A Success Factors Model For M-Government

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Abstract: *M-government uses ICT to more effectively and efficiently deliver services. This paper describes a Success Factors Model developed to assist those in planning and implementing M-government services. The Model includes those factors identified from a comprehensive review of the literature, including government sites worldwide. The presence of these factors ensures that the benefits claimed for M-government will be realized. These are classified into six main grouping. The paper also reports on the usefulness of the model with reference to Australian case studies. In particular the Victorian State Government and the agencies of the Royal District Nursing service and the South West Health Network.*

Keywords*: e-Government, Mobile Government, Government Electronic Service Delivery.*

1. Introduction

M-government is no different from any other mechanism used by governments to deliver services: government has a responsibility to the public to ensure that services are provided as efficiently and effectively (including being cost effective) as possible, and that any risks associated with the service delivery are identified, and managed. For those charged with responsibility for implementing effective and efficient M-government, where do you start? We believe there are two flawed assumptions commonly accepted:

- First, that information communication technology (ICT) evolves at such a fast rate that there is little point in drawing on precedents and past experience.
- Second, that each jurisdiction is so unique that any model for planning, developing and implementing service enhancements must be developed individually, and targeted at the needs of that particular jurisdiction.

Our research suggests that these assumptions are flawed, as there are some critical factors, both positive and negative, that directly correlate to the success or failure of any M-government project. Without the presence of these factors the benefits claimed for M-government are unlikely to be realised.

2. Background

As a complimentary subset of E-government, M-government is using ICTs to improve the activities of public sector organisations and offer the "anytime, anywhere" functionality to citizens and public officials. Since 1997, standards such as 802.11 have stabilised and vendors have incorporated mobile wireless as a standard operating feature of equipment manufactured. Kushchu and Kuscu (2003) suggest that the advances in technologies and their uptake by users signal the inevitable move to M-government. The use of Pocket PCs, tablets, handheld terminals, short message service (SMS), personal digital assistants (PDA's) and mobile or cellular telephones has yielded benefits for government practitioners and citizens alike. Some of these benefits are shown in table 1 below.

Benefit	Reference
1. Increased channels for service interaction	Finneran (2004), Heeks (2004), South Africa's eastern cape network
2. In situ service delivery for citizens	Singapore's E-citizen, Bremen's mobile city, m-Dubai
3. Better access to data for public servants in field	Instanbul's Earthquake and Information System, City of Lincoln's Palm applications,
4. Instant update to information and data	Sage research (2001), Virginia's "My portal",
5. Increased productivity of public servants	Heeks & Lallana. (2004), Czech mobile mail and information channel

Table 1: Benefits of M-government Service Provision

In contrast Lanwin (2002) argues that there are many obstacles to slow the introduction of M-government. He suggests that infrastructure and security will delay the move to M-government and internal problems such as legislation and mobile up take will ultimately determine the penetration of M-government. However Wexler and Taylor (2004) suggest that the "anywhere anytime" and costless connection in the WLAN environment will overcome most hindrances. In their survey of wireless users and managers they note that "technology will soon get smarter" and overcome any shortfalls presently experienced.

Wexler and Taylor's view is consistent with previous opinion. In developing M-government sites there are 5 levels of sophistication. The Australian National Audit Office (1999) suggests that many electronic delivery of service, there is a tiered implementation and functionality ranging from initial publication of information level to the fully interactive level of information sharing. Further it suggests the accompanying level of technology sophistication escalates accordingly with the improvements in technologies and maturity of the service demand.

In examination of available literature six factors critical to M-government success emerged. These are grouped below in table 2 with a sample of reference material:

Success Factor	Reference
Cost	Heeks & Lallana (2004), Welch & Wong (2001)
Business Re-engineering	Kushchu & Borucki (2003), Reola & Pohjanpalo (2002)
Education	Zálešák (2003), West (2002), Huta (2002)
Acceptance	Heeks & Lallana (2004), Aust Bureau of Statistics (2003), Valdez (2002)
Security	Heeks & Lallana (2004), Zálešák (2003), Okenfeld (2002)
Access	Huta (2002), Liff (2000), McClure (2000),

Table 2: Success Factor Groups for M-government Provision

From a comprehensive examination of the literature, including reference to government sites in other pats of the world the success factors model was developed.

