A Six-Level Model of SMS-based eGovernment

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Tony Dwi Susanto, Dr. Robert Goodwin, A/Prof. Paul Calder
School of Informatics and Engineering-Flinders University, South Australia
susa0004@flinders.edu.au
Robert.goodwin@flinders.edu.au
Paul.calder@flinders.edu.au

Abstract:
SMS-based e-government is becoming popular in developed and developing countries as one of strategies to engage more citizens to use e-government services. However, there is no study predicting and explaining the acceptance of the SMS-based e-government. This paper is one of a series of three-papers investigating the opportunities and popularity of SMS-based e-government as a background of a current research project that endeavours to develop an SMS-based E-Government Acceptance Model (SEGAM).
This paper presents current advances in the popularity of SMS-based e-government among local authorities in developed and developing countries by investigating to what extent SMS-based e-government could deliver existing Internet-based e-government services, and more importantly, whether these services can fulfil the actual needs of e-government services users. It represents the current available SMS-based e-government services as a model with six levels: Listen, Notification, Pull-based Information, Communication, Transaction, and Integration levels. The model classifies the SMS-based e-government systems and the levels based on the complexity of the system and the benefits received by citizens; the higher the level the more complex the system and the more benefits received by citizens.
The comparisons of the SMS-based e-government model to the general Internet-based e-government models and the typical e-government use show SMS-based e-government is likely to deliver all service offerings of Internet-based e-government and the actual needs of e-government users except for downloading forms. The outcomes justify the popularity and the advance of SMS-based e-government services.

Keywords: SMS, e-government, model, mobile e-government, six-level.

1. Introduction

Despite the high number of e-government initiatives in the world, one of the current critical issues in e-government is its low adoption rates particularly in developing countries. Research by Dalziel (2004) across 31 countries found that the use of e-government in developing countries is still low: just 14% compared to developed countries where the use is 40% on average. It is a critical issue since one of the main goals of e-government is to improve citizen access to government information and services as well as to ensure citizen participation in and satisfaction with the government process (Moon in Khosrowpour 2005). An e-government system is useful to the extent to which citizens actually use the services (Accenture, 2003). "Until the gap between what is offered and what is used can be bridged, e-government is far from reaching its maximum potential and government can not justify large investments in e-government and get all of the value possible out of these investments" (Al-Adawi, Yousafzai et al. 2005).

In case of developing countries, Susanto and Goodwin (2006) argue that SMS-based e-government is more likely to increase e-government usage than the current Internet-based e-government. SMS-based e-government may be defined as a strategy and its implementation involves the utilization of Short Message Service (SMS) technology, services and applications for improving benefits to the parties involved in e-government including citizens, business, and government institutions. It may address the existing design-reality gap between the common proposed channel (Internet) and the real ICT situation in developing countries which

is high Internet illiteracy, lack of Internet infrastructure, high Internet cost, and low affordability (Susanto and Goodwin 2006; Basu and Norris in Dada 2006). Based on the facts that people in developing countries are more familiar with SMS than Internet, the number of SMS users is much higher, the SMS infrastructure is more extensive, and the SMS cost as well as mobile phone prices are much lower and affordable compared to the Internet and PCs, SMS-based e-government could be the more appropriate channel to deliver e-government services in developing countries (Susanto and Goodwin 2006). An empirical experience of the Philippines also showed that people prefer to contact their government using the SMS-based channel (87%) rather than Internet (11%) (Lallana 2004, p.30). Indeed, based on the technology acceptance theories, the cheaper service/technology might have a higher speed in adoption (Innovations Diffusion Theory by Rogers in Wikipedia 2008), and the facilitation conditions (the available resources and knowledge) have a direct influence on the usage (Unified Theory of Acceptance and Use of Technology by Venkatesh et al 2003). Since e-government service is for every citizen, a leading-edge technology should not be adopted unless most citizens are ready to use it (Lee and Hong, 2002), the governments should provide the channels which people have the technology and skills to access it instead (Dalziel 2004).

