Chapter 4
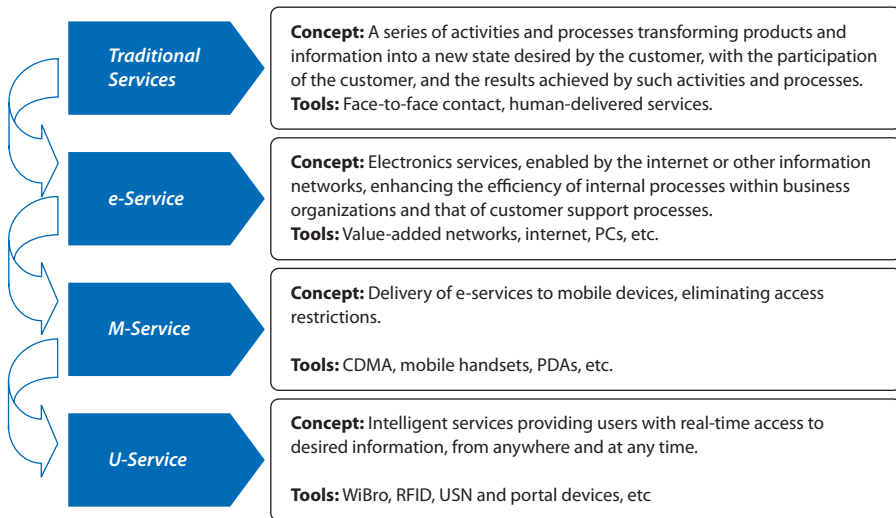
Prerequisites for agility and ubiquity

E-Government services are increasingly required to be platform-independent and constantly available. Therefore, concepts such as mobile government and one-stop shops have gained priority. As governments are trying to foster their capacity to be agile and ubiquitous, they are slowly evolving service delivery towards mobile wireless. This reality requires careful analysis, prototyping and evaluation of services to investigate whether any change leading to new forms of information or service delivery, and/or access, will be accepted by citizens; if changes in user acceptance and cultural adaption are needed; and whether the needed critical mass of "digital natives" exists to fully reap the benefits of the new investments. The analysis may identify a number of different challenges which will have to be surmounted, i.e. *technical, governance, policy, financial, economic, organisational and institutional, legal and regulatory.*

Evolving public service delivery

Governments are slowly evolving service delivery towards mobile wireless. Currently, e-government services are increasingly required to be platform-independent and constantly available. Therefore, concepts such as mobile government and one-stop shops have gained priority. Figure 4.1 summarises this evolution, linking the different levels of service concepts:

Figure 4.1. **Development of service concepts**

Traditional Services	**Concept:** A series of activities and processes transforming products and information into a new state desired by the customer, with the participation of the customer, and the results achieved by such activities and processes. **Tools:** Face-to-face contact, human-delivered services.
e-Service	**Concept:** Electronics services, enabled by the internet or other information networks, enhancing the efficiency of internal processes within business organizations and that of customer support processes. **Tools:** Value-added networks, internet, PCs, etc.
M-Service	**Concept:** Delivery of e-services to mobile devices, eliminating access restrictions. **Tools:** CDMA, mobile handsets, PDAs, etc.
U-Service	**Concept:** Intelligent services providing users with real-time access to desired information, from anywhere and at any time. **Tools:** WiBro, RFID, USN and portal devices, etc

Source: Oui-Suk, Uhm (2010), *Introduction of m.Government & IT Convergence Technology*, KAIST Institute for IT Convergence.

The wider meaning of ubiquitous government – "u-government" – services can be interpreted as advanced social infrastructure for future society. Technology is often a few steps ahead of the socio-economic and usability enablers necessary to make the transition. The stakeholders are working in various collaborative contexts to implement the paradigm of "anywhere, anytime, anyhow access to any service by anybody", which is based on the World Wide Web Consortium (W3C) device independence principles.[1]

