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## Developing a Mobile Portal Prototype for E-government Services

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**Abstract:** Rapid development of mobile and wireless technologies pointed to the potential for the use of mobile channel as a supplement to increase the accessibility and usage of the e-Government services. The emerging technologies and the pragmatic proposal of the mobile channel deliver extraordinary opportunities for the governments to provide innovative, personalised and timely e-services better and faster than the normal internet channels. Mobile portal should be easy to navigate and compatible with the mobile devices limitations (screen, keyboard and memory). Currently many e-Government portals are not easy to navigate by mobile device due to the design of these portals. This study proposed a mobile government portal (m-Government) for e-Government services. This portal shows example of m-government portal prototype and presents important steps towards a comprehensive m-Government solution.

**Key words:** E-government, m-government, mobile portal, e-services

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### INTRODUCTION

Transformation the government systems through information and communication technologies (ICT) is one of the biggest challenges that faced the worldwide governments in order to deliver efficient and cost effective services (Jayashree and Marthandan, 2010). The rapid growth in wireless technology and internet provides the global with new opportunities on the mobility and interactivity of the web-based solutions. Since the e-business has been developed towards mobile business (m-business), the e-Government development also start to launch a few applications towards mobile government (m-Government) (Kushchu and Kuscu, 2003). The large number of mobile phone users, whom are capable to connect internet from their mobile, will pressure on the government to encompass a number of e-Government services to mobile platform. The mobile government defined as:

- “The utilization of different mobile and wireless technologies, services and applications to provide access to government services allowing people to access these services from a mobile or wireless device” (Alrazooqi and De Silva, 2010)

The user interface is one of the possible approaches to categorize m-Government services accordingly. Zefferer-Thomas (2011) distinguished between non-web m-Government (e.g., Short Messaging Service, SMS services) and web-based m-Government. The e-Government defined as web-based technology used to access, deliver, enhance and facilitate the accessibility of the services and information provided by the government to citizens, employees, business partners, government entities and other agencies (Wang *et al.*, 2005).

In various e-Government portals, the interaction with citizens via web-based and the web-based presentation of information shows proven reliability, while the situation in mobile devices is more complicated. Typically, smartphones or similar mobile devices are provided and supported web browsing. Though, the usability of mobile devices integrated browsers is in general lower as compared to desktop PC or laptops because the hardware resources are limited, specifically the limited input capabilities and the small screen size regularly make the interaction difficult via mobile web browsers. The aim of this study is to discuss the design of m-Government portal and related issues. Finally this study will present the main features of m-Government portal in order to propose a mobile government portal for e-Government services.

## **M-GOVERNMENT SERVICES**

The wide range of services and e-Government oriented technologies are now taking a place with a significant speed around the world. Improvement on the governments' fundamental functions is the main reason for e-Government efforts seek to benefit from the use of information and communication technologies, mainly web-based applications. The improved functions increased the use of wireless and mobile technologies and making new directions. The m-Government has significant affect on the current generation through set of tools and complex strategies for e-Government roles, efforts and functions (Kushchu and Kuscu, 2003).

Nowadays, m-Government becomes more popular because the percentage of mobile users is increasing rapidly and their accesses to internet connection become a daily habit. Since the accessibility to mobile device (any time anywhere) is a part of people's daily life, the government have to transform their activities to meet the citizens needs and satisfy all other parties needs such as employees, business partners, government entities and other agencies to make their interactions with the government information and services more efficiency and convenience (Kuscu *et al.*, 2008). Although, tremendous interest in amelioration of m-Government, there is a little, if any, research that examines the development and integration of m-Government services portal, in addition utilizing conventional portal may be insufficient in the current mobile wireless world.

The easy communication anytime any place is the unique strengths over the stationary internet that mobile internet provide. If the government provide easy access and enhanced features to the citizens by supporting mobile services, that will increase the usage by scale and growth rate. For example, the totals market size in Japan is \$500 million and the NTT DoCoMo, the leading mobile operator has more than 25 million subscribers. Japanese use mobile internet more than the static internet (Chae and Kim, 2003). Another example, in South Korea, which is 64% of the population (29 million), where the mobile data subscribers are more than 18 million which represent 39% of the total population (Sadeh, 2002). More importantly, the number of mobile users increased rabidly every day. Based on the population of Malaysia (27.9494 million in 2009) the number of mobile phone owners was 28 million and that make the penetration rate is 1.1 phones per citizen which consider high percentage. This represents a great opportunity for Malaysia to grab the chance to embrace an era of mobile government (Al Thunibat *et al.*, 2010).

