Suomi, 2006).

CONTENT: Value for money in mService is not restricted to its price alone, it is also the 'content' rendered by the service. The content of each service varies with the type of the service. The content, though, needs to be relevant to the region, culture and language in order to initiate and create belongingness to the mobile user. For example a local council could relay details of its council rates to citizens who could then select the relevant amount and pay via the mobile device. Other mobile content rich services could include tourism information, disaster alerts and traffic congestion reports.

3.2 Quality of Service

Every service has a basic set of requirements in order for it to be of a good quality. Quality of service is then perceived as the definition of the service rendered to a stakeholder or user. In fact ambiguous and conflicting objectives may arise when there are many users' requirements to satisfy concurrently, in addition

to having those requirements irreconcilable or imprecise. Hence, quality of service definition varies depending on the perspective from which it is seen. From the user's perspective, quality of service refers to the degree of 'goodness' of the mService in respect of its perceived usefulness. Davis (1989) defines perceived usefulness as “the degree to which a person believes that using a particular system would enhance his or her job performance”. Hatry (1999) states that timeliness, accessibility, accuracy, and fairness are essential elements of quality of service when delivering it to the mobile user. The Johannesburg Metro Police Department (JMPD) uses an Integrated Information Management System to improve its effectiveness by creating a highly accessible and flexible information repository that is maintained on a real-time basis. At a potential crime/incident scene, the responding officer obtains up-to-the-minute information, including identification verification and outstanding arrest warrants, by mobile phone, allowing the officer to react quickly. The mobiles act as both data capture devices as well as data receiving feedback tools, providing police officers with essential information and empowering them with relevant additional facts (Patel & White, 2005). Referring to Figure 1, the quality of mobile government services is analysed into seven components, each of which is then defined.

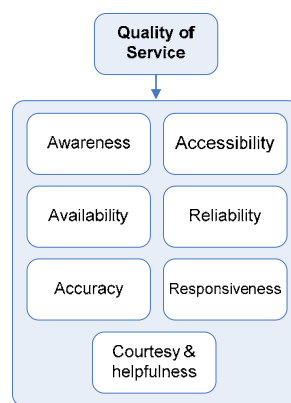


Figure 1: Quality of service components for Mobile Government Services

AWARENESS: Awareness is the first step in the users' experience, as users need to know that the service is in existence, what it does and how it is relevant to them. They then need to know in which ways they can contact and access the service. Community awareness and training programs are often key success factors for successful introduction and acceptance of new services (AOEMA, 2004). For an mGovernment service such as mobile voting awareness of the service is critical. In Finland, for example, all citizens can obtain motor vehicle brand name, type, vehicle owner name and municipality of residence or business, first day of usage of the vehicle, last inspection date and possible unpaid duties on the vehicle, simply by sending an SMS message to one of two Finnish Vehicle Administration telephone numbers for between 1.30 and 1.70 Euros. Awareness of this service is such that it was used 1.37 million times in 2004 and it is interesting to note that this information is not considered private or sensitive in Finland (Suomi, 2006).

ACCESSIBILITY: Accessibility refers to the process of securing or making the service open to a wider user population (Usable Net, 2004), including, where relevant, the assessment of eligibility criteria and the agreement to the specific design (nature and standards) of the appropriate service. All users should have access to their government services regardless of any disability, and this may require some "add-ons" as per the global accessibility guidelines defined by WAI (W3C, 2006). Globally there are 1.7 billion of mobile phone users who are potential users of mobile services. In underdeveloped countries a mobile device, such as PDA, will be the nearest device to a computer that most of the population will ever have. . A country like Bangladesh suffers annual natural disasters such as cyclones and floods which claims the lives of thousands and causes billions of dollars worth of damage (Hossan, Chowdhury, & Kushchu, 2005). The lack of electronic services in Bangladesh is pronounced, as only 30% of Bangladeshis has access to electricity and

a lesser percentage has access to TV or radio, while mobile phones are widely spread and always on so citizens can receive information 24/7/365.

