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DELIVERING PUBLIC SERVICES VIA SMS: TYPES OF THE SERVICES AND THE ACCEPTANCE FACTORS

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Abstract: Most Internet-based e-government services in developing countries have failed to engage people in using the services. The gap between the Internet technology and the poor ICT situations in developing countries (which are low Internet penetration, lack of Internet infrastructure, high Internet cost and illiteracy) is believed to be the barrier causing the low e-government adoption. Delivering public services via SMS (SMS-based e-government services) can bridge this gap and encourage more citizens to use e-government services.

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This paper presents the reasons why SMS-based e-government services are a good strategy to reach and engage more citizens in using e-government services particularly in developing countries. It also presents currently available SMS-based e-government services as a *Six-Level* model, a classification model of SMS-based e-government services based on the service offering, the complexity of the system and the benefits offered by the system. This paper also presents the 13 cognitive and affective factors which influence individuals to accept SMS-based e-government services as the *SMS-based E-Government Acceptance Model* (SEGAM).

In order to obtain a fast adoption of an SMS-based e-government service, it is recommended that governments start an SMS-based e-government service initiative from a *Notification* service targeting male citizens aged 31 to 40 and focus on how to develop a favourable *attitude towards using* the service among the target users. Five direct determinants (i.e. *perceived compatibility*, *perceived cost*, *perceived convenience*, *perceived behavioural control*, and *perceived risk*) and seven indirect determinants of *attitude toward use* (i.e. *perceived ease of use*, *perceived reliability and quality of the information*, *perceived personal relationship*, *perceived responsiveness*, *facilitating conditions*, *self-efficacy*, and *normative social* influence) should be accommodated in the processes of designing and delivering of an SMS-based e-government service. Given constraints in resources, governments should focus on the two

most important determinants of user acceptance of SMS-based e-government services: *attitude towards use* and *perceived compatibility*.

■ INTRODUCTION

Despite the success stories of e-government in developed countries, most e-government initiatives in developing countries have failed to engage citizens. Research by Dalziel (2004) across 31 countries found that the use of e-government in developing countries is just 14% compared to developed countries where the use is 40% on average. Similar research conducted by Accenture (2005) revealed that the use of e-government in developing countries is 11% on average, compared to 70%-90% e-government usage in developed countries such as Europe Union countries, Australia and United States.

Considering the main goal 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, the low rate of e-government adoption in developing countries is a critical issue. 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 cannot justify large investments in e-government and get all of the value possible out of these investments" (Al-Adawi, Yousafzai, & Pallister, 2005).

One of the critical failure factors of e-government projects is unrealistic design for the local environment (Heeks, 2003). Most e-government initiatives recommend governments build an Internet infrastructure and urge people to use the Internet medium to access the system. On the contrary, it is found that low Internet penetration, high Internet cost and Internet illiteracy, lack of Internet infrastructure, and unreliable power supply still exist in developing countries (Fifteen, 2008; Pedrelli, 2001). Some of the governments have been trying to address this problem by providing Internet training programs, building many Internet kiosks, and developing Internet and electrical infrastructures across the countries. However, these programs require large financial support, long-term process, and are very difficult to implement especially for poor and archipelagos countries. As a result, the gap between the Internet, as the main e-government channel, and the actual ICT (information communication technology) situations in developing countries (low Internet penetration, poor Internet infrastructure, high internet cost and illiteracy) results in the low adoption of Internet-based e-government services.

This paper suggests opportunities and a recommendation for implementing SMS-based e-government for delivering public services particularly in developing countries in order to reach and get more citizens using government services. It also presents a classification model of currently available SMS-based e-government services called the *Six-Level* model and reports the most popular services and the majority adopters of SMS-based e-government services. Finally, this paper presents a user adoption model of SMS-based e-government services called the *SMS-based E-Government Acceptance Model* (SEGAM). The recommendations, the classification model and the user adoption model of SMS-based e-government services are useful for governments in developing countries who are still struggling to engage people in their e-government services, for governments in developed and developing countries who want to initiate a new SMS-based e-government service or to evaluate existing SMS-based e-government services, and for system designers of SMS-based e-government services.

■ OPPORTUNITIES FOR SMS-BASED EGOVERNMENT

In order to bridge the gap between the Internet and actual ICT situations in developing countries, to reach and to engage more citizens to use e-government services, governments are recommended to adopt a bottom-up development approach by utilising the more popular communications technology in developing countries: mobile phones and the Short Message Service (SMS) application (Susanto & Goodwin, 2006). Instead of focusing on an Internet and PC-centric environment in providing e-government services, governments should provide an SMS channel as a starting point for the development of e-government services. Compared to the Internet, SMS has been accepted and used by many more people in developing countries; SMS is easy to read, easy to write, and easy to send for most people, even for uneducated people; the SMS price is much lower; and the SMS infrastructure is more extensive which supports widespread SMS usage (Susanto & Goodwin, 2006). As people have the necessary skills and access and the infrastructure is already in place, SMS can be considered to be the appropriate medium for delivering e-government in developing countries. The SMS-based e-government may then become a complimentary channel when Internet infrastructure is in place and Internet literacy among citizens is high.

