Mobile and Wireless Services and Technologies for M-Government Solution Proposal for Dubai Government

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Abstract: - Electronic governments (e-governments) are fast emerging replacing functions performed by traditional governments. However, as new mobile and wireless technologies are penetrating even faster and more and more people prefer them than the landline connections, the governments are faced with a new challenge. The mobility of people and use of mobile devices necessitate the provision of anytime, anywhere access to government resources. As such, governments need to move to mobile governments (m-governments). In this paper, an m-government solution for the Dubai government is proposed by gathering and analysing the requirements of the public that visit the Dubai Police. For this purpose, quantitative and qualitative data were gathered using interviews and questionnaires and qualitative data were analysed using Thematic Content Analysis. Finally, the mobile and wireless service and technology components of m-Government solution for the Dubai government are presented.

Key-Words: - e-government, m-government, ICT, mobility, mobile penetration, technology and services

1 Introduction

Many governments around the world have a poor reputation in the level of services they provide [1] Overload of staff involving repetitive and manual tasks at government offices is time consuming and affecting worker morale. Low throughputs involved with traditional communication channels which are expensive to operate and require intensive human processing and lack of a single point of contact with the government are identified as the two key problems with the service provision of traditional governments.

In order to overcome limitations of traditional governments and to improve the delivery of their services, many governments including the United Arab Emirates (UAE) government, are moving towards e-government [2]. The UAE government proposes the transition to e-government in order to enhance access and delivery of government services to the citizens, businesses, employees and other government departments twenty-four hours a day, seven days a week through a single government portal using modern Information and Communication Technologies (ICTs) [3].

Such challenges have led some governments to shift their attention to m-government as the ultimate target of e-government [4]. Use of ICT in the public sector service delivery has been considered in Malaysia [5] and in [6], the full potential of mobile access of information systems using currently available mobile devices has been investigated in relation to the Czech Republic and other selected European countries. Song [7] also advocates going beyond the e-government and recognises the potential of m-government for the transformation of government services.

However, the implementation of m-government is more complex than implementing e-government as governments need to identify the mobile technologies and applications relevant to service efficiency [8]. The development of infrastructure based services for m-government is in its infancy [9]. Besides, although there is a four stage model created for e-government by Gartner Group [10], there is no model for m-government.

The UAE is in early stage of e-government and the possibility of incorporating m-government into e-government is much higher. Also, there are multiple drivers towards an m-government such as a high penetration of mobile and

wireless devices that exceeds the penetration of PCs [11]. However, there is a gap in the knowledge required for the provision of m-government services. This paper attempts to bridge that gap by studying the requirements of the public in context of the Dubai Police and proposing an m-government solution for the Dubai government.

The rest of the paper is organised as follows. Main problems and limitations associated with both traditional and e-governments as well as the current mobile government initiatives around the world are discussed briefly in Section 2. Research methodology is discussed in Section 3 and data collection and analysis is devoted to Section 4. The paper is concluded in Section 5.

2 Background

The rapid development of ICTs coupled with the desire to overcome traditional government limitations by improving government functions and services drive governments, including the UAE government, towards e-government [2]. The UAE e-government initiative aims to deliver government information and services to citizens, businesses, employees and other government departments twenty-four hours a day, seven days a week through a single government portal.

2.1 Problem Statement

Providing services through electronic channels other than the Internet has the advantage that it enables the governments to reach a large number of people and interact with them. This is enhanced by the growing interest in an "always-on" society [7] that the traditional and e-governments fail to deliver to an increasingly mobile society. As such, several government initiatives have already been commenced to extend the capabilities of e-government to the mobile and wireless arena creating an m-government.

M-government is defined as a subset or a complement to the e-government through the utilisation of different mobile and wireless technologies, services, applications and devices to provide information and services to citizens, businesses and all government units thus creating better opportunities for public to

participate and communicate with the government [12].

The vision statement of UAE e-government has three goals [13];
1. To become a world-class e-government,
2. To create a knowledge-based society; and
3. To integrate policy formulation.