Reviewing the various approaches to u-government shows that a unified definition or understanding of u-government is still lacking.[2] For the purposes of this report, u-government can be viewed as a superset of e-government, which reflects new forms of interaction and transaction that are possible anywhere and at any time on various devices, due to the pervasive availability of

networks, applications and services. On the other hand, it should be taken into account that the provision of public services is citizen-centric, and governments must meet the digital divide challenge. For services to be available and delivered ubiquitously, *i.e.* beyond any temporal or geographic constraints, they may not necessarily use online channels exclusively. While the use of online channels to deliver government services may be more cost effective and efficient in many circumstances, it is not necessarily always the case. Pragmatically, policymakers have to exercise due diligence to assure the availability of government services online and to improve their accessibility and mobility. An imperative question is how to use limited resources to maximise the availability and accessibility of government services through an appropriate combination of online and offline channels in a ubiquitous manner.

Looking at the potential of mobile devices for positive social and economic change in rural communities, Pete Cranston relates that Information and Communications Technologies for Development (ICT4D) policy targets eight critical success factors:[3]

- build on existing systems

- ensure services are demand-driven

- determine who should pay

- ensure equitable access

- promote local content

- build capacity

- use realistic technologies

- build knowledge partnerships

Successful *Mobile for Development* projects are more evolutionary than revolutionary, more aligned with existing practices, and more focused on intended outcomes. Approaches to success include:

- embedding the mobile element into an ongoing development effort, rather than creating the mobile service as the development effort itself;

- using mobile technology to reduce transaction costs and increase productivity of existing practices, rather than introducing entirely new behaviours;

- requiring only basic literacy or skills from users, rather than requiring additional technical knowledge or support.

Deployment and feasibility

Careful analysis, prototyping and evaluation of services are required to investigate whether any change leading to new forms of information or service delivery and/or access will be accepted by citizens. Given the evolving and diverse nature of mobile technology use, designing m-government services merely to support current practices is likely to lead to obsolescence and to result in an inefficient use of resources. However, the more general lessons that arise from studying current usage provide a foundation for designing and deploying m-government services and applications that are likely to be accepted and used by citizens in the long term. It appears that an evolutionary approach, where a small set of high-value services that are accessible from a range of technologies is developed over time, will be more successful.

Furthermore, flexibility in the form and nature of applications is needed to meet the changing needs of a variety of citizens. As citizens' technology choices change, these applications can be evolved to meet new needs. Therefore, the findings indicate that a "mix-and-match" rather than a "one-size-fits-all" approach to the development of m-government services is more likely to succeed.

In determining whether to deploy mobile and/or wireless technology and, on such basis, to offer new forms of service delivery, the following factors are also relevant:[4]

Possibility of substituting wired networks – These are cases in which the areas of operation are remote and the wired infrastructure is very expensive. In many developing countries, the wired networks are unreliable and expensive. In some developing countries, technology has skipped a generation and thus, while the wired telecommunication infrastructure is spotty and sporadic, one may find extensive wireless coverage. In such cases, wireless technology is an obvious choice for m-government applications.

Multi-channel strategies – The application of m-government services should be part of a multi-channel strategy to provide options for the delivery of services to citizens and businesses. Hence, the impact and role of wireless technology on e-government should be examined within the context of a multi-channel strategy.

Impact on digital divide – Given the penetration of wireless technology among citizens, its social acceptability, its user friendliness, and its cost, compared with the PC-based Internet wireless technology, it may be a significant way to reduce the impact of the digital divide and provide m-government services that more citizens can access.

Impact of competition – Governments often look at wireless technologies only from the point of view of return on investment (ROI) and cost containment, but there is more to consider. Governments at the local and national

levels compete in today's global economy for business investments, skilled workforce, good jobs, and so on. Governments need to view wireless/mobile technology as a means of gaining competitive and strategic advantage in a crowded field. Thus, some wireless applications may not make much sense from an ROI (Return on Investment) viewpoint, but may make good sense from a strategic, social viewpoint.

M-Government offers many opportunities to economise on the traditional costs of e-government. For example, in certain parts of a country where no fixed telecommunication facilities exist, the cost of developing and maintaining such facilities can be saved. Most authors[5] agree on the following financial and economic advantages of m-government:

- increasing efficiencies;
- decreasing costs by avoiding overlaps;
- increasing service level and ease of service;
- increasing adaptability to future requirements;
- improving auditing and control.