In fact, SMS-based e-government services are becoming popular, not only in developing countries but also in developed countries. For example, the Australian government, commencing in 2010, reminds citizens via SMS about tax refunds, sends emergency situation warnings and sends notifications of public transportation timetable changes via SMS. Singapore's citizens have been able to access 150 public services through a single SMS number since 2006. By December 2008, 54 national government agencies in the Philippines were providing SMS-based services to augment traditional public services; in Oman, people can apply for jobs via SMS; and most local authorities in Ghana, the Philippines, and Indonesia have provided SMS channels for obtaining feedback from their citizens (news.smsegov.info, 2011). By July 2010, e-government resource centres such as the Victorian e-government centre (Australia) found 95 reports on initiatives on SMS-based e-government around the world and ePractice.eu found 19 current reports on SMS-based e-government in European countries.

The reasons why SMS-based e-government services can be relevant for both developed and developing countries are the high penetration of SMS and the characteristics of SMS technology itself. By April 2010, SMS was still believed to be the undisputed king of data applications even compared to mobile Internet (Marlatt, 2010). The huge number of SMS active users in 2009, which was 3.6 billion around the globe and reached 4 billion people at the end of 2010 is much larger than the number of worldwide internet users which was 1.9 billion people (including those who access at internet cafe's and on their mobile phones) (Marlatt, 2010; Stats, 2010). Moreover, SMS is easy to read, easy to write, and easy to send for most people, even for uneducated people. Compared to the mobile Internet, SMS is more readily available to every mobile user since SMS is one of the most basic functions of a mobile device. With 60 countries having already reached 100% mobile phone penetration rates and the mobile device typically always within arms' reach of the user 24x7, SMS-based e-government could enable governments to connect with citizens anywhere any time including in emergency situations (Marlatt, 2010). The receivers have flexibility where and when they want to read and to reply to the message. Technically, an SMS message could be sent personally or broadcasted to all mobile users in a certain area. Most importantly, an SMS message is guaranteed to be delivered since the message is stored in the network until the destination cell phone becomes available, so a user can receive or transmit an SMS message at any time, whether a voice call is in progress or not. SMS users also said that they could overcome shyness by avoiding talking or meeting in person, behave appropriately social behaviour, and send important information in a concise message by using SMS (Barkhuus, 2005).

Additional benefits of SMS-based e-government have also been reported. Providing public services through the SMS channel has significantly reduced the time and cost for public services; introduced a cheaper, easier and faster information accessing channel; improved transparency, accountability, communication and the relationship between government and citizens; made the services and procedures

easier for citizens to use; improved the district political image; increased citizens participation; and promoted e-Democracy (Bremer & Prado, 2006; Lallana, 2004; Rannu & Semevsky, 2005).

On the basis of these arguments, governments should consider SMS-based e-government services as a starting point for development of e-government services in developing countries and as an alternative e-government channel for broadcasting emergency information and to reach citizens in any country particularly those who live in rural areas where Internet access is unavailable but mobile networks are available, are poor, are uneducated, or do not know how to use the Internet.
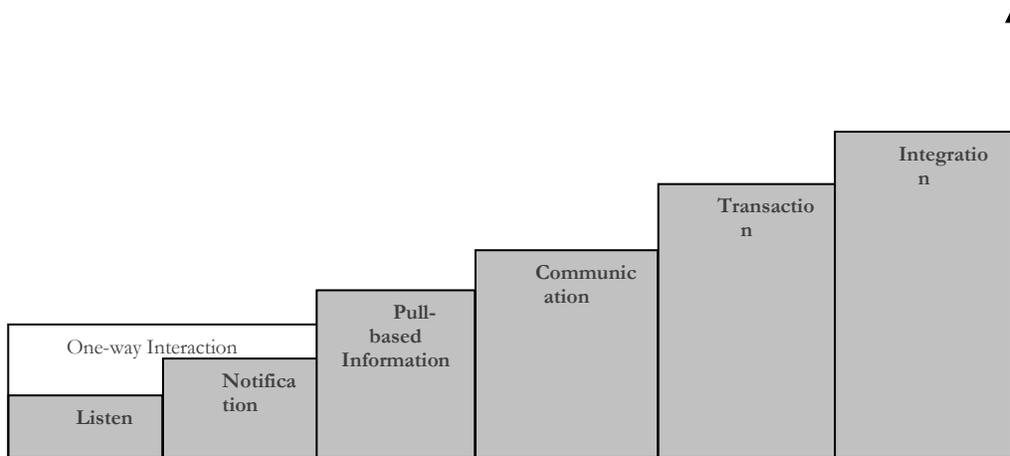
■ TYPES OF SMS-BASED EGOVERNMENT

To assist governments to decide what SMS-based e-government services can be developed and delivered, this paper presents a classification model of currently available SMS-based e-government services. Classification of the services also enables governments to use specific strategies to handle related e-government services (Zinkhan & Wallendorf, 1985). Understanding the variety of existing SMS-based e-government services is useful when trying to explain the adoption of SMS-based e-government services as different types of services may involve different adoption factors.