However, according to UN statistics [14], the UAE ranks 42 in e-government services and 67 in e-participation. The UAE is thus far from achieving the e-government vision to become a world-class e-government provider.

For countries such as the UAE which is in an early stage of e-government, the possibility of incorporating m-government into e-government is higher than the countries that have significant experience with e-government [15]. It is important to include m-government within the scope of e-government in order to have effective, efficient and future government services [15]. In the UAE, there are multiple drivers towards an m-government. For example, there is a high penetration of mobile and wireless devices in the UAE. For every 100 people, there are 176.50 mobile subscribers [16]. Also, mobile phone penetration is well above PC penetration [11].

As such, before shifting to m-government, a comprehensive study of the requirements of services expected by the public from the UAE government is required. In this research, the opinion of the public was collected using interviews as well as open-ended questionnaires and a complete list of requirements was identified by analysing the transcripts.

2.2 Literature Review

Traditionally, governments used only telephones and faxes as electronic means for their communication. These governments had their inherent problems such as inefficient services and high costs associated with them. Public confidence in the government services have declined from 46% in 1983 to 17% in 2000, possibly due to the fact that government services are not improving as quickly as business services [17].

One of the important components of economic and social development is to provide citizens with access to government information and services, but providing access to these services has been a challenging process [18]. Public can access government information and services only during working hours [19] which limits the democratic delivery of services.

Worldwide, there is an increased demand for quicker and longer access to government services, 24 hours a day, seven days a week, and government requirements to have shorter life cycles and faster response times for service delivery [20]. Consequently, governments now attempt to make information and services more accessible to the public through the web and other communication technologies [4]. This changes the perspective of the government, who are now looking to bring services to people rather than have them visit the government departments in order to be serviced [21]. This vision led to the emergence of the concept of electronic governments (e-governments) as an alternative to traditional governments. However, when considering e-government solutions, many concentrate solely on the Internet portal. E-Government Web Portal discussed in [22] is such an example.

As a result of limited Internet penetration, e-government vision may worsen the digital divide and increase inequality among citizens which is a matter of great concern [7]. According to ITU statistics for 2004, only 10% of the world's population has Internet access, demonstrating an extreme digital divide [17].

On the other hand, m-government is 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. A mobile device is not limited to a mobile phone, but could involve a Personal Digital Assistant (PDA), handhelds, smart phones, cellular phones, terminals or any other devices that can be carried [23]. A mobile device is a computing device that is not restricted to a desktop and can connect to a data source without a physical connection [4]. Mobile cellular penetration around the word by the end of 2009 was 67% compared to 26% for Internet penetration [24].

2.2.1 Current mobile government initiatives around the world

Although m-government is in its infancy and early stages of development [25], several governments have already started or are in the process of planning to use mobile services. Usability-driven open platform for Mobile Government (USE.ME.GOV) is a research and development project of *European Consortium* that consists of a regional government, three local governments, two research institutions, two universities and a number of technological companies from France, Italy, Germany, Spain, Portugal and Poland [26]. The project aims to deal with problems associated with traditional governments such as low throughput, time consuming tasks and staff overload as well as problems with e-government such as long delays in implementation and low return on investment [1]. NOMAD is a pilot National Project of the *United Kingdom* consisting 9 authorities that commenced in November 2003 [27]. The project aims to facilitate local authorities to begin mobile computing operations and assist staff to be more productive thus, reducing operating costs, improving field worker productivity and increasing processing time [27].

Mobile Public services (Mobud) project started in 2004 in Berlin, *Germany* [28] was developed to solve public administration problems. Since the population was low, the establishment of public service offices were considered costly for small number of users and it was difficult for people with limited mobility to visit the public service office because it required waiting there to obtain the required service. The government of *Canada* has launched a project called "Government of Canada Wireless Portal" [29] in order to provide people access to government information and services through web enabled devices such as PDA and web enabled mobile phones.