AVAILABILITY: Service availability is the concept that users can obtain service on demand and without interruption, in spite of using failure-prone hardware and software elements to build the underlying infrastructure (CERN, 2006). It is usually measured against time and expressed as a percentage. If service availability is measured from users' perspective, probably as a percentage of successful access, it is more likely to reflect whether, and to what extent, a service really works. Obviously this is a major concern with wireless and mobile devices which may drop out as the mobile user changes location. Despite this, Kushchu & Kuscu (2003) argue that mGovernment could be the solution for reaching citizens and exchanging information especially in remote areas. Hossan, Chowdhury & Kushchu (2005) define four major life saving uses of mGovernment applications in Bangladesh through disseminating pre-disaster and post-disaster warning SMS, and through exchanging SMS with citizens to enable them request relief assistance, and government-to-citizens interaction to exchange information about health hazards.

RELIABILITY: Schay et al. (2002) define service reliability as the “ability to perform the promised service dependably, accurately, and consistently”. Reliability is then a measure of an mGovernment service’s potential for failure since mobile users expect it to be reliable and sustainable - 24/7/365. As an example, take the case of a person paying a parking fee to the local government authority (a mobile government service) via a mobile device – a reasonably common request by a constituent. After paying via SMS, the constituent receives a receipt number on the mobile device as an output. This is feasible and operational in Singapore and provides the citizen with a unique receipt number.

ACCURACY: Service accuracy is defined as the agreement between the offered and the promised services. It does not mean error free, rather a minimal error possible, service. For the Finnish tram and metro ticket payment by mobile phone (mentioned earlier, to eliminate abuse, the system has a certain time lag so that the ticket purchase cannot be initiated when a ticket inspector is arriving (Suomi, 2006).

RESPONSIVENESS: Responsiveness indicates the speed with which mService requests are manipulated, pages are browsed, commands are achieved and acknowledgments are displayed. Mobile government services may be hindered by latency when network traffic is high.

COURTESY & HELPFULNESS: Respectful, considerate, friendly, helpful, polite and efficient are all examples of courtesy and helpfulness attitudes that relate to the behaviour of mGovernment service provider to mobile users, which may contribute to their (dis)satisfaction. Carroll (2005) found in her study that unless the services and applications of mGovernment meet citizens’ needs, they will not achieve long-term, persistent use.

3.3 Efficient Transactions

Any online government service and/or transaction must be secure and private. When deciding whether a mobile payment service is efficient; users will consider the following: Is this mobile transaction system easier, faster and better than conventional payment methods? As for mServices in particular the following elements play even more significant roles in making a transaction efficient:

USABILITY: The simplicity or complexity of the system rendering the service is a significant determinant of either an efficient or inefficient transaction (Wefering, Rupprecht, Wegeler, & Grimm, 2002). Accordingly, in order to accurately define the simplicity or complexity of an mService, mobile users needs have to be investigated. This is particularly important when related to mobile devices which have small screen real estate and awkward input procedures.

TIMELINESS: Service timeliness is when the service is delivered on the expected or promised time and does play an important role in the government to citizen (G2C) relationship.

TRUST: Trust has been known as a critical success factor of e & mCommerce, and has received significant attention in private sector eCommerce research. Lack of trust in online entities can prevent mobile users from providing personal information (Hoffman, Novak, & Peralta, 1999) and hinder adoption of eCommerce (Bhattacharjee, 2002). Mayer et al. (1995) define trust as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control the other party”. Citizens must have trust in their governments and, indeed, in the Philippines, soldiers are able to use SMS messages to communicate with their leaders if they suspect corruption in the ranks (El-Kiki, Lawrence, & Steele, 2005). Dietz (2005) reported that a group of Mobile Network Operators have joined the Liberty Alliance, ‘which standardizes identity management functionalities bridging mobile and Internet, turning the mobile devices into trusted, mobile passport-like devices’.

PRIVACY: Privacy is defined (Legnini, 2006) as “the right to be left alone and to control the conditions under which information pertaining to you is collected, used and disseminated” . If users’ privacy is not protected when using a mobile service, they simply will not use it again, making it very difficult to achieve critical mass. Users are becoming more aware of privacy issues and comparing the privacy policies of government sites with those of the private sector. As outlined by Ng-Kruelle et al. (2002) a serious concern for the concept of “location/context awareness” is the confidentiality of information concerning a person’s position. Indeed “Misuse could lead to increased intrusion on privacy by exposing an individual’s real-time movements with possible negative implications.” Citizens would normally react badly to such surveillance of their movements by a government although it is enabled so that emergency services can locate mobile phone users.