A common method to classify e-government systems is based on their service offerings. The service offering refers to the operational service flow between the actors involved in the e-government service in order to achieve the service's objectives and to realize the proposed value (Lee & Hong, 2002). Typically, Internet-based e-government systems are classified into development-stage models which categorise the services into Presence/Catalogue (one-way communication), Interactive (two-way communication), Transactional, and Integration/Transformation stages (as cited in Coursey & Norris, 2008). The models classify present e-government systems into stages and predict a 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 (a government has to proceed through each step in series).

Similarly, currently available SMS-based e-government can be classified based on the service offering, the complexity of the system and the benefits offered by the system. Susanto, Goodwin, and Calder (2008) proposed a *Six-Level model* of SMS-based e-government that classifies currently available SMS-based e-government services into six levels: *Listen*, *Notification*, *Pull-based Information*, *Communication*, *Transaction*, and *Integration* (see Figure 1). Instead of *stage* or *step*, the proposed model uses the term *level* as the proposed SMS-based e-government model is not a development-stage model: sequence of the levels does not suggest the direction of system evolution. Each level represents the degree of the system's complexity and benefits gained by the users. The higher the level, the more complex the system and the more benefits may be received by citizens as the users. Each level is independent of the others and could be complementary each other (one or more level could be added into another level). Additionally, for each level, the operational service flow between the actors involved in the services is relatively different. The proposed model is presented as Figure 1 and elaborated below.

FIGURE 1: A SIX-LEVEL MODEL OF SMS-BASED E-GOVERNMENT SERVICES

Listen level

In the first level, this model groups current SMS applications that are simply for listening to citizens' opinions, reports, and complaints. Most of these systems found in literature are for enabling citizens to send messages directly to mayors, councillors, the council, the local authority, or the decision makers in the government. However, the systems in this level are not designed to reply to the input-messages or to inform the sender of the subsequent 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, while the DMH ESCUCHA is a channel to 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 subsequent actions.

Notification level

While the Listen level classifies one-way SMS applications from citizens to government, the next level of this model – the Notification level – incorporates the other one-way SMS applications: from government to citizens. This level covers all SMS-based applications that enable government to notify citizens about personal information or to broadcast official information to the public such as the Meteorology department providing weather reports and disaster warnings, the Transportation office providing commuters details of delayed arrivals of trains or closing of some roads, or notification of a new publication on government policy.

Current 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 message. 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. Examples for these applications are the *eBroadcasting* system (in the Philippines) and M-library in Tartu (in Estonia). The *eBroadcasting* system which belongs to the Bureau of Internal Revenue - the Philippines is an SMS-based application that sends a confirmation message to taxpayers including the amount and 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 push-scheduled SMS sends the messages to people activated by time scheduled-based application, such as DMH CITA system in Mexico City. The DMH CITA sends a reminder or confirmation of appointment 24 hours before the appointment triggered by the database of appointments previously requested through the call centre.

Messages in the push-personal profile are sent to citizens activated by an application based on the profile and preferences of the user. An example of these SMS applications is the *Job Hunt* system in the Philippines that sends a notification message to the job seeker whenever a matching job is available (Smith, 2005).

The push-location SMS system will send a particular message when the user approaches a certain location. An SMS-based tourist guide system is the example that will send messages to tourists at certain locations with information about what to see, the artist, or the history of the place.

Finally, the SMS broadcasting system broadcasts messages to all citizens in a particular area (using Cell-Broadcast Service) or to certain people registered in the database (using point-to-point SMS service). One of the examples is DMH PROTEGE (in Mexico City). It 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).

Pull-based Information level

On the third level, this model classifies current SMS applications for public services that enable citizens to 'pull' information by sending a request message. Yet, the information options provided by the services are limited and the request-text must be in a certain format. These two-ways communication services are called *Pull-based Information* level.

Examples of current e-government applications in this level are the NHS Direct system in UK and the SMS-based vehicle detail system in 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. The SMS-based vehicle detail system enables citizens inquire about a vehicle (tax, model, and owner) by sending the vehicle registration number.