In matter of fact, the implementations of SMS-based e-government services are getting popular. Major reasons of the local authorities to setup and to promote SMS-based e-government relates to characteristics of the SMS medium which are easy to use, very cheap in cost, an anywhere anytime communication channel, high penetration, and excessive in infrastructure. By these characteristics, governments expect to improve communication with their citizens, to reach more people in rural area where Internet access is unavailable, to allow easier, greater access, convenient and flexible in time to the government services, to provide cheaper and faster services, to improve effectiveness of the communication by reaching the correct citizen personally, to encourage citizens participation, and to improve the accountability of government (epractice.eu 2008; Lallana 2008). Indeed, current surveys on the implementations of SMS-based e-government in some local authorities have proved its benefits. The local authorities have reported significantly empirical benefits of SMS-based e-government including reducing time and cost; introducing a cheaper, easier and fast information-accessing channel; improving transparency, accountability, communication, and relationship between government and citizens; making the services and procedures easier for the citizens; improving the district political image; engaging more people and increasing citizens participation; and promoting e-Democracy (Lallana 2004; Rannu and Semevsky 2005; Bremer and Prado 2006).

However, despite its current popularity, there is no a single study on adoption of the SMS-based e-government. The study will be needed in order to predict and explain what factors that influence individual to use the SMS-based e-government services. By knowing the determinants and the relationships among the factors and the actual usage behaviour, it will assist local government to design the accepted SMS-based e-government which increases e-government usage as one of the main goals.

This paper investigates the popularity and the advance of current existing SMS-based e-government services compared to Internet-based e-government services. The research question in this paper: how extent the SMS-based e-government services could deliver the current Internet-based services and meet the users' needs? Currently available SMS-based e-government services will be investigated and presented as a six-level model of SMS-based e-government in Section 2. In Section 3, the paper analyses and compares available services in the SMS-based e-government model to general Internet-based e-government models in order to analyse whether the SMS-based e-government systems can render all services in Internet-based e-government. In Section 4, currently available services in the SMS-based e-government model will be analysed to determine if they provide the currently used features of e-government. The conclusion and the future directions are in Section 5.

2. Available SMS-based e-government services
The available service offering in e-government refers to the operational service flow between the actors involved in the e-government service in order to achieve the service's objectives and realize the proposed value (Lee and Hong, 2002). A common method to categorize the

service offering in current Internet-based e-government systems is a stage model which categorises services into presence/catalogue, interactive (two-way communication), transactional, and integration/transformation stages (Laynee and Lee, Baum and Di Maio, Ronaghan, Hiller and Belanger in Coursey and Norris 2008).

By investigating currently existing SMS-based e-government applications among local authorities in developed and developing countries, we propose a model to represent the available SMS-based e-government services (Figure 1). The model suggests that SMS-based e-government services can be classified into six levels based on the service offerings: Listen, Notification, Pull-based Information, Communication, Transaction, and Integration. This SMS-based e-government model is not a development-stage model, like common Internet-based e-government models, that classifies e-government into steps and predicts the linear development of e-government from the lowest step to the highest step progressively (each successive stage is better than previous one) and step-wisely (the government has to proceed through each step in series). Instead of *stage* or *step*, the proposed model uses the term *level* since it represents the available service offering and not the direction of the systems' evolution, each level is independent of the others and can be complementary each other (one/more level can be added into another level). It ranks the levels according to the complexity of the system and benefits received to citizens. The benefits delivered by mobile government to citizens are presented in Table 1 (U.K. Cabinet Office 2000b in Lee & Hong 2002, El-Kiki & Lawrence 2006). The higher the level, the more complex the system and the more benefits may be received to citizens.

Table 1: Benefits offered by mobile-government (El-Kiki & Lawrence, 2006)

| Benefits	Description
Value for Money	The content and service are worthier for the price paid, even better.
Quality of Service	Citizens (users) aware that the services are in existence, know what it does, how it is relevant to them, and how to access it. (Awareness)
	All citizens have access to the services. (Accessibility)
	The services really work any time any where. (Availability)
	The services perform dependably, accurately, and consistently. (Reliability)
	The services are more accurate, minimal error possible. (Accuracy)
	The systems response any access and request fast. (Responsiveness)
	The services are more respectful, considerate, friendly, helpful, polite, and efficient. (Courtesy and helpfulness)
Efficient Transactions	The services are easier and more convenient to use. (Usability)
	The services are delivered on promised time and do play an important role in G2C relationship. (Timeliness)
	The services can be more trusted. (Trust)
	It protects the users' privacy. (Privacy)
	It has more secure service. (Security)
Strategic Data	Through the services, citizens can tell and ask who did what and when to the government, and government answers it by keeping their privacy and security. (Accountability)
	Using the services, government makes any decisions and actions open for citizens. (Transparency)
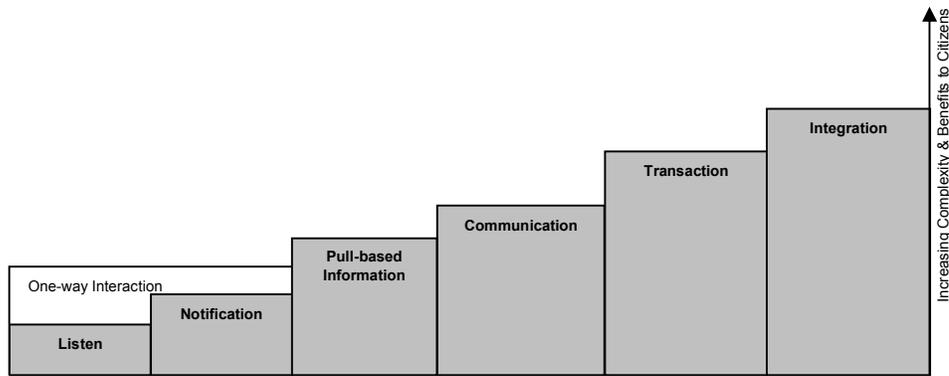
Figure 1: A six-level model of SMS-based e-government services