**The m-portal:** A mobile portal (m-portal) defined as an internet gateway via web browser interface enables mobile devices such as a smart phone and tablet to connect with an extranet or enterprise intranet (Adewumi, 2013). The fixed-line service is the traditional way to access the web or portal via internet. However, the accessibility of e-Government services becomes more by wireless and portable devices. Exceeding the desktop computer-based access by mobile based access in 2008 considered as big achievements and important milestone in transferring the services into mobile-web from fixed-line form. Since the emergence and development of huge numbers of multi-touch smart-phones in 2007 and with rise of multi-touch tablet computers in 2010, the transition to mobile-web access has been accelerating. Comparing with different browsers, multi-touch tablet and smart-phones platforms are better browser-based user web experience and more conducive to internet access Adewumi (2013).

Mobile-web users are often referring native and mobile-web application as a whole, as they are not able to distinguish the differences. The main challenges for mobile-web access portals are interoperability and practicality, mainly due to platform fragmentation of browsers, mobile devices, varied operating systems, besides, it's a challenge to make this work within the small screen and tiny physical size.

In mobile services, there are several blend elements that might affect the m-portal strategy such as permission, personalization and specification of information, payment, communication and location features. The permission element can be handled by giving the right to the citizens to set the types of content and information they need. Thus, the m-portal will specify the content dynamically based on the information provided by the users. In addition, the m-portal should be compatible with different type of mobile device specification features (Dholakia and Rask, 2002).

**Design of the mobile government portal:** No doubt the enhanced capabilities of mobile systems, which observers has been looking forward, still limited and there is a need for empirical studies specifically interface designs for m-services. The user interface design been investigated in term of Human-computer Interaction (HCI), but the users experience in personal computers environment is different than mobile devices. Furthermore, the qualitative and descriptive studies in information system, typically limited to the perspective of new technology adoption, while the user interface design for mobile devices still limited. Such as the model that has been developed by Carroll *et al.* (2002) that investigate three set of factors that influence users' adoption of mobile devices

namely attractors/repellents which represent the non-appropriation (technology as designed) criteria and appropriation (technology in use) and the power, identity and fragmentation which represent the higher order reinforcers (Carroll *et al.*, 2002; Lee and Benbasat, 2004).

From the past, m-services were taken as a subset of e-services, which is inadequate to handle the portability of m-services, in the contrary, researches shown that the design of m-services shall not be adopted directly from e-services. Wireless and mobile technologies becoming advanced and mature over years, which facilitate e-Government conducted from static internet to a mobile internet. M-Government is a part of e-Government and refers to the interaction between governments and citizens via mobile device.

Before the era of smart-phones and tablets, users been using computer based e-Government service only, with the widely spread of smart-phones and devices and rapidly growth of mobile technologies, using m-services are likely to be the daily activities, users are supported by the technologies to use m-Government services using mobile devices. In the past few years the mobile technologies market has seen significant growth. This is creating a new opportunity for the growth of m-Government. Mobility and broad reach shall be the two main characteristics for m-Government application, the portability shall provides business real time via mobile devices; on another hand, broad reach shall be two ways, it provides a platform for citizens to be reached through mobile at any given time. In this paper, m-Government refers to the conduct of transaction via wireless devices where the user's context may changing dynamically, making different services or service implementations appropriate at different times and type of mobile device (Roggenkamp, 2004).

**METHODOLOGY**

In this study, we adopted the m-Government user requirements model developed by Al Thunibat *et al.* (2011). This model has described the needs of end users for successfully implementing the m-Government portal, the model contains five dimensions, each dimension has variables that represent m-Government user requirements as illustrated in Table 1.