In the case of mobile health service (m-health), for example, enabled health care institutions aim to improve the effectiveness of care services while reducing costs. Handheld wireless applications can enable doctors, nurses and other health care professionals to gain access to the right information at the right time to prescribe the proper treatment. In addition to saving time for intervention and prevention, using mobile devices can offer benefits and efficiency with:

- access to patient records, lab test results, latest drug reference databases;
- requests for urgent blood donations;
- sending patients' data for a second opinion;
- electronic billing for in-home health care workers.

In terms of deployment, scaling-up of m-application initiatives – expanding coverage and organisational size, increasing activities, broadening indirect impact and enhancing organisational sustainability – should be considered. A universalist approach is possible: generalisations that can be replicated, directly expanded, or adopted elsewhere with a simple set of rules. Another possible approach is contextualised: focusing on tailored-made applications to address context-specific conditions. Given that m-governance applications must be inclusive and have a national spread, the key aspect is how to go from successful pilots to national-scale projects.[6]

Changes in user acceptance and cultural adaption

Widespread acceptance of mobile technologies for everyday activities does not guarantee the acceptance of these technologies for the provision of public services. It is important to temper some of the enthusiasm for m-government by drawing attention to some likely barriers to user acceptance of m-government services. There are risks in investing significant resources in providing technologies and services whose acceptance is uncertain. One needs to look beyond the groups that are driving m-government to those individuals who will use mobile technologies in providing or consuming m-government offerings. Failure by these stakeholders to accept m-government, or use the mobile government services as intended in the long term, will lead to failure of m-government programmes.[7] The risk for governments is low levels of take-up of mobile services, as experienced by many countries for some e-government services.

Adopting mobile technologies to deliver services traditionally delivered electronically necessitates a change. Habits, fear of the unknown, security-related concerns and economic factors are some reasons why people might resist accepting new approaches. When mobile technologies are implemented in the workplace, civil servants might view these applications as threatening, fearing that they may lead to their replacement, or make them feel that they are losing control to machines.[8]

Education, employee participation, and interpersonal communication should be at the centre of the adaption process; this will persuade the parties involved to be part of the change willingly, rather than forcing them to agree to the established goals. Employees should be motivated, supported throughout the process and ensured that these effects will bring with them better self-service within the organisation and better service delivery to citizens and businesses.

On the user side, mobile devices – particularly mobile phones – are seen by many as leisure tools *e.g.* for fun and entertainment, more than for serious activities. Yet politics is a serious business involving difficult choices. Aligning these two mismatched worlds may be difficult. One sign already emerging of this underlying tension is the use of m-government systems for playing pranks, such as hoax messaging, encouraged by the anonymity that many mobile devices (which are often unregistered) offer.

To design and to deliver m-government services, authorities should consider the expectations and the perceptions of citizens toward using the services. A recent study indicates[9] that whether or not citizens adopt m-government services is influenced by the following beliefs:

- perceived ease of use; efficiency in time and distance; value for money; convenience; availability of device and infrastructure; usefulness;

responsiveness; relevance, quality and reliability of information; risk to user privacy; reliability of the mobile network and the SMS-based system; risk to money; compatibility;

- trust in the mobile service technology, in the government and perceived quality of public services;

- self-efficacy in using mobile technology.

Cultural resistance to m-government may come from a lack of confidence in the new technologies, and from traditional caution (as a bureaucratic virtue) which may turn to risk-avoidance and lack of innovation.

Finally, resistance and limited uptake may also be due to the inadequate level of digital literacy among the targeted users of m-government services, both within the society and the public sector. The common perception is often that the rate of digital natives is much higher than the actual one. There are still segments of the population that do not have the right level of digital literacy required to use mobile technologies to their full extent, which may cause their exclusion from the new opportunities to interact more easily and conveniently with the public sector brought about by m-government. This aspect should be taken into consideration by governments worldwide as they increasingly consider developing m-government to provide more inclusive and convenient public services. Ensuring a multi-channel service delivery strategy and envisaging policies specifically aiming to increase IT capacities and skills within the society will indeed be essential to avoid the creation of new forms of digital divide and to reap the benefits of investments in m-government. The topic of accessibility and digital literacy is also discussed in Chapter 5 of this report.