3. The Success Factors Model

The Success Factors Model postulates a service delivery where the level of M-government sophistication positively correlates with the level of service delivery functionality. We identified five levels of functionality in electronic service delivery (mobile and web presence). They are:

- initial – provides basic wireless access with brochure ware, non interactive responses such as set answers to interrogation from citizens

- enhanced – delivers updated information such as weather forecasts, traffic conditions, policy changes, or periodically enhanced material
- interactive – allows formal interactions between citizens and government service providers. Providing a more sophisticated level of access enabling users to directly access information based on their specific interests or needs. Users can search specialised databases; download forms and applications or submit them from mobile devices or wireless connection; make appointments with officials etc.
- transactional or mature interface – provides a single entity interaction for mobile and wireless users. Regardless of department or agency, a mobile wireless request is actioned through a single government interface with disregard for time and place. It will provide non-critical transactions with payment.
- fully-interactive – offers a secure mobile wireless transaction for payment, ordering and billing of services. Agency independent, it offers the users 7/24, anywhere access from a mobile wireless device with secure identification and authorisation. It offers the ability to use critical data regardless of the device's size and susceptibility to loss or theft.

We have also identified the relative importance of each of the critical success factors for each level of service. Adopting mobile and wireless technologies as part of that platform allows a move from E-government service delivery to M-government delivery. However, the planning, development and implementation of service delivery on this platform requires careful attention to the factors that promote or inhibit a successful project.

We further classified each of the success factors, as shown in table 2, into six main groupings. The groupings are:

- **Cost** – The need to investigate public funding of infrastructure and the options for joint ventures with private operators. The high initial investment and cost recovery or return on investment (ROI). Political factors and audit/regulatory considerations. The ability to have a single audit trail of transactions and procedural benchmarking. Realisation of cost benefits from long term contracts with telecommunications companies (telcos) and application vendors.

- **Business Re-engineering** – Centralised authority and political support over potentially fragmented/rival channels. Cohesive legal and regulatory environment to facilitate M-government operations. Uniform interface for services and multi jurisdictional service delivery. Technology portability from older systems to M-government interfaces.

- **Education** – Communication of mobile wireless literacy. Standard operating environment regardless of device or interface. Re-definition of government's products and services to work in the mobile wireless arena. Development of M-government skill sets within agencies or departments. 7/24 access for all demographic groups.

- **Acceptance** – Seamless service from appropriate agency or department via uniform mobile wireless interface. Customer relation management backend for mobile wireless citizens. Process participation by citizens in M-governments evolution. Internal m-government relationship management between agencies and departments. Regular public review and communication of M-government initiatives.

- **Security** – Communication stability via stringent Service Level Agreements (SLA) from telecommunication and application providers. Data integrity regardless of interface device particularly in relation to loss and theft. Transaction audit and transparency for financial interactions. Seamless moves to future enhancements, and secure warehousing of data images through minimal duplication between agencies.

- **Access** – Key infrastructure to provide mobile wireless connections to all constituents. Interface adaptations for community stakeholders with special needs or disabilities. The use of provider contracts to facilitate initial support for specific socio-economic groups. Consistent user interface regardless of location and usage pattern.

The absence of any of the critical success factors will inhibit realisation of the potential benefits of delivering services using advanced technologies.

4. Research Objectives

The key objective of the study was to identify success factors for M-government service delivery and model these. We believed such a model would prove useful for any government involved in either:
- the planning, development and implementation of M-government service delivery; or
- reviewing the efficacy of a system that has already been implemented.

The three objectives of the study were to develop, identify and validate a model for the successful delivery of M-government. They are to:

1. Develop a success factors model through identification of those factors and classify into different types.
2. Determine the relative importance of these factors in promoting successful delivery of government services using M-government, at each stage of technology sophistication, and service delivery functionality.
3. Validate the usefulness of the model for those planning and implementing M-government service delivery.

We believe that there is a positive correlation between the level of technology sophistication and the level and range of service delivery. We also believe that the relative importance of each factor can vary according to the level and range of service delivery. Whilst it would be useful to look at a user perspective, this paper is targeted for the implementers and reviewers of such programs and does not accommodate the user perspective.

5. Research Method

The Success Factors Model for M-government was developed following a comprehensive review of available literature. We reviewed the experience of governments and other quasi government organisations around the world. This yielded project-specific assessments and criteria, but no integrated success factors model had been developed which:
- broke down the factors according to the relevant phase of a project (that is, the technological sophistication, and service functionality), or
- combined the experience into one useful 'model'.

Of course, governments use many different 'tools' to deliver their services, including across the counter, postal, telephone, fax and e-government services. Technology is constantly changing, such that we cannot anticipate future innovations even a decade ahead. We developed our model, initially with a focus on E-government. However, we have found that the success factors are equally relevant considerations with each change in technology, such as a move from E-government to M-government.