**RESULTS**

In systems engineering and software engineering the use case describe the actions or steps between a actors (users) and a software system which lead the user toward useful features. The user or actor might be a person or

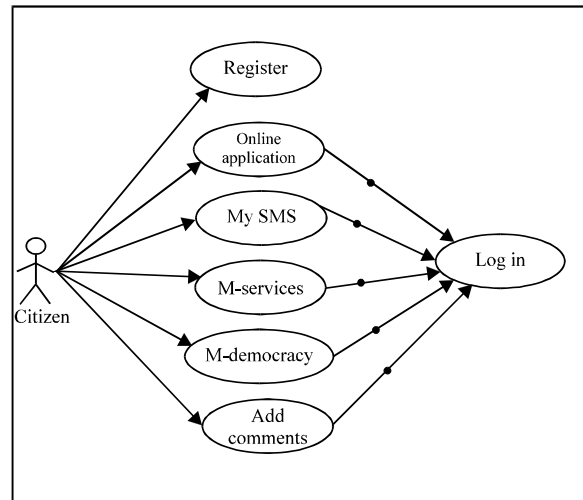


Fig. 1: M-Government portal use case diagram

Table 1: M-Government requirements

| Dimension                     | Variables   |
|-------------------------------|---|
| Perceived value               | Cost<br>Content   |
| Quality of services           | Availability<br>Responsiveness<br>Accuracy<br>Courtesy and helpfulness<br>Reliability |
| Efficient transaction         | Timeline<br>Security<br>Privacy   |
| Functionality                 | Usability<br>Accessibility<br>Interface   |
| Citizen-government engagement | Accountability<br>User control<br>Transparency  |

external software system or manual process (Jacobson, 1992). The use case is a software modeling technique that facilitate the developments process by helping to determine the implementation of specific features and how to gracefully resolve errors (Petriu and Woodside, 2002). The use cases within systems engineering are used at a higher level than in software engineering, often representing stakeholder or missions goals.

Figure 1 illustrates the use case diagram. As shown in Fig. 1 the user provided in the use case is a simple citizen who interacts with all of the seven functions. The use case diagram provides additional detail to the developer such as a login case that is included by all other use cases except register use case. The use cases are pretty self explanatory in what functionality the use case describes; no need to provide much detail for the use cases.

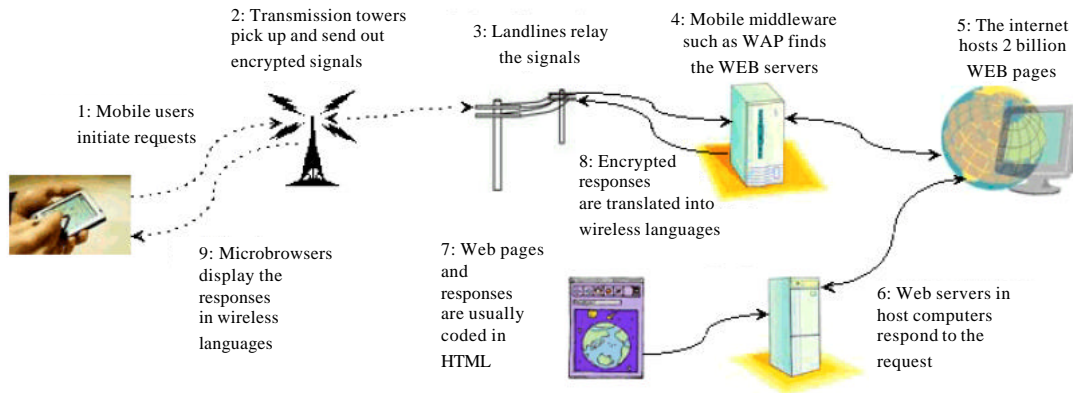


Fig. 2: Portal flowchart (Hu, 2009)

**Portal flowchart:** The flowchart (Fig. 2) illustrating how a user request is processed by the components in a mobile government portal, along with brief descriptions of how each component processes the request. In the following sections, we discuss in detail the components listed in Fig. 2 and how they relate to the processes shown in the flowchart below:

- **M-Government applications:** An application implements by a solution provider with 2 modules: Administrator’s module, such as database administration and access control member’s module, such as the user interfaces displayed on the mobile devices
- **Mobile devices:** The user interfaces to the end users present as mobile devices, who specify the user requests on the interfaces. The mobile devices will relay the user requests to the specific components or processor and later display the output using the user interfaces
- **Mobile middleware:** The objective of using mobile middleware is to transparently and seamlessly map internet content to mobile stations that support a wide variety of protocols, micro-browsers, operating systems and mark-up languages. Also, the mobile middleware provide some level of transactions security
- **Wireless and mobile networks:** With the existence of wireless networks (e.g., WiFi-access). User requests are delivered to either the base station (in a cellular network environment) or a closest wireless access point (in a wireless local area network environment)
- **Wired networks:** In m-Government system the wired network component is optional. Though, the server

or host computers are generally connected using physical cables and wires. Hence, the security mechanisms provided by wired networks is used to rout the user requests to these servers

- **Host computers:** Server or host computers store and process the data needed for m-Government services, they include three main components: Database servers, web servers and support software or application programs

First and foremost, the mobile devices shall be capable to take over the task of e-Government despite the technical restrictions, to date, mobile access to stationary e-services are playing the supplementary role for enhancement, this shall be taken care of specifically m-Government portal. Hyperwave’s WAP (Wireless Application Protocol) Framework, for example, enables mobile users to browse the Hyperwave Information Portal with WAP-enabled devices. But we need to design specific contents for the portal also to avoid using images and animations. This is due to the limitation of mobile devices. In this study, we design specific portal with specific content and services to adapt the mobile device properties. The portal consists of many forms that users can interact with, so these forms should has the following properties:

- **User friendly:** Means to be easy to understand
- **Understandable:** The language should be easy so that all kind of people can deal with it
- **Integrity:** Covers all the operations

This part contains the most important interfaces in website and their description.



Fig. 3: Main page of m-Government portal

Figure 3 illustrates the default page for citizens when they access to the m-Government portal.

Citizens must be registered first, then login using his/her password and username to access to the main page that contains the services. The main page has five options the citizens can chose if they want online application. For example, renewing driving licence they can fill the application and submit it to the responsible department; the second choice is my SMS the citizens can inquire about the SMS services that offered by the government and read the instructions that help them to utilize the SMS services; third option is m services, when the citizens select this option they can use the m-services offered by government, (for example) inquiring about car licences expiry date and tax; the forth option is m-democracy, using this feature the citizen can participate in the decision making process and give their opinions to the government, also voting to the government polls; the last option is comments, this option allows the citizens to write their suggestions for the purpose of enhancing the portal and improving the services.

**Online application:** Online application is defined as the utilisation of the internet for filling an e-Government application and submits it to the government agency. For example, applying for deriving license renewing. By using online application, citizen can save the time and cost. In Malaysia, government allows entry and application submission online, anytime, anywhere. The notification later can be sent immediately via SMS and/or e-mail. Figure 4 describes the online application page in m-Government portal.