Initiatives in the *USA* include registered citizens notifications service in California [30], traffic management using GPS in Portland [30], a university wireless network to provide access for students and faculty in Texas [29], mobile computing installed in 14 police cars in Kentucky [30], mobile access to the email system using Blackberry technology in the New York city Fire Department [31] and using

mobile technology to keep the South Florida environment clean [32].

Another objective of m-government research is to estimate the efficiency that such a system can deliver [33]. Though such efforts are in their inception, they clearly indicate that m-government initiatives have generated a large amount of interest and will soon reach their maturity.

3 Research Methodology

Soft Systems Methodology (SSM) theory was used in this research to identify the technical and user requirements. SSM theory, developed by Peter Checkland, uses a system thinking approach for understanding the whole and the relation among the parts [34]. SSM is one of the well-known methodologies for information system development and one of the most widely used methodologies in many parts of the world [35]. It has been used in the public sector and in the industry [36].

SSM offers a methodology to deliver multiple views of the problem situation and launch a new product that can be seen differently by different people [37]. It involves identifying the problems need to be solved and clarification of them in order to define the options for improvement [38]. In order to develop an information system effectively, the real problem situation should be examined through 'what' and 'how' questions before making an effort to find a solution [39].

SSM is divided into seven stages [40]. They are:

1. Problem situation unstructured: In this stage, it is discovered by the researcher, managers, or employees that there is a need to review or change the way the work or task is performed. There is a problem or space for improvement. Hence, the researcher gets an understanding and wider view of the problem.

2. Problem situation appreciated: The researcher collects information from as many resources as possible and sorts the information and provide description of the problem. Information could be collected through work observation, interviews and discussions.

3. Root definition: In this stage, the root definitions are developed which are the basic descriptions of the proposed system. It gives explanations of potential information systems that are then used to choose the needed ones [41]. It contains information about the transformation process. Root definition is a short statement that expresses the main purpose of the proposed system.

4. Conceptual model: It involves developing conceptual model on how the system should operate so as to compare it to the real world situation [42] The most essential skill of SSM is to move freely between the two worlds, Real and conceptual, and to compare and contrast them [41].

5. Comparing conceptual model with real world: Compare the real world with conceptual model to see the similarities and differences and what have been changed.

6. Feasible and desirable change: All changes are discussed and expressed and a plan of schedules is developed to prioritize the requirements.

7. Action to improve the situation: It is considered to be the development and implementation phases.

In this project, the application of SSM progressed as follows:
Stage 1: In this stage, the need to improve the services provided by the Dubai Police through m-government was researched. This was the literature review and formulating the research problem.

Stage 2: The information was collected and a detailed description of the problem was established. The information gathering process is described in Section 4 of this paper.

Stage 3: Gathered information was analysed in Section 4.1 and results were produced towards the end of Section 4.

Stage 4: Using these results, key mobile and wireless service and technology enablers were identified. From the key mobile and wireless service enablers that were identified, the most

suitable ones were chosen for the Dubai Police (Section 4).

Stage 5: In this stage, the proposed m-government system and the current system used by the Dubai Police were compared to indentify the similarities and differences and the changes brought in by the new system (details are not provided here but can be found in [55]).

Stage 6: All changes recommended and proposed as part of m-government solution for the Dubai Police were discussed and a recommended course of action was developed. A policy document was developed, and the actions were prioritized (details are not provided here but can be found in [55]).

Stage 7: This stage deals with the deployment of the recommended mobile services and technologies and is beyond the scope of this research.

3.1 Ethics Clearance

The ethics requirement of CQUniversity was adhered to throughout the process of this research by following the ethical guidelines of research, practices and principles. This helped ensure that the research was conducted in accordance with the National statement and the ethical and research arrangements of the organisation involved. The Human Research Ethics Committee, Central Queensland University, approved this project under the project number H08/02-009.