We used a detailed case study to assist with the development and validation of the model. The case study was the State Government of Victoria, Australia. Like many governments worldwide, the Victorian Government is currently implementing a platform of M-government to deliver a wide range of services. The process has been underway since the mid 1990's, and many valuable lessons

have been learned. The authors have had the benefit of close affiliation with all relevant layers of government in developing and validating the model.

The usefulness of the model was validated with reference to an in-depth case study of the Victorian Government experience in M-government, with particular reference to the experience of the following government agencies:

- Royal District Nursing Service
- South West Health Network.

Data relevant to the model was collected through a series of comprehensive interviews conducted between February 2004 and February 2005. We interviewed all identified decision makers within the Victorian Government's E-government project, and those involved in the M-government transition associated with these two government agencies. We were also able to access a wide range of relevant project documents. The questions asked were directly related to the critical factors identified from the literature and the planning and implementation experience of the Victorian government and associated agencies. This formed our interview instrument and a sample instrument is available upon request from the authors. All interviews were transcribed and collated to determine common themes and trends in responses.

6. The Case Studies

The investigation employed McCracken's (1999) long interview technique as a qualitative research approach, to document and analyse individual's experiences and personal accounts of the M-government phenomena. The approach has been successfully employed to reveal patterns of social positioning in emerging trends grouped under the information systems banner and was deemed suitable for this study, McCracken (1999). We further refined the criteria used in determining suitable interviewees to deliver a valid M-government conceptual group. These were based on the following criterion:

1. Participants must have been actively involved in the M-government process for at least 4 years
2. Participants must have been able to provide expert opinion on one or more areas of the instrument groupings.
3. Participants were available for follow-up interviews if required.
4. Participants were prepared to give written permission agreeing to the interview process.

While this limited the number of possible participants it did provide specific insight to matters of relevance in M-government. In addition to interviewing 15 senior and middle managers from various departments across the Victorian Government, we focused on two of the more interesting agencies within constituency.

The Victorian Royal District Nursing Service (RDNS) is a non-profit organization with 80% funding from the Victorian Government. In 1997/1998, the RDNS conducted a 12-month trial of 80 mobile computers. After a successful trial and identification of six areas of potential significant impact on the project success, a rollout of 800 mobile units commenced in 1999. The rollout was completed in late 2003 and represented a landmark wireless innovation for the Victorian Government; it also provided a suitable in-field, in-production case study for this research.

Initially part of the Victorian Department of Health Services, the South West Health Network (SWHN) has evolved into a 112 member non-profit organization operating wireless technologies in telephony (WiVoIP) and mobile tablets throughout 33 hospitals and 70 ancillary health sites in a geographical area comparable in size to Ireland. Driving factors included a relatively small population, spread over a very large area, with vastly differing geographic requirements (e.g. ranging from coastal mountains, to flat, desert regions), and considerable divergence in the existing

infrastructure in the various regional towns. As an extensive regional exercise, it offered non-city centric interests and insights peculiar to larger geographical developments.

7. Research Findings

At this time (February 2005) the data has been subject to a preliminary analysis and this paper reports on a number of findings. Importantly the case study data validates the usefulness of the Success Factors Model. The main findings are:

1. The positive correlation of the level of technology sophistication and level of service delivery is supported. The RDNS study has delivered a production system, which has grown through the 5 levels of sophistication over 5 years from **initial** wireless presence over digital telephone to fully interactive wireless service delivery. Initially the service was from handheld sharp PB5000 infra-red connections to digital mobile telephones and was a one-way transfer of information from the field staff to a central storage facility. It moved through **enhanced** service using basics PDAs and moved toward **interactive** level with the introduction of more sophisticated PDA. Since the introduction of backend systems support and tablet PCs it has evolved to **transactional** level of information and application transfer and in late 2003 incorporating full internet access to meet **fully interactive** level of service delivery. This required the use of more sophisticated equipment with greater capital investment. It was confirmed at interview by senior officers and by careful examination of project documents held at RDNS. Also interviews with other M-government officers outside RDNS supported this theory.

2. The case study experiences confirm the predictive usefulness of the model for a government contemplating embarking on systems service delivery, or transitioning to a more sophisticated delivery level. All factors identified in the model were confirmed during the case studies. Interviews with senior managers and operatives demonstrated all factors were present during the relative projects and non were omitted. Further other interviewees within the Victorian Government examined the model at different levels and confirmed all factors to be relevant and have a correlation to the level of service delivery and technology sophistication.

   Cost components in each of the studies suggested the need for funding adjustments through public/private initiatives and an ultimate cost recovery to the agency through service delivery saving refer to sections 3 and 4. Regulatory and legislative considerations were apparent in developing the SWHN over a period of 6 years. Both of the major case studies were in a review phase and could demonstrate procedural benchmarking and the ability to perform transaction audits.