2.1. Listen level

On the first level, we classify current SMS-based e-government applications which have been widely used by governments to listen to citizens' opinions, reports, and complaints. Most of the systems in this level use SMS to enable citizens to send messages directly to mayors, councillors, the council, and the local authority. However, these systems are not designed to reply to the input-messages or to inform the sender of the following actions. This one-way communication mode from citizens to government is categorized as the Listen level.

Examples of SMS-based e-government applications at this level include TXTGMA and text 117 in the Philippines, 9949 channel in Indonesia, and DMH ESCUCHA in Mexico City. The TXTGMA and 9949 channel are the SMS channels to reach the president. The DMH ESCUCHA is the SMS channel for the district mayor. Citizens can bring their concerns directly to the president or mayor by sending messages such as complaints about government services, projects, or officials; opinions about new policy; enquiries about new programs; or reporting about corruption. All of the input-messages are classified and forwarded to the right departments or officials to take action. However, most of the systems do not acknowledge receipt or inform the senders about the following actions.

The main benefit contributed by this level is accessibility. Citizens have a channel to share or broadcast their views on important issues directly to their government. It contributes to the citizens' empowerment. However, the lack of responsiveness and transparency, as well as protection for the senders' privacy and security prevent the public from actively participating in using these services (Signo, 2006).

2.2. Notification level

In the second level, current SMS-based e-government systems have enabled one-way communication from government to citizens. The government is able to notify citizens about their personal information and to broadcast important public information. This model classifies these applications as Notification level.

Services in this level use Push-based mechanism, which sends the messages to citizens activated by data on the server, not by a user's request. Technically, the services can be *Push – Event SMS*, *Push – Scheduled SMS, Push – Personal Profile SMS*, *Push – Location SMS*, or *SMS broadcasting*. In the Push-Event SMS, messages are sent to citizens activated by event-based application. The Push – Scheduled SMS sends the messages to people activated by time scheduled-based application. Messages in the Push – Personal Profile are sent to citizens activated by application based on profile and preference of the user. The Push-Location SMS system will send a particular message when the user approaches certain locations. Finally, the SMS broadcasting system broadcasts messages to all citizens in particular area (using Cell-Broadcast Service) or certain people registered in the database (using point-to-point SMS service) (Susanto & Goodwin, 2006).

An example of the current push-event SMS-based e-government applications is the *eBroadcasting* system (the Philippines) and the M-library in Tartu (Estonia). The

eBroadcasting system which belongs to Bureau of Internal Revenue-the Philippines is an SMS-based application that sends a confirmation message to taxpayers including the amount when their tax payment is received (Lallana, 2004). The M-library sends out a notification message to citizens registered in the system when a book, movie, or audiotape becomes available for loan (Rannu & Semevsky 2005). The sample of push-scheduled SMS-based e-government is DMH CITA (Mexico City). It sends a reminder or confirmation of appointment 24 hours before the appointment triggered by the database of appointment that previously requested through the call centre. An application of current push-personal profile SMS-based e-government is the *Job Hunt* system (the Philippines) which sends a notification message to the job seeker whenever a matching job is available (Smith, 2005). An SMS-based tourist guide system is an example of the Push-Location SMS services that will send messages to tourists at a location information about the location such as what to see, the artist, or the history of the place (Decker M. 2006). Additionally, the example of SMS broadcasting system is DMH PROTÉGÉ (Mexico City) which sends alert messages to citizens in the district regarding meteorological and high rain risks, low temperatures, potential disasters, and emergency locations as well as contact numbers (Bremer & Prado, 2006).