4 Data Collection and Analysis

Being the selected department from the Dubai government, data were gathered at Dubai Police General Department (Head Quarters) that is located in the city of Dubai in the United Arab Emirates (UAE).

The participants for the semi-structured interviews and questionaries were randomly selected by the Industrial Advisor from the people who visited different Dubai police departments for receiving services. Interviews that contained open-ended questions were conducted with government employees in Dubai Police, at different levels and in different areas in order to determine the services currently delivered by them with specific reference to the strategic vision of Dubai Police

departments to increase the effectiveness of service delivery and the problems and needs in the service delivery.

The total sample size was 120 comprising of 20 participants for the interviews and 100 participants for the questionnaires. The sample covered participants from Dubai Police employees and the rest of the public who dealt with Dubai police.
After collecting data using questionnaires and interviews, the next step was to analyse them. Since the collected data were qualitative and could also be unstructured, a method of analysis that can extract key features was required. A common method used in other studies [43] is the Thematic Content Analysis (TCA) approach.

4.1 TCA approach
Thematic content analysis is a qualitative tool used to find out not only themes, but also recurring patterns of meaning [44]. As stated by Ritchie and Lewis [45], the common method that is used in TCA to analyse qualitative data is the identification of key themes, concepts or categories.

Interviews and questionnaires were theme-based content analysed, where repeated patterns and themes could be formed [43]. It included encoding the qualitative information in order to identify a particular theme with the information that may have some relevance to the area or research.

TCA follows five main steps: familiarization, identifying a thematic framework, indexing and coding, charting and rearranging data according to themes [40]. Henning et al. [46] proposed that the following steps are required for this type of analysis:

- Preparing and organising data for analysis
- Reading for global impression
- Coding
- Categorising
- Thematic organisation
- Writing up the findings
- Validating accuracy and credibility

In this research, the application of TCA progressed as follows:
Preparing and organizing data for analysis:

Hand written notes were taken during the interviews and reviewed immediately following each interview. Any necessary notes were added. Questions and answers of each interview were written and typed out in full length and safely stored as electronic files in order to protect the data. All questionnaire responses were scanned and stored electronically. Backup copies were created for future use should there be a loss or damage to the files.

Reading for global impression
The entire data gathered from the interviews and questionnaires were repeatedly read and studied to familiarise with the information and to have a global impression about the content.

Coding, Categorizing and Thematic organisation
Codes are served as a template for the data analysis [47]. Morse and Ritchard [43] states that 'Topic coding is a very analytical activity, it entails creating a category or recognizing one from earlier, reflecting on where it belongs to among your growing ideas, and reflecting on the data you are referring to and on how they fit with the other data coded here'. As stated by Merriam [44] 'although categories and variables initially guide the study, others are allowed and expected to emerge thought the study'. Therefore, a coding method that is consistent with the research aims, objectives and the theoretical ideas was identified and developed at the beginning, and additional codes were created for ideas presented from reading the interviews and the questionnaires that did not fit into the original coding scheme.

Krippendorff [48] states that, a unit is distinguished as a whole and is treated as an independent element. These units are described as categories. Codes were then organised and grouped together into related parts which formed categories. Categories that are related to each other were grouped together. The categories, codes and patterns identified from the findings led to the themes. These themes are then used to answer the objectives of the study and later categorised into appropriate headings.

Writing up the findings
The research findings are the results that the researcher reaches after analysing the data. These findings are used to find out the real

situation. These findings are described in Chapter 4.

Validity and Reliability
Greenhalgh [49] believes good qualitative research use different data collection methods in order to know really what is happening and have deep information rather than just the surfers in order to have validity (closeness to the truth). Different methods have been employed to enhance the reliability and validity of the research.
Qualitative data can be analysed using qualitative, quantitative or both methods. An analysis using both methods can be used to triangulate results from different methods, to complement results from one method with another or to increase the coverage of the research by using different methods [50]

Triangulation is using different sources of data surrounding the same topic under research, making the research analysis and findings more valid [51]. It is a useful and a widely used strategy to improve the truthfulness of research [47]. Researchers also use triangulation approach to study m-government services [52]. Validation includes checking, questioning and the interpretation of research findings. It verifies the reliability and the accuracy of the research process [46]. Moreover, bias can be minimized when the researcher spends enough time in the field and use different data collection methods to support the findings [53].