Key barriers and challenges

Considering rapidly changing citizens' needs, quick technological developments and the increasing number of policy initiatives aiming to foster innovation in public service delivery through the use of m-government solutions, further growth of m-government implementation is certain in the coming years. However, many challenges will have to be surmounted. To mention one technical example, not every government service can be adapted to mobile technologies (for example, services that require large amounts of data to be downloaded to mobile phones, which have limited storage capability and small screen real estate).

Hence, a thorough investigation of the government services that can be offered by mobile technologies and a careful analysis of the barriers to success of such services should be undertaken when embarking on a mobile service project. To define, analyse and tackle these barriers, they are classified and grouped together as challenges (See Figure 4.2).

Figure 4.2. **Mobile government service implementation challenges**
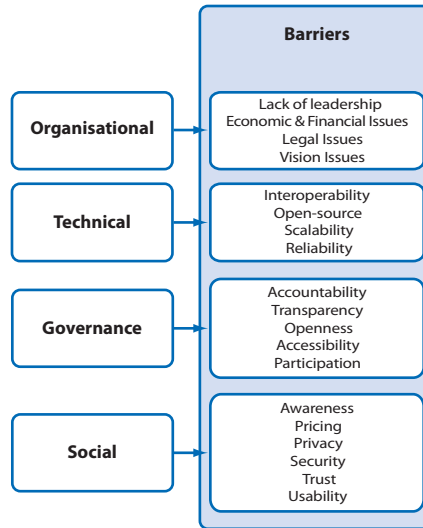
Governance and policy challenges

It is evident that the digital divide still exists in most countries worldwide. M-Government policy actions should therefore try to avoid widening the digital gap. Governments should avoid enforcing the use of mobile channels, and provide access to new technologies only to those who are willing to use them. While m-government has great potential to vastly expand access to public services to the most vulnerable segments of the population, particularly those living in remote areas, or in areas where wired telecommunications and ICT services do not exist, there are still limits to its capabilities, *e.g.* older and poorer groups in society tend to be excluded from this technology. This poses a challenge to governments, which have to ensure that m-government does not become one more way in which the "haves" benefit at the expense of the "have-nots". The fact that some groups cannot access m-government services, however, does not imply that the unreached benefits from m-government will increase the schism between those who are able and those who are not.[10]

M-Government is currently over-shadowed by a lack of clarity on the value it can add to service delivery. M-Government should focus on exploiting the mobile aspect of the devices to position mobile devices as a complementary dissemination channel for e-government; both channels should be used to maximise service delivery to citizens. The existence of m-government

and its applications alone do not guarantee results. Despite the global character of mobile technologies, governments' and citizens' needs may differ significantly, which leads to the general recommendation that governments should proactively consult with the public and take stakeholders' opinions into account for implementation of m-government strategies. Therefore, three separate strategies need to be developed: an infrastructure strategy, a service delivery strategy (based on users' needs assessment) and an organisational change strategy. There is a need for pragmatic planning on the side of governments, which must understand that technology is not the focus of planning. The focus should rather be the end-user of the m-enabled solution, be it the civil servant, the citizen or the business. This will help governments reduce the risk of low levels of m-government service uptake, as was the case for e-government services. Additionally, as technology evolves quickly – screen sizes, device capabilities – there will be an on-going 'maintenance' cost to keep in step, as well as keep supporting older technologies, and a well thought-through strategy weill help governments to keep pace at an affordable cost.

Moreover, it must be noted that users keeping a constant communication channel with the government through their mobile devices may raise issues about transparency and accountability. Users (either businesses or citizens) expect a free flow of information about governments' decisions and actions, *i.e.* transparency.[11] Transparency is part of, and cannot be separated from, accountability; risks will arise when one of them is applied and the other is neglected.

Technical challenges

The technical challenges that governments deal with when developing e-government are comparable to the challenges they have to face when implementing m-services projects. Public sector agencies suffer from relatively high rates of failure among their largest IT efforts.[12] Experience with the introduction of sizable ICT innovations into public administration also shows that progress is difficult and risks are high.