A Pull-based Information system could be set up by utilizing a mobile phone or a GSM modem connected to a PC with an SMS server application installed and a database of the information. The SMS server application receives each incoming message, parses the words, picks the information from the database, and sends the reply to the sender's mobile phone. A government organization could provide the service and set up the system by themselves or collaborate with a private mobile service provider, for instance the government provides the information (content) while the private company runs and manages the service.

Communication level

This level classifies current SMS applications for public services that enable people to inquire, to complain or to report about anything through the SMS channels without worrying about the text format and to get responses immediately. The SMS services in this level are analogous with an advanced Listen service that not only receive a free-format message ("listen") but also replies the sender with information straight away ("communicate"). These SMS applications that enable two-way communication between government and citizens (with free format or sentences) are classified as *Communication* level services.

The simplest system of this level 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, comment, 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 the 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 to 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.

Transaction level

The fifth level of this model includes all of the SMS applications that enable citizens to complete transactions via SMS including financial transactions (such as SMS banking) or data transactions (such as an SMS voting system).

Current examples of these applications are mobile ticketing in the UK and an SMS voting system in Switzerland. Mobile ticketing enables people to order tickets for major events (such as football matches and rock concerts) by sending an SMS (MonashUniversity, 2005). They then receive a reply SMS that 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 mobile users 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 from home or when travelling (itwire, 2008).

Integration level

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

An example of SMS-based e-government in this level is SGOVT (Singapore), a single SMS portal for 150 government services across government agencies. Since July 2006, citizens have been able to access all services by sending messages to 74688 or SGOVT.

SMS-based eGovernment Services: Comparison with Internet-based eGovernment Services, the Most Popular Services, and the Majority Adopters

Regarding typical e-government use, Taylor Nelson Sofres Plc, one of the world's leading market research and information groups, revealed that the major use of Internet-based e-government services is for information seeking, followed by downloading government forms that were normally sent by post or fax (such as tax forms and forms to claim government rebates), providing personal/household information to the government, 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).

Compared to the available SMS-based e-government services represented by the *Six-Level* model, most of the typical e-government uses may be fulfilled by available SMS-based e-government services. Information requests can be delivered by using SMS applications in the Notification and Pull-based information levels. Providing personal information to government and transactions 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 government forms can not be done through SMS. This may not be an issue for governments who have started a paperless culture.

Even if in terms of service offerings and typical e-government use SMS-based e-government might be able to deliver Internet-based e-government services, it does not mean that the SMS-based e-government can replace Internet-based e-government. The limitation of the SMS channel that allows delivery of 160 characters as text only without sounds and images for one sending-time indeed cannot deliver the complex services in the Internet such as unlimited texts and multimedia with more security layers.

The simplicity of SMS, low in cost and the ability to get citizens anytime anywhere is the power of SMS for public services. Hence, rather than replacing, the SMS-based channel is suggested as a complement to the Internet-based systems and plays a front-line role for e-government services particularly for engaging more people in the services. Governments should define what services are appropriately delivered by SMS by considering the main advantages of the channel. For instance, notifying due date for tax or warning about a potential disaster may be better using SMS than email as citizens may find and read the message immediately.

In terms of popularity, a survey involving 159 responses from 25 countries found that the *Notification* service is the most frequently used SMS-based e-government service, following by *Pull*, *Listen*, and *Transaction*. This survey also found that male citizens aged 31 to 40 years are the most likely adopters of SMS-based e-government services (Susanto & Goodwin, 2010). These findings recommend governments, at the initial stage of implementation of SMS-based e-government services, run a *Notification* service targeting male citizens aged 31 to 40 in order to get a fast adoption of the service before moving to more advanced levels. This strategy will give governments the time to focus on simple SMS-based e-government services that are more responsive to citizens' needs and at the same time evaluate and improve the service, get the fast adopters who may influence other citizens to use the service by spreading their successful experience through their interpersonal networks, establish a positive online relationship with citizens, and collect feedback for the next SMS-based services.