To validate and verify the results, transcripts of the interviews were sent back to the participants to check the details and make necessary corrections. The results of questionnaires were used to validate and complement the qualitative material.

The collected information from participants was extensive and provided the researchers with a good picture about the Dubai police. After reading and studying, the collected information from the interviews and questionaries, the following six themes and categories were identified. Each Theme draws the current picture of the Dubai police and its sectors.

· THEME 1: Dubai Police general department strategies and roles
    o Category A: The main strategy of Dubai police

- o Category B: Different Dubai police department's strategies and roles
· THEME 2: Access to Dubai Police information and services
  - o Category A: Access, feedback and communication means to Dubai police information and services
  - o Category B: Difficulties in accessing and obtaining information and services
  - o Category C: problems, shortcomings and needs of the departments

· THEME 3: Services
  - o Category A: Main systems and services
  - o Category B: Stakeholders
  - o Category C: Resources and Supply management
  - o Category D: Payment
  - o Category E: Satisfaction

· THEME 4: Traditional and electronic services
  - o Category A: Strength and weaknesses
  - o Category B: Preference

· THEME 5: Mobile and wireless service enablers
  - o Category A: Current usage by Dubai Police
  - o Category B: Stakeholder's usage and ownership
  - o Category C: Access
  - o Category D: Rank of possible key mobile and wireless service enablers
  - o Category E: Recommended mobile services

· THEME 6: Futuring
  - o Category A: Participants opinion about the services that should be provided and their recommendation about specific useful ICT technologies
  - o Category B: Suggestions and recommendations

The user requirements are then matched with the mobile and wireless technology and services using Task-Technology Fit (TTF) theory of Zigurs and Buckland [54]. Mobile Messaging Services (MMS), Wireless Fidelity (WiFi), Worldwide Interoperability for Microwave Access, Inc. (WiMAX) type Wireless Networks, Wireless Access Protocol (WAP), Web Services Architecture (WSA), Interactive Voice Response (IVR), Mobile Geographic Information System (M-GIS) and Location Based Services and Resource Management, Mobile Procurement, Mobile Payments and Mobile Participation (M-participation) services were then identified. Complete details of this matching process can be found in [55] but we provide identified technologies or services and their usage in the m-Government in Table 1 below.

Technology or service	Usage
Mobile Procurement	Automation, services on the move, access using mobile and wireless devices
Mobile Messaging	Alerting people about emergencies
WCA	Integrating independent applications, and providing plug and play applications
Wireless Network (WiMAX)	Linking Dubai Police H.Q. with remote departments through fast and free network.
Mobile messaging	Notifying people about different services.
Wireless networks (WLAN and WiMAX)	Access to information and services on the spot. Connecting the field spot with Dubai Police H.Q.
Mobile GIS	Locating and tracking Policemen in the field. Showing movement on a screen. Guidance (through digital maps) and information access through mobile or wireless devices
IVR	Access by voice portal to information and services

M-participation	Means of discussion between Dubai Police and people about different matters through mobile devices
Mobile Payment	Paying through a wireless terminal in the field and receive receipt immediately

Table 5.1 Identified technologies or services and their usage in the m-Government

5 Conclusion

Analysing the requirements of public that visit the Dubai Police for receiving services, an m-government model for the UAE government has been proposed. Due to time and cost factors, the scope of requirements gathering had to be restricted to the Dubai Police, but it is expected that similar requirements would result for other government departments of Dubai and the UAE. Apart from this limitation, there are no other limitations involved, as a thorough survey and interviews were conducted on selected random samples of public visiting the Dubai Police. It is expected that the proposed m-Government will be implemented in Dubai Police within the next five years.

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