Delivering notification services to the public in this level makes citizens in the place as customers (the courtesy and helpfulness benefit). The systems enable citizens to get the information easily, conveniently, on time, cheaply, and often free (the benefits of usability, timeliness and value for money). Other major benefits of this level's services are that citizens are informed about and more involved in the activities of government (the transparency benefit), making the government more accountable to its citizens. Privacy is a common issue in this level should all mobile phone users be included in the services automatically or only with their permission. Other issues include information services do not match the needs of citizens and providing easy registration methods.

2.3. Pull-based Information level

Current SMS-based e-government systems also provide two-ways communication that enables citizens to access public or personal information by sending a request-message. The services use the pull method: citizens send a 'request SMS' to the service and the replied service is sent back to the sender's handset via SMS. The information options provided by services in this level are limited and the request-text must be in a certain format.

Examples of current e-government applications in this level are NHS Direct system (UK) and SMS-based vehicle detail system (East Java, Indonesia). The NHS Direct system allows citizens to track the nearest health services by sending a text message with the name of the service required (such as doctor or pharmacy) and their post code to the NHS Direct number; the sender will receive an instant reply with the details of the requested service, including address, telephone number and distance from the postcode area (eGovernment Research Center, 2008). The SMS-based vehicle detail system enables citizens inquire about a vehicle (tax, model, and owner) by sending the vehicle registration number (dipendajatim, 2007).

The dominant benefits delivered by this level are accessibility, availability, responsiveness, and timeliness. Citizens can access their personal or public information any time any where. Some challenges in this level include how to provide cheap or even free notification services (value for money benefit), how to choose the information services which are really needed by citizens (awareness), and how to provide a simple, easy to use and remember request-message formats (usability).

2.4. Communication level

There are some existing SMS-based e-government systems that provide two-way communication between government and citizens in which the people can inquire, complain or report about anything (without worrying about the text format) and get responses/replies immediately. This level is the Communication level.

A simple system to receive and reply to citizens' input-messages is an SMS gateway operated by a team who has been trained to answer any queries, such as TXTCSC (the Philippines). The TXTCSC of the Civil Service Commission of the Philippines is for Filipinos to complain, suggest, commend, inquire, or report about public services, corruption, and

inefficient bureaucracy. The TXTCSC answers the queries and complaints within a day. When the system is unable to respond to queries, it refers the text messages to the agencies concerned and reports back regarding the actions (Lallana, 2004). Another option for providing services at this level is combining the SMS and email channels like in Stirling (UK). The Stirling council receives the citizens' messages through the SMS gateway which converts the messages to emails. The contact centre officers respond immediately the emails if they know the answer to the query or direct it to the relevant service. Responses to customers will automatically be converted back into a text message and sent back to their mobile phones (egovmonitor, 2006).

Since it enables citizens to express their opinion, comment or query to the government using sentences without worrying about the text format and getting the reply immediately, this level offers more benefits in accessibility, availability, responsiveness, courtesy and helpfulness, usability, timeliness, accountability, and transparency. Potential issues at this level are low protection for privacy and security of the senders, and lack of the assurance of fast and effective response to any input-messages (the responsiveness).

2.5. Transaction level

Some SMS-based e-government systems can process transactions. Through these systems citizens can pay bills and send or update their personal data through SMS.

Some examples of existing SMS-based e-government applications categorized in this level are mobile ticketing (UK) and an SMS voting system (Switzerland). The Mobile ticketing enables people to order tickets for major events (such as football matches, rock concert) just by sending an SMS (SkiData in Monash 2005). They then receive a return SMS which has an image with a 2-dimensional metric-code containing details such as the ticket number, the mobile phone number and the seat number. The people will be charged for their tickets by the mobile service provider once the 2-D codes on their mobile phones are scanned on entering the stadium. The SMS-voting system enables citizens to cast their votes in elections or votes from home or when travelling (itwire, 2008).

Since citizens can do any transaction (money and data) with the government agencies any time any where in a secure channel, this level offers more benefits in the accessibility, availability, accuracy, responsiveness, courtesy and helpfulness, timeliness, trust, privacy, and security. However, trust and security are still the dominant issues.