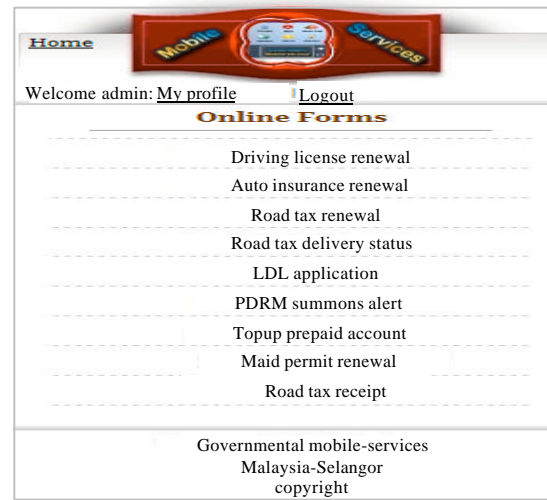


Fig. 4: Online application page

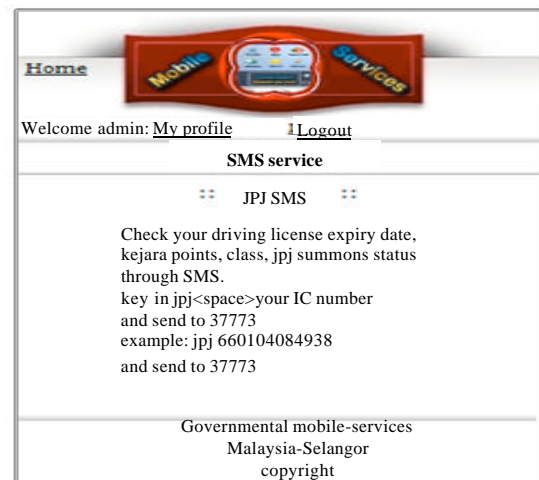


Fig. 5: SMS services page

**My SMS:** When the citizen selects my SMS they can read the instructions which help him/her to know the SMS services that offered and how to use them. Figure 5 represents the m-SMS services page in m-Government portal.

**M-services:** m-Transactions and m-Payments. Mobile portal provide a channel of communication between citizens and government; also it enables government-to-citizen (G2C) transactions. Figure 6 illustrates the m-Services page.

**M-democracy:** m- Voting (mobile voting) and the use of mobile devices for citizen to participate in political



Fig. 6: M-services page

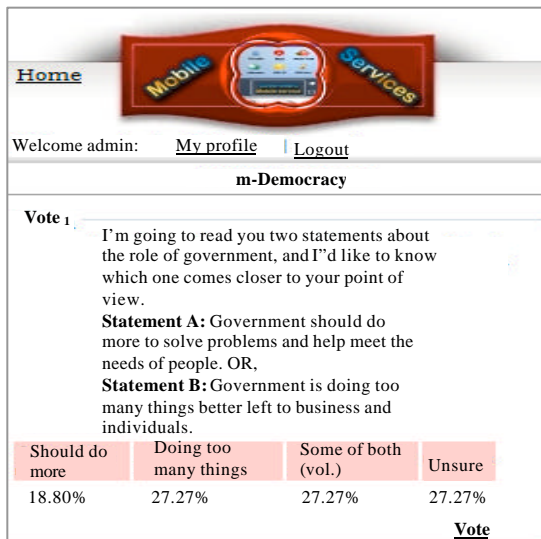


Fig. 7: M-democracy page

decision making, which is an m-Government application with a great potential to enhance democratic participation. In the m-Government portal, the government admin can add questions related to the special issues and the citizens give their opinions or can vote, also they can look at the result of voting for each question. Figure 7 represents the m-Democracy page provided by the m-Government portal.

In addition, using m-Government portal allows the citizen to write comments about the portal and services provided and then send them to the respective agency. This will increase the citizen engagement in the evaluation process to enhance the m-portal services.

The situation in e-Government portals is different than m-Government which is more complicated. Since the hardware resources still limited in mobile and the usability of integrated browsers is low compare with desktop computer. Moreover, the interaction with web is difficult because the screen size is small and the input capabilities is limited (Zefferer-Thomas, 2011). The development of m-portals is rapidly evolving since the mobile devices become more complicated. Hence, in the exiting portals were developed based on the Wireless Markup Language (WML) and the Wireless Access Protocol (WAP) the type of content accessibility and the interface features are still limited (Parsons, 2007). To overcome the previous challenges, in our case, m-portals take advantage of the development of the new generations of Java 2 Micro Edition devices and smart phone which enable one-to-one interactivity with the m-portal and facilitate the content delivery, using dynamic applications loading. The proposed portal were developed especially for mobile devices, the forms, services and contents of the proposed portal developed based on the capabilities and limitations of the mobile devices, which make it more ease to use, usable and faster in browsing.

## CONCLUSION

The example of m-Government portal shows some important elements to build a comprehensive m-Government solution. With this m-Government, citizen may use the services even they are commuting from one place to another, likewise, m-services and other features create awareness among citizens and, hence increases the usage of e-Government services.

With the increasing free of charge WiFi-zones in the public areas or private organizations and the better broadband quality, higher bandwidth of 3G network (UTMS) and lower connection fees resulted after continuous price war among the mobile operators, it is positive contribution to the success of m-Government and would encourage citizens to access the portal using mobile devices. Although, there is still a lack of research and studies on developing m-services portal; hence there is a need to study the m-Government portal design and implementation issues in order to increase the usage of e-Government services by mobile users.

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