SECURITY: Security is protection from intended and unintended breaches that would result in the loss or dissemination of data (NECCC, 2001). Security is not just about installing the latest security devices and deploying the most modern security technologies. Information security is a combination of business, management and technical measures on an ongoing basis. In a 2005 study by Quocirca, two thirds of IT professionals rated data falling into the wrong hands by theft or loss of a device as the most important mobile security issue (Bamworth, 2006). If the material contained mobile voting records, the effect could be catastrophic for governments.

3.4 Strategic Data

ACCOUNTABILITY: Accountability is an immediate issue as mGovernment services must be accountable to their mobile users, i.e. assure that mobile users can tell who did what and when, and are convinced that the system keeps its security promises. As per Christensen and Laegreid (2002) “The success of market-oriented accountability is dependent on citizens having sufficient resources to make their preferences felt in the market and upon the perfect realization of the notoriously unrealistic conditions that characterize the economist’s ‘ideal market’.” “A preoccupation with efficiency tends to overvalue the need for managerial accountability rather than promoting political responsibility. Efficiency is no guarantor of good political and social judgment, which are essential in securing genuine political responsibility and legitimacy in a democracy” (ibid, 2002). In addition, the use of private sector partnerships must not reduce accountability.

TRANSPARENCY: Transparency means openness of decisions and actions taken by civil servants to the public who would seek to hold them accountable (Heeks, 2004). Citizens too rarely understand how government decisions are made. This lack of transparency prevents the public from actively participating in government and from raising questions or protesting unfair or ill-advised decisions. A lack of transparency can conceal official graft or favouritism (Reffat, 2003). mGovernment as a subset of Government (El-Kiki

& Lawrence, 2006b) is no different; mServices should provide security and transparency to their mobile users.

3.5 Usage

mGovernment increases the acceptance, adoption and the usage of online governmental services by reaching the citizens through a more personal, familiar and friendly device (I. Kushchu & Borucki, 2004). Earlier, Accenture (2003) found that the potential benefits of eGovernment— improved service, greater efficiency and potential cost savings—will not be realized if usage of the services is low. In our model we conjecture that higher usage is the likely outcome of satisfaction which is an accumulative value of all the users' goals mentioned above. By early 2005, fifty (50%) of all users of the Helsinki train and tram mobile ticketing systems buy at least one mobile ticket per week and one third (33%) buy a mobile ticket monthly (Suomi, 2006).

4. Conceptual model of end-user's needs to mServices and survey hypotheses

Gathering all the fore mentioned points, the conceptual model of the user's needs for mServices is therefore formed as follows in Figure 2:

