Development modules to unleash the potential of Mobile Government

Developing mobile government applications from a user perspective

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Abstract
Current Mobile Government applications do not exploit the full potential of available technology. Furthermore, throughout the development process the user perspective is neglected in favour of discussion about technical feasibility. This paper will describe methods of assessing a process' mobility need from a better understanding of mobility and a way of implementing a user perspective when defining new application fields and requirements for Mobile Government.
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About the Author

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1. Introduction

The number of mobile users is increasing and has already surpassed the number of households with internet access. The roll-out of mobile broadband data access using technologies such as UMTS, Wireless LAN, TETRA or WiMax is beginning to reach a critical mass of users who are offered many new multimedia and data services for their mobile devices. This availability of an always-on connection, allowing for more bandwidth and access from almost anywhere is putting pressure on national and local administrations to include mobile government services in their basket case of electronic government offerings.

So far, e-government has allowed for a faster, more convenient and often value-added delivery of public services. It has started a regrouping and rethinking of processes in many administrations, helped to create a new and improved access to various services and also supported citizen participation in political processes. Even where it is not obvious to "front-end users" like citizens, e-government has in many cases boosted the more efficient gathering and processing of data. Information and communication technologies in governmental organizations have reduced cost, redundancies and errors, thus speeding up the handling of services.

Nevertheless, mobile technologies, however unknown their real value still is, will take this development on an even higher level. Not only are such mobile services promising more efficiency, faster and less erroneous processing of data, but also an improvement of service as a whole through the direct contact with citizen. "As painful as e-government transformations have been, the challenges of dealing with an always-on society and workforce will be even more daunting. Service delivery, democracy, governance and law enforcement will all be affected" (Di Maio 2002).

Since mobile government is a rather new field, it is not sure whether it will replace the "classical" electronic government, if it is just a new access channel or if "mobile" is a disruptive technology like the internet has been called in its early day, completely changing the way information and communication is handled – the question to be answered here is *how* mobile government services should be developed and deployed to really exploit their potential.

To approach this subject, the author of this paper wants to take a brief look at mobility in general and the requirements which derive from this "being mobile". To then approach the question of how to unleash the real potential of mobile government, the possibilities of how to evaluate available and how to create new services for a mobile user group in a government context will be studied in depth below. Questions to be answered on this way are about assessing process mobility and the development of applications, based on user- rather than organizational need. The starting point is always the user of the service that is to be created. His needs and experiences form the overall corridor, in which mobile government services can be successfully deployed.

2.   Understanding mobility

A fairly subtle distinction between E(lectronic) and M(obile) Government is the clarity of what exactly each term describes. While Electronic Government obviously deals with the electronic handling of government processes, Mobile Government could address the mobility of the government itself, e.g. the parliament meeting in a train (physical mobility). The term could also include the government customer moving from administration to administration, thus being mobile and dealing with government, however is appropriate, e.g. one time as a citizen moving from city to city, next time as an employee paying taxes, then maybe as an employer dealing with social security matters (social mobility).

These various implications of "mobile" government result from different understandings of "mobility". To better comprehend what lies behind mobility, the following paragraph will explore different concepts of mobility, leading to a closer look at requirements of different "mobilities" for mobile communication devices, the services for these devices and their users.

2.1   Mobility

Mobility in a general sense is understood as a form of *being mobile*. The adjective "mobile" goes back to the Latin word "mobilis", meaning *movable*. In this sense, mobile objects are capable of moving or being moved.

Depending on the context, in which the term is used, its implication is variously extended. These differences lead to distinct approaches how to deal with mobility, how to become mobile or how to support being mobile.
For example, the question "Are you mobile?" does not ask for the status of someone being physically movable but for the subjects *ability to move* from one place to another in a more social context. Maybe the asked person has obligations that do not allow leaving ("I'm stuck here"), thus making him immobile, at least for a certain amount of time. It could also be asked, whether someone is mobile in a sense of *willing to move*.
The same applies to objects, e.g. a heavy box that is "immobile". It is not fixed to its place due to any physical law, but by its weight – it can not be moved. Tools to lift it could easily move this box from one room to another, sometimes a second person helping to carry it can solve this "mobility problem".