■ USER ACCEPTANCE OF SMS-BASED EGOVERMENT SERVICES

In addition to starting an initiative of SMS-based e-government services from the most popular SMS-based e-government services and the majority adopters, governments and system designers also need to understand what factors influence individuals to use SMS-based e-government services. Understanding the adoption factors and accommodating them in the design and delivery processes can improve the possibility of an SMS-based e-government service being accepted by the target users. The understanding can also assist governments to evaluate existing SMS-based e-government services, why was an SMS-based e-government service rejected while another was accepted.
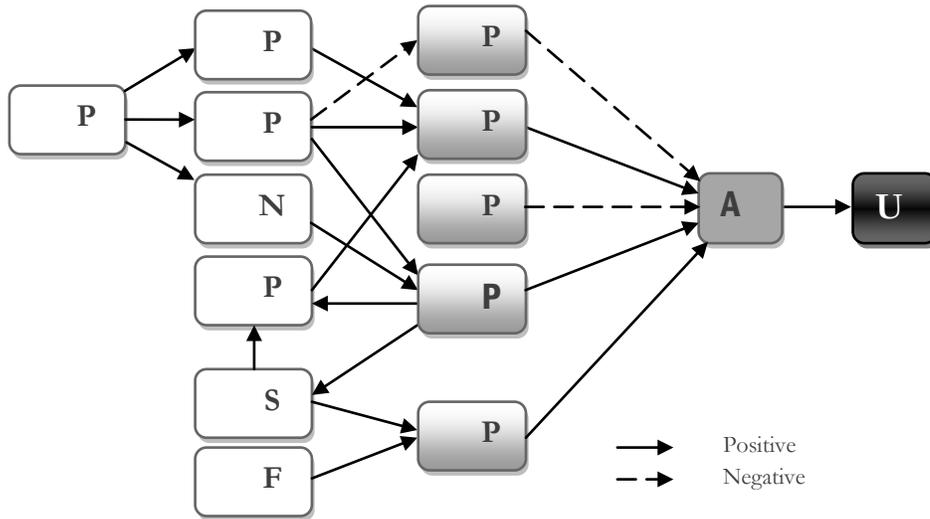
Our study on investigating what cognitive and affective factors influence individuals to use SMS-based e-government services found and suggested 13 factors: *attitude towards use*, *perceived behavioural control*, *normative social influence*, *perceived compatibility*, *perceived cost*, *perceived risk*, *perceived convenience*, *perceived ease of use*, *perceived responsiveness*, *perceived personal relationship*, *perceived reliability and quality of the information*, *self-efficacy*, and *facilitating conditions* (Susanto & Goodwin, 2011). To describe the relationships among the factors the study proposed the *SMS-based E-Government Acceptance Model* (SEGAM), which can explain 58 % variance of *usage intention* of SMS-based e-government services and 60% variance of *attitude towards use* (the most important factor of usage intention). The SEGAM has been validated using data from 589 citizens in three cities in Indonesia, the *Confirmatory Factor Analysis* (CFA) and *Structural Equation Modelling* (SEM) methods, and AMOS application

(*Analysis of Moment Structures*). The SEGAM is presented in Figure 2 and the constructs are explained in Table 1.

TABLE 1:   USER ACCEPTANCE FACTORS IN THE SEGAM

CONSTRUCT	DEFINITION
Usage intention (UI)	A measure of strength of individual's intention to use an SMS-based e-government service (Davis, et al., 1989).
Attitude towards use (A)	The degree to which a person has a favourable or unfavourable evaluation of using an SMS-based e-government service in question (Ajzen, 1991).
Perceived behavioral control (PBC)	The extent to which a person perceives that the required opportunities and resources to use an SMS-based e-government service are available for him/her (Ajzen, 1991).
Normative social influence (NSI)	A person's perception that most people who are important to him think he should or should not perform the behaviour (Ajzen, 1991). In the context of SMS-based e-government, the survey revealed that individuals perceived *normative social influence* (NSI) dominantly from family, friends or peers, and government (Susanto & Goodwin, 2010).
Perceived ease of use (PEU)	The degree to which a person perceives that using an SMS-based e-government service is easy (Davis, et al., 1989). This perception covers usability on the registration and unsubscribe methods, the text format for requesting information, the service number (whether it is easy to remember or not), and the way to use all of the service's functions (Susanto & Goodwin, 2010).
Perceived convenience (PC)	The degree to which a person believes that using an SMS-based e-government service would give him/her flexibility and efficiency in time, place, effort and control in accessing public services (Susanto & Goodwin, 2010). It represents *perceived usefulness* construct in TAM relevant for SMS-based e-government services.
Perceived risk (PRk)	The degree to which a person believes that using an SMS-based e-government service may cause problems for him/her. The concerns include risk of the SMS technology, risk to user privacy and security, and perceived financial risk (Susanto & Goodwin, 2010).
Perceived reliability and quality of the information (PRQI)	The degree to which an individual perceives that the information delivered by an SMS-based e-government is relevant for him/her, reliable and up-to-date (Susanto & Goodwin, 2010).
Perceived personal relationship (PPR)	The degree to which an individual perceives that using an SMS-based e-government service enables him/her to communicate directly and in-person with the decision maker (Susanto & Goodwin, 2010).
Perceived responsiveness (PRs)	The degree to which individual perceives that an SMS-based e-government service respond any incoming messages quickly and satisfactorily (Susanto & Goodwin, 2010).
Perceived cost (PCt)	The degree to which a person perceives that an SMS-based e-government service is costly. The perception covers individual consideration whether the service charges users more than a standard SMS rate (Susanto & Goodwin, 2010), comparison between the SMS cost to other communication channels such as phone call or Internet cost (Ajzen, 1991), and comparison between the cost and benefits they might obtain from using the service (Scharl, Dickinger, & Murphy, 2005; Turel, Serenko, & Bontis, 2006).
Perceived compatibility (PCy)	The degree to which individual perceives that an SMS-based e-government service is consistent with the way the one communicates, the existing public service channels and the popular communication media, and perceives the service or the information contents is suitable being delivered by SMS (Rogers, 2003; Susanto & Goodwin, 2010).
Facilitating conditions (FC)	Individual's belief on the availability of resources needed to use an SMS-based e-government service, such as a mobile phone and phone credit (Susanto & Goodwin, 2010; Venkatesh, Morris, Davis, & Davis, 2003).
Self-efficacy (SE)	Individual's self-confidence in his/her capability to use an SMS-based e-government service, including self-confidence in capabilities to use SMS, to register to and unsubscribe from an SMS-based service, and to utilize an SMS-based service's functions (Susanto & Goodwin, 2010; Taylor & Todd, 1995).