2.6. Integration level

Finally, the ultimate level of this model is when all the SMS-based systems are integrated and organized in a single portal so people just send messages to a single service number for all services. This level predicts the integrated-SMS systems will be also integrated with the Internet/web-based e-government systems so citizens have options whether accessing the services by sending SMS to one number or through the Internet at one web address. The SMS and the Internet may complement each other in a service, for example: a citizen may send form or pay a public service electronically by Internet and get notification via SMS, or pay the services through SMS and get the receipt by email.

An example of the SMS-based e-government which has achieved this level is SGOVT (Singapore). It is a single SMS portal for 150 government services across government agencies. Since July 2006, citizens just need to send their messages to short code 74688 or SGOVT (idasingapore, 2006).

As the ultimate level, this level should accommodate all of the benefits of mobile governments including value for money, high quality of service, efficient transaction, and strategic data benefits. Interoperability among the SMS-based systems, databases, and the Internet-based systems will be a potential issue.

In general, currently available SMS-based e-government systems have been able to deliver a wide range services from the simplest level that is Listen, up to Notification, Pull-based information, Communication, Transaction, and the Integration level.

3. Can SMS deliver Internet-based e-government services?

The (Internet-based) e-government models are development-stage models that represent the available service offerings of current Internet-based e-government systems. They classify them into stages, and predict the evolution process. In general there are four main stages: Web presence or Catalogue, Interaction, Transaction, and Integration or Transformation. The models assume that the development process is linear and step-wise (Laynee and Lee, Baum and Di Maio, Ronaghan, Hiller and Belanger in Coursey and Norris 2008).

Compared to the Internet-based e-government models, the SMS-based e-government is likely to deliver all of the service offerings. The Web Presence stage in Internet-based e-government may be transferred into Pull-based Information level in the SMS-based e-government model. The service offerings in the Interaction stage may be delivered using the Listen, Notification, and Communication levels in the SMS-based e-government model. The Transaction stage may be implemented similar with the Transaction level in the SMS-based government model. Finally, the service offerings in Integration levels in both models may be interchangeable.

4. Could SMS fulfil the typical e-government use?

In relation with the typical e-government use, Taylor Nelson Sofres Plc, one of the world's leading market research and information groups, found that the most major use of e-government services is for information seeking, the second is downloading the government forms that were then sent by post or fax (such as tax forms and forms to claim government rebates), the third major use is for providing personal/household information to the government, the fourth is for transactions such as paying for government services or products through the use of a credit card or bank account number (such as driving licence, traffic fines, recycle bins), and the least use of e-government services is for consulting with government (Dalziel 2004 p.6).

Most of these typical e-government uses may be fulfilled by SMS-based e-government. Information requests may be delivered by using applications in the Notification and Pull-based information levels. Providing personal information to government and doing transaction with government may be conducted through the SMS-based applications in the Transaction level. Consulting with government could be done using applications in the Communication level. Downloading the government forms may not be done through SMS. However, it may not be an issue for advanced governments who have started paperless culture.

5. Conclusions and next stages of the study

This paper is the first stage in an on going study to develop a model for the acceptance of SMS-based e-government service. The paper investigated to what extent current SMS-based services could deliver existing Internet-based e-government services and fulfil typical e-government use. It supports arguments for the importance of a study of an acceptance model of SMS-based e-government services.

Based on the service offerings, current SMS-based e-government may be classified into six levels: Listen, Notification, Pull-based Information, Communication, Transaction, and Integration. The higher the level the more complex the system and the more benefits received to citizens. The current SMS-based e-government systems may transfer service offerings in all stages of Internet-based e-government models including presenting information, interaction, transaction, and integration purposes. The SMS-based e-government is also likely to fulfil all of the typical e-government use: information seeking, providing information to government, doing transaction, and consulting, but not downloading of forms.

The next stages of this study will focus on developing an SMS-based E-Government Acceptance Model (SEGAM). It will investigate what factors may influence individuals to use SMS-based e-government services. The study will combine existing theories/models in technology acceptance; current studies' findings in adoption of e-government particularly mobile government and wireless services especially SMS; and empirical validation of the research model by developing and running three kinds SMS-based e-government services (Notification, Pull-based Information, Transaction) on real local authority/communities and a

survey on use. The study will develop a theory that explains the behavioural intentions and actual usage of SMS-based e-government services and may also provide a theoretical foundation for further studies on acceptance of other IT-based public services which use the SMS medium. For local authorities and e-government practitioners, it will assist them to determine which antecedent to focus on in order to increase the adoption rate of the SMS-based services and to analyse the reasons for resistance toward the services.

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