   In relation to **Business Re-engineering** both RDNS and SWHN clearly highlighted the use of a centralised governing body, which "championed" the project with the aid of strong political and managerial support. In the SWHN case we were fortunate to interview the primary instigator of the project who articulated the possible problems of channel or agency rivalry and the need for a cohesive legal and regulatory environment to limit demarcation. A uniform interface was available for all SWHN clients regardless of particular sources and both the RDNS and SWHN had ported older systems into an M-government environment. It is interesting to note that the preference of most managers interviewed was to keep older systems separate and create data images to work with, rather than a full porting of older systems and technologies.

   As an on-going success factor **Education** was present in the case studies. Each had established standard operating environments for customers and staff. These were a by-product of pilot systems used to select the most appropriate environments. As

suggested in the model, services did require some re-definition, primarily to reduce duplication of data and provide unique identifiers. Both SWHN and RDNS staff were provided with new skill levels and RDNS staff were able to use the mobile wireless beyond their work environment 7/24 for personal development (refer section 4).

Both cases were able to support the **Acceptance** success factor with examples of process participation by staff and customers in the project evolution. This fostered relationship management internally and externally and was a catalyst for regular reviews and reporting. As both these case entities are non-profit organizations public review was important for their respective constituents and was viewed as a major factor in their success.

Consistently during interviews with case study representatives and other Victorian government managers, **Security** was a major success factor. Service Level Agreements (SLA's) and data integrity were common areas of discussion. One Victorian Government manager noted that while most of his neighbours in his residential area were fully utilising mobile and wireless technologies, the uptake in some government agencies was poor. He attributed this to "security insecurity". Having evolved trough 5 levels of sophistication the RDNS could clearly show the success it experienced with seamless service and uniformity of interface. One senior manager suggested that if the uniform interface was not maintained he would have experienced considerable resentment from operational staff.

In the SWHN **Access** was a particularly important success factor. Wireless access was used as a rapid deployment tool in remote towns and villages. Similarly it provided access to specialist staff in hospitals and pharmacies hundreds of kilometres away. In interviewing one official, we were able to see a shop assistant in a remote coastal village use a voice and video link to verify with the pharmacist 120 kilometres away, which drug to sell to the customer. Similar experiences were cited at interviews in relation to specialist physicians and surgeons. This scenario was repeated in the RDNS with immediate access to medical reference materials and data repositories. In the SWHN case the monies saved on contract negotiations were redistributed to specific socio-economic groups to purchase or lease necessary equipment. This distribution was usually in remote areas.

3. Like most government initiatives cost, ROI, suitable venture partners and secure services are major issues. The importance of obtaining suitable SLA's that guarantee bandwidth and uptime, and also avoid the necessity of expensive infrastructure investment were considered a high priorities by interviewees. This was particularly evident in the SWHN study. In addition to negotiating a 50% discount across the board from its telecommunication service provider for a 5 year contract, the stipulations required for remote and regional service requirements were stringent. The high requirement for microwave and GPRS necessitated considerable infrastructure development and service monitoring by the telecommunications provider. This initial cost and infrastructure deployment was not possible at the start of the SWHN M-government plans. Recently at the contract renewal further discounts were applied by the provider due to the increase in usage.

4. Long-term contracts generally mean more government service delivery savings. In the RDNS experience, a long-term contract negotiated with its telecommunications provider was used to gain cost-capping on usage or a "nominal monthly fee". This arrangement is considered to have delivered major long term cost benefits. In addition to operating its own extensive service applications, the RDNS has enjoyed the evolution of internet services and references. This has resulted in a considerable increase in usage over its wireless network at a cost borne by the telecommunications

provider. RDNS employees are able to utilise the wireless network 7/24 for work and research purposes, which is considered to have delivered many tangible and intangible benefits throughout the organisation.

5. It is important to implement fixed-wireless as a back-up technology in the early stages of the project, or to conduct a trial service as pilot study with scalable growth potential. This is important as it removes the high cost of traditional ADSL/DSL copper "last mile" connections and provides an excellent base for future evolutions of wireless M-government. Existing technologies such as Multichannel Multipoint Distribution (MMDS), or point-to-multipoint and Local Multipoint Distribution Systems (LMDS) or "wireless fibre" offer a comprehensive coverage to government and constituents ranging from home to enterprise access. This was particularly attractive for the SWHN in larger remote centres. Interviewees noted that although proprietary in nature, these technologies are evolving through design and external influences. At 4 interviews it was suggested there is a ground swell of momentum for interoperability with Worldwide Interoperability for Microwave Access (WI-Max or Mobile-FI) and IEEE 802.16.