FIGURE 2: SMS-BASED E-GOVERNMENT ACCEPTANCE MODEL (SEGAM)

The SEGAM suggests that individuals' intention to use an SMS-based e-government service is solely determined by his/her *attitude towards using* the service (A). All other proposed factors influence *usage intention* (UI) indirectly through *attitude towards use* (A). *Attitude towards use* (A) of SMS-based e-government services is an individual's emotional (affective) response or feeling towards behaviour of using an SMS-based e-government service which could be ranging from dislike to like, unfavourable to favourable, bad to good, or negative to positive (Fishbein & Ajzen, 1975). This dominant role of *attitude towards use* (A) on individual acceptance of SMS-based e-government services is possibly because using an SMS-based e-government service is fully voluntary and commonly charges the users with standard SMS cost, which is cheap or even free. Moreover, the currently high penetration of SMS and mobile phones, availability of the mobile network in most places, simplicity of the SMS technology, and low SMS cost, means using SMS may not be a problem for most of citizens. As the result, *intention to use* (UI) SMS-based e-government services will be formed based simply on personal likes or dislikes with respect to utilizing the services (Davis, Bagozzi, & Warshaw, 1989).

This finding recommends governments and the system designers to pay attention on the target users' *attitude towards using* the service (A) in order to predict acceptability of an SMS-based e-government service and to have an acceptable SMS-based e-government service. In the early stage of the system development process, the government agency can develop and run a prototype of the service and administer a survey measuring the target users' *attitude towards using* the service (A). The more favourable their attitudes the more likely the service will be accepted by the target users. Likewise, to have an acceptable SMS-based e-government service, system designers should also accommodate all factors which may develop a favorable attitude towards using the service in the designing process and governments should emphasize the factors when promoting and managing the services.

The SEGAM suggests five beliefs that may influence *attitude towards use* (A) directly (i.e. *perceived compatibility* (PCy), *perceived cost* (PCt), *perceived convenience* (PC), *perceived risk* (PRk), and *perceived behavioural control* (PBC)), and seven beliefs that may influence *attitude towards use* (A) indirectly (i.e. *perceived reliability and quality of the information* (PRQI), *normative social influence* (NSI), *perceived ease of use* (PEU), *facilitating conditions* (FC), *self-efficacy* (SE), *perceived personal relationship* (PPR), and *perceived responsiveness* (PRs)).

The SEGAM suggests that a favorable *attitude* towards using an SMS-based e-government service (A) can be improved directly by increasing *perceived compatibility* (PCy), *perceived convenience* (PC) and *perceived behavioral control* (PBC), and by decreasing *perceived cost* (PCt) and *perceived risk* (PRk). Among these direct factors, *perceived compatibility* (PCy) is the most important determinant of *attitude towards use* (A) for both adopters and non-adopters. Across four types of SMS-based e-government services (*Notification*, *Pull*, *Listen*, and *Transaction* services), *attitude towards use* (A) was primarily influenced by *perceived compatibility* (PCy) in *Notification*, *Pull*, and *Transaction* services, while in *Listen* services *attitude towards use* (A) is significantly influenced by *perceived convenience* (PC).

Perceived compatibility should be guaranteed firstly since compatibility was the strongest predictor of *attitude towards using* SMS-based e-government services. Compatibility applies when the SMS-based e-government service fits within the target users' life style and the way they likes to do things, for example the target users should be a group of citizens who are used to using SMS. Compatibility also applies when the information delivered by the SMS-based service is emergency information or updated time by time so people may need to access the information anywhere any time.

Governments should lower users' perception on the service's cost (*perceived cost*). The SMS-based e-government service should be free, or if it charges the users the cost must not be more than a standard SMS cost. It should take note that individuals tend to reject SMS-based e-government services which charge users with a premium SMS cost.