To fully realise m-government's service co-operation potential, measures have to be implemented at three levels:[13]

- within and across levels of government with respect to sharing of information;

- within levels of government with respect to service delivery and user registration;

- across levels of government with respect to overall information architectures.

The first level is about electronic sharing of data related to service users and societal situations. During the design and reconciliation phases, the following aspects are to be taken into account:

- the definition of the shared data (which are often further defined in local regulations);

- the definition of messages required for the execution of tasks (operational work processes, about which administrative departments want to maintain a certain autonomy);

- the adoption of technical standards and protocols (to which administrations are accustomed and wish to adhere);

- the quality of data in terms of actuality (which may differ quite substantially among parties);

- the need to safeguard the security of shared data through technical and organisational measures and authorisations (the importance of security for the continuity of the business or for privacy may differ for the parties);

- the need to safeguard information privacy which refers to attributes that exceed anonymity, *i.e.* anonymity, unlinkability, linkability, undetectability, unobservability, pseudonymity, identifiability. The protection of these attributes introduces technical challenges since the privacy requirements should be taken into account while designing technical solutions;

- the establishment of a control authority on the observance of the set of agreements with respect to data and messages;

- the bearing of costs for common facilities (often the unbalanced benefits and costs for some parties leads to protracted discussions and considerable delays);

- object identification and numbering (of major importance for statistical research and prevention of fraud).

The second technical level is about the transformation of service delivery, the adoption of user orientation, the portal functions and the registration of citizens and businesses users. When the functional bureaucratic orientation is replaced by a "user" orientation, different agreements have to be reached concerning:

- public agencies, which move in the direction of becoming parts of one-stop shops, will have to agree on the portal functions they will develop in common and identify where the common boundaries of the network of connections with other organisations will be drawn;

- the management of the content of the website (this is normally organised according to information about rights and obligations, procedures and contacts with sister organisations and independent experts; "what-if" questions, etc.) and calculations of the entitlements with respect to provisions;

- content management systems have to be developed, *e.g.* with respect to standardisation and possible changes at one of the partners in the network;

- the required levels of identification and authentication for different online transactions have to be determined, as well as answers to questions about such things as electronic signatures, encryption, and public key infrastructure;[14]

- differences between the participants at a one-stop shop arrangement as to freedom of information and active disclosure of policy initiatives and existing databases have to be balanced.

The third technical level is about exchange of information between different sectors of the public administration. If different agencies "feed" databases which are managed and used by others, a need arises to develop an overarching information architecture for the whole public sector, as well as separate architectures for each sector. The overarching architecture must establish: where registrations will be kept, what kind of infrastructure will be built and maintained for routing data, and how this infrastructure will be positioned. Every time regulations applying to one of the relevant sectors change, the effect on the architecture will have to be checked. On the basis of the architecture, the most practical solutions for introduction, costs and administrative burdens can be chosen.

Financial and economic challenges

M-Government is no different from any other mechanism used by governments to deliver services: governments have a responsibility to the public to ensure that services are provided as efficiently and effectively as possible, and that any risks associated with the service delivery are identified and managed as early as possible.[15] Adopting mobile and wireless technologies to provide mobile delivery of services requires careful attention, throughout the stages of planning, development and implementation, to the following factors:

Cost – The need to investigate public funding of infrastructure and the options for joint ventures with private operators (*e.g.* PPPs); the high initial investment and cost recovery or return on investment (ROI); political factors and audit/regulatory considerations; the ability to maintain a single audit trail of transactions and procedural benchmarking; and the realisation of costs and

benefits from long term contracts with telecommunications companies and application vendors.

Business Process Re-engineering (BPR) **–** Business Process Re-engineering is an essential part of any given project, or initiative, and significantly affects the economic and financial factors (*i.e.* if a delivery process is not effective, first it needs to be re-organised, which might cost even more than later putting it on the mobile delivery channel); 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; and technology portability from older systems to m-government interfaces.

Service 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.

Long-term contracts **–** Generally, they increase savings for government service delivery. Because of the relatively high initial cost for infrastructure deployment, long-term perspective is required to realise major long-term cost benefits. Some governments have been able to adopt innovative costing strategies; for example, using fee-sharing arrangements that do not require the public sector to provide many up-front costs. At contract renewal, further discounts can be applied by the provider due to the increase in usage.