6. At this time and level of implementation, it was agreed by most non RDNS and SWHN case study interviewees that projects should implement only non-critical tasks until the current IEEE 802.11 security standards evolve further. Similar in nature to the early days of internet access, government practitioners appear wary of the technology, but can see the benefits to be realised through controlled introduction or levels of M-government presence. Interviewees believed it possible to utilise the existing M-government technologies and manage the evolution by mitigating the risk with prudent introduction and controlled change to suitable applications. Wireless LANs, and WI-FI are simply the conduit through which information passes. There still remain many options to secure data via addressing, encryption and the use of non-sensitive or non-critical data to achieve better service delivery to citizens and realise government efficiencies.

8. Summary and Conclusion

Our case studies investigation supports the commonsense notion that the level and range of M-government service delivery increase as the technology employed to support delivery increases in sophistication. It also demonstrates that the relative importance of a success factor can change depending on the level and range of service delivery. Regardless of Wireless LAN, WI-FI, WI-Max or Mobile-FI, this study suggests the lack of technology or technological solutions are not the main inhibitor in M-government uptake. Just as E-government has evolved, so too M-government is expanding. Astute managers in government and implementers are using these tools to provide efficiencies and better delivery of service to their constituents.

The findings of the investigation also suggests the most important factors in successfully implementing M-government include procedural benchmarking, the "championing" of the project, the existence of a "tight" Service Level Agreements, securing Long Term Contracts, ease of transition to wireless M-government and minimising the risks associated with employment of new technologies. In conclusion, we believe our case study experiences demonstrated the usefulness and validity of the model for those planning and implementing M-government service delivery. However, we acknowledge the limitations of generalising our findings to other jurisdictions and advocate that the usefulness of the Success Factors Model be further tested with additional case studies. We believe the findings of our investigation are positive and encouraging in terms of the usefulness of the Model for those charged with responsibility for implementing effective and efficient M-government.

References

Australian Bureau of Statistics (2003) <u>Household Use of Information Technology, Australia</u>

Australian National Audit Office, Nicoll, P. et al. (1999). <u>Electronic service delivery, including Internet use, by Commonwealth government agencies</u>. Canberra, Australian National Audit Office.

Heeks, R. and Lallana, E. (2004**)** M-government benefits and challenges, [online] http://www.e-devexchange.org/eGov/mgovprocon.htm

Huta, P. (2002) "Digital Divide", National office for the information economy, Canberra, Australia

Kushchu, I. and Kuscu, H (2003) "From E-government to M-government: Facing the Inevitable" in the proceeding of European conference on E-Governemnt (ECEG 2003), Trinity College, Dublin.

Kushchu, I. and Borucki, C. (2003) "A Mobility Response Model for Government" in the proceeding of European conference on E-Governemnt (ECEG 2003), Trinity College, Dublin.

Lanwin, B. (2002) A Project of Info Dev and The Center for Democracy & Technology: The E-government handbook for developing countries. [online] http://www.cdt.org/egov/handbook/2002-11-14egovhandbook.pdf

Liff, S. (2000) "Consumer e-commerce: Potential for social inclusion" <u>Consumer Policy Review 10</u> (5) : 162-166.

McClure, P. (2000) <u>Participation support for a more equitable society : final report of the Reference Group on Welfare Reform</u>, Canberra, Dept Family and Community Services.

McCracken, G. (1999). <u>The Long Interview</u>. Newbury Park, Sage.

Okenfeld, M. (2002) "Digital Signature Applications for E-Government" ECRIM News, 48 (January)

Rekola,K and Pohjanpalo, P (2002) Finland: Developing regulation for the IT regime, <u>International Financial Law Review</u>: 69-77

Valdez, M. (2002) "Policy on privacy crucial to e-governance success" <u>Computerworld Philipines</u>:1

Welch, E. and Wong, W, (2001) Global information technology pressure and government accountability: The mediating effect of domestic context on Website openness, <u>Journal of Public Administration Research and Theory</u>, 11(4): 509-538

West, D. (2002) Global E-Government, 2002. Providence Rhode Is, Brown University:32

Wexler, J. and Taylor, S. (2004) 2004 Wireless LAN State of the Market Report [online] http://www.webtorials.com/main/resource/papers/taylor/paper4.htm

Zálešák, M. (2003) "Overview and opportunities of mobile government" [online] http://www.developmentgateway.org/download/218309/mGov.doc

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