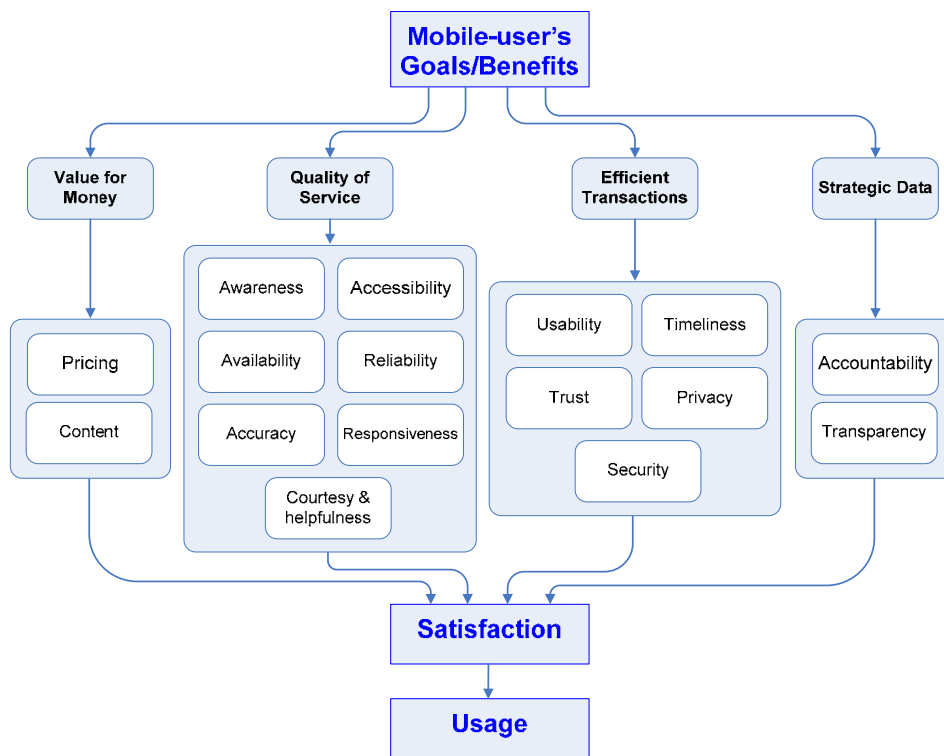


Figure 2: Mobile-user's Benefits from mGovernment Services

Hypotheses:

H₁: The higher rate of mobile user satisfaction will positively affect the rate of mService usage.

H₂: The higher rate of mService usage will positively affect the effectiveness of the rendered mService.

These hypotheses are represented in the following Figure 3:

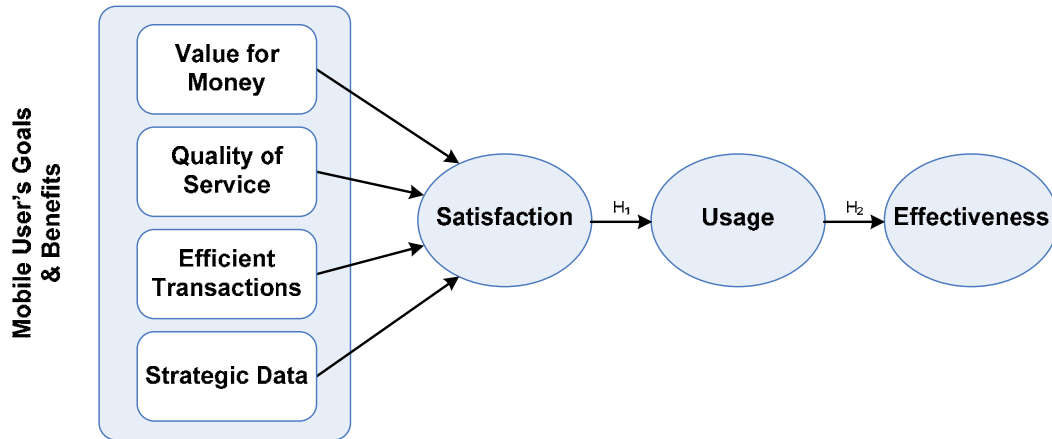


Figure 3: Hypotheses Allocation in the Conceptual Survey Model

El Kiki et al (2005) have described effectiveness as the extent to which the goals of a certain policy measure have been achieved. A government initiative measure is said to be effective if the goals are reached, i.e. if the outcomes match with the goals. Government is said to be effective when it renders its services to its constituents, and produces a desired result. Effectiveness evaluation is used to describe the relationship between inputs and desired outcomes, that is, between the amount of resources used and the desired effect or result achieved by a project or program (The City of Norfolk VA, 2005).

5. Methodology of the study

This paper represents the third stage in our research of the success and failure factors of mGovernment service projects initiated by the devised generic mGovernment framework (El-Kiki, Lawrence, & Steele, 2005). The focus of our initial literature review concentrated on existing studies that handled mGovernment user's topics. Academic databases, mainly Proquest and Computer and Information Systems Abstracts (CSA), were consulted. As mGovernment is a new but growing area of research, as evidenced by having its own international conference as well as specialized tracks in other international conferences, exploratory research is a legitimate methodology (Hussey & Hussey, 1997). Such exploratory research assists in establishing the theoretical foundation for further examination and has been vital in developing a viable, theoretical framework as set out in our previous paper (Sekaran, 2003) and which is further expanded in this paper. To complete this study, the case study method was chosen (Lee, 1989) where data will be gathered through structured interviews and surveys (Pinsonneault & Kraemer, 1993). Structured interviews will be used with businesses whilst surveys will be used with core, regular or sporadic users of mobile government services. This methodology has been utilized by other researchers (Guimaraes & Igbaria, 1997; Tait & Vessey, 1988) in similar studies. Questions are collated in groups and ranked on a 5-point Likert type scale. Open ended answers will be analysed via content analysis.