In addition to the above factors, a sound financial rationale is required for the introduction of new channels (or possibly the retention of old channels), in which costs and benefits must be balanced against each other. Evaluating m-government services with a cost-benefit analysis or with a similar financial assessment method, the rationale can be summarised along these lines:

- not all m-benefits are unambiguously net gains, and some efforts are driven by political or non-economic efficiency reasons;

- there is confidence *a priori* in potentials to be realised, although justifiable resource allocation requires rigorous evaluation methods;

- advanced services need vertical, horizontal, front/back-office integrations, often implying additional costs.

The assessment of costs and benefits will have to focus on both tangible and intangible factors. The question to be addressed is: how do the costs contribute to improved service delivery (user requirements), increased efficiency and effectiveness (provider requirements) and wider political objectives (greater participation, economic/social development)? There is no

single measurement method that applies equally to all administrations. The metrics to be used should be determined by a strategic management decision. However, whatever metrics are chosen, calculations should be based on realistic assumptions, past experiences and good practice cases.

By introducing and promoting new, less expensive channels of service delivery, in an effort to save costs on more expensive and traditional measures, the service becomes more visible and its take-up has good chances to grow. However, practice shows that the growth in service take-up is often distributed over all available channels; *i.e.* including the more expensive ones, thus raising total administration costs.

Organisational and institutional challenges

Governments around the world are now setting ambitious targets to move towards mobile government, while remaining engaged in the further development of e-government. This bureaucratic, or top-down, approach – which is primarily a result of external pressures from citizens and businesses – may fall short in identifying strategies for content (what) and process (how) in the shift to m-government. In other words, governments should have a roadmap which clearly identifies when it is necessary to make the change, what needs to be changed and how to make it happen.

It can be assumed that it is unlikely that mobile government will require significant structural changes in public institutions in the near future. – This is in large part due to the fact that many m-government applications do not seem to have a large impact on the work of public organisations at large yet to necessitate a major structural change. Most mobile government initiatives are in fact occurring at the lower or local level with the involvement of very few agencies and civil servants. Moreover, m-government builds on structural changes already made to support e-government development. However, m-government will rather require re-engineering working processes,[16] that is in the way tasks are accomplished. In other words, some changes in the business processes and workflows of the departments are necessary. Moreover, as m-government will further develop, an increase in volume of requests to any existing services, as well as new services, is to be expected. It will create organisational needs in terms of required additional support staff to handle the increased volume of inquiries, requests, comments. This will be particularly true if a response in near real-time is expected by the user. Governments will therefore need to engineer the whole system and organisation to meet expected and forecast needs.

As an increasing number of public agencies embrace mobile government applications, a more unified mobile government strategy – as well as more integrated infrastructure and databases within the government – are likely to emerge. Once this level of adoption is achieved, some changes can be expected

in the structure of governmental organisations. Such changes are likely to be: virtual public agencies (*e.g.* mobile technologies enable civil servants to spend their time in the field); consolidation of some public agencies, and/or reductions in headcounts. For example, the void inspection surveyors in the London Borough of Barking and Dagenham[17] no longer require fixed office space.

The size and complexity of existing governmental structures usually limit their adaptability to new situations, such as emerging m-government opportunities. Co-operative behaviour is hindered by the separation of powers, the tier structure of public administration and the right of self-determination at different levels of government. The necessity to come to an agreement leads to compromises at the level of the lowest common denominator. The flexibility which is required by m-government is square to the immobility of existing public authorities. The legal necessity to maintain off-line facilities makes online m-government facilities extra expensive. Many organisational changes inspired by m-government relate to horizontal cross-boundary processes, while public administrations are generally mainly interested in vertical jointed jurisdictions. Finally, m-government measures are often too directed at saving costs in existing departments, rather than boosting interconnected chains of activities.

Commitment to the same objectives and a common sense of direction over the long term is often lacking in m-government initiatives. Different civil servants, each with their own specialty and "trained incapacity", are participating in larger m-government projects. Without strong management, too many partial decisions are taken, which are at cross purposes with the common goal. The staffing is often discontinuous, the dependency on outside specialists intensive, and the documentation of the projects insufficient.