Governments should improve citizens' perceptions on how an SMS-based e-government service enables them to access public services more conveniently (*perceived convenience*). The functions of an SMS-based service should enable citizens to access public services more easily and more conveniently. Governments should promote the advantages of the SMS-based services compared to other public services channels. For example, convincing target users that the SMS-based services are less intrusive than phone calls, cheaper than Internet-based services, and more flexible in time and place as the recipients can read the messages at their leisure and choose when to respond. Governments should also consider the best time, the frequency, and the appropraite topics of Notification messages to keep users' perception on the service' convenience. For example, Scharl et al. (2005) recommends the messages should only be sent between 9 and 19.30 on weekdays, and messages for students should not be sent before noon. Governments should educate the target users about the need and relevance of chosen services.

Governments should also improve *perceived behavioural control* of the target users since an individual's perception of opportunity and ability to use an SMS-based e-government service may foster his/her *attitude* towards using the service. To do this governments should ensure as many citizens as possible can use the service by improving their self-confidences to use the service (*self efficacy*) and availability of the resources (*facilitating conditions*). Governments may demonstrate and publish how to use the SMS-based services through mass media, develop effective user guidance, provide assistance for those who ask for assistance on using the service, or run free training sessions for the target users. Governments may also provide for the target users the resources required to use SMS-based e-government services, such as cooperating with a mobile operator to provide reliable and free SMS-based service, or cooperating with a mobile phone vendor to provide cheap or even free mobile devices for the target users. A possible marketing strategy for increasing citizens' perceived control could be to offer free use of the service for a period (no charge for all request messages sent to the service and reply messages from the service) so it would enable potential users to learn to use the service.

Additionally, to improve users' trust (or to lower *perceived risk*) of SMS-based e-government services, governments should convince citizens that using the services is safe for their privacy and security. Particularly for Notification service, each citizen should have a choice as to whether or not the SMS messages are received as well as choosing from the information options is sent to them. Messages should disclose how to stop receiving further messages. To include a citizen and his/her mobile phone number into a Notification

SMS-based service, a government agency should have the person's permission before sending the messages. The registration and unsubscribe procedures should be easy and available through multiple channels, such as SMS, Internet, email, phone, fax or even in-person. Government agencies need to guarantee that their client's personal data will be used only in connection with its services and secured, so they can include easily visible privacy statements on their sites. Governments should introduce an SMS spam act and enforce the law. Also, a government regulation that allows people to keep the same mobile phone numbers when switching cellular carriers enables people to keep registered for a *Notification* service even changing the telephone operator. For the Listen service, governments should ensure *whistleblowers* (the senders) remain anonymous and guaranty security for them. For the Transaction services, governments should introduce and enforce the policies and regulation for electronic transactions, such as electronic signatures, electronic contract, SMS receipt for each transaction, SMS notification for every successful or failed transaction, and a recording management system for all transactions. Government agencies should provide a simple and fast process for receiving and responding to any complaints about SMS-based transactions and implement current technology for SMS security such as SMS encryption, password or personal identification number (PIN), cell phone data eraser applications (enable users to delete private or sensitive data in their mobile phone), Subscriber Identity Module (SIM) Application Toolkit (allows security-related functions and identity verification), or Agent Dispatcher (AD) module (rejects unauthorized access by identifying the user from the Mobile Station ISDN number/MSISDN of the mobile device).

In addition to the direct attitudinal beliefs, the SEGAM also recommends government and the system designers pay close attention to seven indirect determinants of *attitude towards use* (A): *perceived ease of use* (PEU), *perceived reliability and quality of the information* (PRQI), *perceived personal relationship* (PPR), *perceived responsiveness* (PRs), *self efficacy* (SE), *facilitating conditions* (FC), and *normative social influence* (NSI).

The *perceived ease of use* factor recommends governments and system developers provide an easy to use procedure to register for and to unsubscribe from Notification services, provide information on how to use the services, setup simple steps to use the service, and define a short and simple number for the SMS service centre. The developer should ensure, through usability pretesting, that an SMS-based e-government service is considered sufficiently easy to use by the target users. Government should provide various registration channels (including SMS, web-based form, phone, fax, or by coming to the office), the registration data should be simple and easy to fill in, and steps to unsubscribing from receiving *Notification* services should also be easy and available in various options as well. An SMS-based e-government service should also provide information on how to use the service, which can be provided as a brochure, a web page, or a 'help' feature on the SMS system (users may ask for assistance on how to use the service by typing and sending the 'help' word). The text format for the request-SMS in Pull service should be simple, not case sensitive, easy to remember, and the information requested by clients should be sent in one SMS (the system should not send the client other options or instructions). The information sent to the citizens should be concise, clear and easy to understand. If it is needed, the system may use capital letters or punctuation marks appropriately to emphasize important words.