6. Survey plan & questions

Building upon our 'Multi-Perspective Effectiveness Evaluation Methodology for mGovernment (MPE²M-mG), which collates the concepts of Goal/Question/Metric or GQM (Solingen & Berghout, 1999) and Balanced Scorecard Approach or BSA (Kaplan & Norton, 1992), the following table reflects the citizens and businesses perspectives as mobile users or consumers of mobile government services. . It is worth mentioning that there are opening questions which are not mentioned in the set of questions here below. One question will ask the mobile users which government mobile service they usually access through their

mobile devices and ask them to rate it and comment on it. Another will ask if they have been involved in developing a mobile service and ask them to rate it and comment on it. The authors have designed three questionnaires: 1. for mobile government experts for example academics, mobile consultants and mobile Telcos, 2 for government officials and finally 3 for mobile users. Demographic data will be captured. Participants will be asked to complete the survey online. The rest of the questions are based on those found in the table below:

QGM BSA	Conceptual Level	Operational Level	Qualitative & Quantitative Level
Perspectives	Goals	Indicator Domains	Questions
Citizens / Businesses	Value for money	Pricing	How do you rank this mobile service fee compared to the normal service? Are there any savings using this mobile service? How much do you think you saved last year using this mobile service?
		Content	Does the mobile service provide the precise information you need? Does the mobile service report seem to be about exactly what you need? Does the mobile service provide sufficient information?
	Quality of Mobile service	Awareness	Were you previously informed about this mobile service? Have you been trained to use this mobile service? How did you learn about this mobile service? (Recommended to you, media...)
		Accessibility	Does the mobile service provide access for persons with disabilities?
		Availability	Is the mobile service available at anytime? Is the mobile service available anywhere?
		Reliability	Does the mobile service provide reliable information? Do you think this mobile service is fault-tolerant? Is your connection session recoverable if there is any interruption?
		Accuracy	Is the mobile service error-free? Does the mobile service provide correct information? Does the mobile service provide accurate information?
		Responsiveness	Are you satisfied with the speed by which the pages appear on the screen?
		Courtesy & Helpfulness	Is it easy finding somebody to answer your question? Do you receive the expected assistance when you need it? Do you receive any courtesy calls after your request is fulfilled?
	Efficient Transactions	Usability	Do you understand how this mobile service works? How do you rank the easiness of this mobile service? How difficult was it learning how to use this mobile service? How do you find the language of this mobile service? (Hard...)
		Timeliness	Do you get the information you need in time? Does the mobile service provide up-to-date information?
		Trust	Do you trust this mobile service? Why do you trust this mobile service?
		Privacy	Do feel confident about your privacy protection when using this mobile service? How do you feel when divulging your personal details when using this mobile service?
		Security	Do feel your transaction is secure when using this mobile service?
	Strategic Data	Accountability	Are you able to communicate with government officials through this mobile service?
		Transparency	Does this mobile service enable you to actively give your opinion to the government? Does this mobile service enable you to protest unfair or ill-advised decisions?
	Overall Satisfaction		How would you rate your satisfaction with the use of this mobile service?

Table 1: Mobile-user's Satisfaction Questions

7. Conclusions and Future Directions

This paper has presented the third stage in an ongoing study of effective and efficient mobile government's services. It describes the architecture of the conceptual model that has been devised and analyses the mobile user requirements necessary to ensure satisfaction with the mobile service. Satisfaction is considered the

gateway to increase the mobile service usage which is a key element in measuring the effectiveness of an mService project's validity. Finally it has outlined the questions that will form part of the next stage of this ongoing investigation. The results of the survey will be analysed and contribute to the next stage into the authors' investigation of effective mobile government services

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