Employees' acceptance of mobile and wireless technology and intention to use the new technology for work processes depends on three main factors:[18]

- the perceived usefulness of the technology

- the perceived ease of use

- the perceived availability of resources for the technology

Perceived usefulness is defined as the extent to which a public employee believes that using a particular technology will enhance her or his job performance. The higher the perceived usefulness, the higher the technology acceptance and adoption.

Perceived availability of resources includes resources such as time available for performing or learning to perform a task and level of support available from other staff, as well as technology attributes such as system availability, cost of access, documentation, and perceived level of control over the technology. The higher the perception of availability of these resources, the higher

the technology acceptance. This factor is particularly relevant if the wireless/mobile application is complex. Taking into account the civil servants' needs and views as users of the m-applications, and ensuring their buy-in will secure the success of m-government initiatives. Government agencies can take the following steps to increase employees' acceptance of wireless/mobile technology: [19]

- *Train and educate employees* – Training programmes, which include formal classroom education and hands-on job training, are essential for employees to understand the role wireless technology can play in their jobs. These training/education programmes must emphasise productivity benefits and process/usability issues. Testimonials from peer groups and superiors can play an important role in the acceptance of specific applications.

- *Build peer support* – An organisation can identify employees who are most receptive to wireless/mobile technology and use them as the "lead-user" group in providing support for their peers. Lead-users can be selected for training programmes first and then play a critical role in helping/supporting their peers through similar training programmes.

- *Implement pilot initiatives and applications* – In many situations, the usefulness of applications may not be explicitly evident before the applications are implemented. In such situations, pilot programmes are excellent ways to introduce the wireless technology and its benefits to employees. In addition to fostering employees' buy-in of such programmes they may help identify potential inhibitors to successful applications so that the negative impact can be minimised before a full-scale launch.

- *Provide staff support* – It is critical to engage staff early in the adoption process, especially when technology readiness is low. This helps employees overcome feelings of discomfort and insecurity.".

- *Create a learning culture in the organisation* – Employees should be encouraged to experiment with new wireless technology and new applications. Incentives should be provided helping to design applications and for suggesting improvements to the processes and applications. This enhances their involvement in the use of wireless technology, providing a sense of ownership and thereby improving the chances of successful adoption and potential productivity gains.

Increasing employees' comfort with the technology and increasing their perception of ease of use are the best ways to prepare them for technology acceptance. Government agencies should use incentives to encourage employees' use of PDAs, wireless devices, and handheld devices both for work and personal use.

Legal and regulatory challenges

Security and privacy concerns are perhaps the most important considerations for both the government and citizens in any m-government project. There needs to be data integrity, particularly in relation to loss and theft, as well as transaction audit and transparency. Storage of data is another relevant concern. If users' privacy is not protected when using a mobile service, they simply will not use it again, making it very difficult to achieve critical mass.[20] Users are becoming more aware of privacy issues and are comparing the privacy policies of government sites with those of the private sector. Security is not just about installing the latest security devices and deploying the most modern security technologies. Information security relies on a combination of business, management and technical measures applied on an ongoing basis, towards a "culture of security" as called for by the 2002 OECD Security Guidelines.[21] Privacy and security issues must be addressed in the planning phase, and may impact the timing or selection of a specific type of wireless service. Additionally, privacy challenges for m- services should not be limited only to data protection regulatory compliance. Information privacy refers to attributes that exceed anonymity, *i.e.* anonymity, unlinkability, linkability, undetectability, unobservability, pseudonymity, identifiability. The protection of these attributes introduces legal challenges.

Another major regulatory aspect is interoperability. National public services risk creating new electronic barriers if they opt for solutions that are not interoperable.[22] Such so-called e-barriers fragment the global market and hinder it from functioning properly. The disparate legal landscape across countries often prevents cross-border exchanges of information between state administrations. When such exchanges are allowed, the legal validity of information must be maintained across borders, and personal data protection legislation in both originating and receiving countries must be respected and aligned.[23] Thus, advancing interoperability is an essential requirement for the further development of m-government.

Notes

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