Perceived reliability and quality of the information recommends government agencies to setup the information appropriately. The messages sent to citizens should be relevant to the target group, answer the target users' needs and interests, short and to the point, timely, up-to-date, and personalized according to individual user identities. Local authorities may allow opportunities for potential users to participate and to give feedback in the process of designing the services (such as: types of services and information, format text). Such participation increases the likelihood that the chosen services fit their pre-existing values. The messages should also utilize the available 160 characters effectively. Even though most mobile phones have enabled showing messages longer than 160 characters in one view, sending an important message using more than 160 characters (a limitation of one SMS message) is too risky since the message could be received and displayed incomplete due to insufficient memory of the mobile phone or the connection quality. When addressing young people (such as notification about sex education, aids, or anti smoking campaign), the messages should be entertaining and use familiar words for the young (Scharl, et al., 2005). Government may also personalize text messages based on the customer's local time, location, and preferences (Scharl, et al.,

2005) or even include the client's name on the message (for registered users). For example, the message says "Dear Mr. Susanto, the nearest clinic open at the time of request is Dr. John's clinic on 15 Goodwood rd open today 8am-4pm". Particularly, for information which changes with time (such as weather, pray time, or emergency situations), governments should update the information regularly and ensure its accuracy by asking for advice from the relevant agencies. For example, in the Australian flood disasters in January 2011, the Brisbane City Council and the Victoria government used an SMS early warning system to broadcasted thousands text flood warnings repeatedly to people who lived in a danger area to make sure target people received the messages; The decision to send out the messages was made by the councils based on an advice from the weather bureau.

Perceived personal relationship recommends government to build a personal relationship with citizens through the messages; the message should build a perception that the users are communicating directly in-person with the decision maker. For example, the messages may include the recipient's name and the government official's name, the system always replies to any message in a short time, or sends a personal message on a users' special date. This study suggests that an increase of *perceived personal relationship* will increase *perceived convenience*.

Perceived responsiveness also recommends the SMS-based e-government systems to reply each incoming message quickly, inform that the messages have been received and read by the right officials, and inform of the response and the progress to the senders. Every year, the government agency may publish the number of reports sent by citizens to a *Listen* service keeping the senders anonymous, and elaborate more about how many reports have been responded to and the progress of the actions. This publication may encourage citizens to use the Listen service and improve people participation in the governance.

In addition to motivational and attitudinal influences, governments should consider the fact that normative pressures exist for individuals' intentions to use SMS-based e-government services, so they should consider the social context in which the service is used. *Normative social influence* recommends governments utilize social influences to promote SMS-based e-government services. The marketing strategy should seek to produce impact of the target users' friends, family members, experts, public figures, teachers, and government officials. For example, a government agency initially may focus on a citizen group who has high self-efficacy to use SMS as they are more likely potential users of SMS-based e-government services. These adopters are then encouraged to promote the services to their family, friends and peers. In this case "words of mouth" can have a significant influence on one's perception about a certain service's usefulness. Governments should promote and market SMS-based e-government services adoption through mass media, particularly to increase awareness and detailed knowledge about available SMS-based e-government services. They should advertise users' successful experiences to attract non-users by involving opinion leaders such as experts, top government official, public figures, and teachers.

■ CONCLUSIONS

Delivering public services via SMS or SMS-based e-government services can bridge the gap between the Internet, as the main technology of e-government system, and the actual ICT situations in developing countries. SMS-based e-government services can reach and engage more citizens to use e-government services.

Current SMS-based e-government services are available in six levels: *Listen*, *Notification*, *Pull-based Information*, *Communication*, *Transaction*, and *Integration services*. To promote user acceptance of SMS-based e-government services, governments are recommended to start an initiative of SMS-based e-government services from a *Notification* service targeting male citizens aged 31 to 40 in order to get a fast adoption of the service before moving to more advanced levels.

Government and system designers should foster the target users' *attitude* towards using the services by improving *perceived compatibility*, *perceived cost*, *perceived convenience*, *perceived behavioural control*, and *perceived risk* as the direct determinants of *attitude towards use*. Also, this paper recommended government and system designers to pay attention to the indirect determinants of *attitude towards use*: *perceived ease of use*, *perceived reliability and quality of the information*, *perceived personal relationship*, *perceived responsiveness*, *facilitating conditions*, *self-efficacy*, and *normative social influence*. When designing and delivering an SMS-based e-government service, this study recommends governments to accommodate all of the proposed factors and monitor them as performance indicators. When promoting an SMS-based e-government service, the service marketers should particularly highlight aspects relating to the proposed beliefs. However, given constraints in resources, this study suggests that governmental agencies can set priorities based on the relative importance of the factors.

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