This short look at mobility gave a first insight at different meanings of the word "mobility". There is a physical and a social level of mobility. With the introduction of ICT, a third level can be added: virtual mobility.
Approaching the field of mobile communication, these levels do not help to pin-point a certain application to one or the other type of mobility. Mobile communication includes the physical level, since at least one communication partner is mobile. It also includes the social level, forcing a participant to quickly switch between social contexts (Ling 1997, 2000; Palen et.al. 2000), e.g. dealing with urgent business matters while meeting friends. Services such as mobile messaging also include virtual mobility by letting users roam in virtual communities.

Looking at mobility as "three distinct dimensions of human interaction" that have been "dramatically mobilized by intensive us of ICTs" (Kakihara, Sørensen 2001: 33) helps to get closer to describing a certain mobile situation and thus refining applicable needs, expectations but also limits.

2.1.1 Spatial mobility

Spatial mobility refers not only to extensive movement of people, it also considers the mobility of *objects, symbols and space* itself. Objects like a mobile phone always "follow" their owner on his roam, aiding and allowing his mobility. The exchange of symbols, via TV as well as the internet or other media, also assist greater mobility. Nevertheless, with the expansion of communication networks they themselves become more mobile, extending the reach of interaction by enabling a broader and more rapid exchange between people and objects. Space itself is made mobile in the context of media like the internet, creating "virtual communities" – dissolving the "here" and "there" distinction (Rheingold 2002) and requiring own rules (Lessig 1999).

2.1.2 Temporal mobility

In order to accelerate the pace of processes, many technologies are employed to speed up matters. Mobile communication viewed from this perspective is a typical example. Apart from the acceleration through communication technology as a whole, the temporal order of work and social life is changing. With the growing penetration of mobile phones, "time becomes a commodity that is bought, sold, and traded over the phone. The old schedule of minutes, hours, days, and weeks becomes shattered into a constant stream of negotiations, reconfigurations, and rescheduling" (Townsend 2000). Whereas some technology lead to or supports increased *monochronicity*, meaning that activities are structured by allocating time slots to an event (e.g. printer queues, fixed line phone calls), especially networking technologies depend on and increase *polychronicity* (the main idea of the internet itself is that of time-shared computing). Asynchronous communication via SMS or e-mail allow for the handling of multiple tasks simultaneously or rather instantaneously when they occur. Time-slots can be "moved" if something else seems more urgent, some talk about the "liquidisation" (Geser 2003), "fluidisation" (Sørensen 2002) or "softening" (Ling, Yttri 1999) of communication.

2.1.3 Contextual mobility

In addition to the aspects "where" and "when" of interaction, especially mobile communication has to take into account the modalities, in which and *how* this interaction occurs. Particular circumstances and partners of a situation constitute the critical disposition of interaction. Two dimensions assist characterizing the contextual mobility. How strictly an interaction process imposes an obligation to notice or react to it can be described along the distinction of *obtrusive vs. unobtrusive*. At the same time, interaction can range from *ephemeral* to *persistent* interaction (Kakihara, Sørensen 2001: 35). The first refers to modalities only important to the current interaction taking place whereas the latter creates information which has relevance for later activities.

These dimensions apply to mobile communication services in different degrees. To split mobility up once more, three different sets can be defined. They can be applicable simultaneously but each of them leads to different solutions in their respective context:

- **device mobility,**
  the continued access to services with a device while moving;
- **user mobility,**
  apart from the mobility without physical constraints, this refers to location- and device independent service access;
- **service mobility,**
  the capability to provide a certain service irrespective of device and user.

While the aforementioned levels of mobility help to describe service needs and constraints, the above stated degrees help to assess the available mobility of these services form the device, service and, most important, the user point of view.

To finish this look at mobility, a common misunderstanding in the realms of mobile applications has to be corrected:

- **wireless ≠ mobile**!

Even though both terms are often used synonymously, there is a logical (and important) difference between them. "Wireless" simply describes devices which are <u>without</u> wires. "Mobile", as has been described above, is something capable of moving or being moved. A desktop PC can be as wireless as a PDA or mobile phone, depending on whether it is connected to a wireless network. Still, it does not have mobility, for it can not be moved (far) and still be used in the same way. Hence, mobile communication refers to being able to communicate anytime and anywhere whilst wireless communication simply does not rely on cable and wires, nevertheless being immobile to the reach of a wireless network. Thus, "wireless" shall be regarded merely as a subset of "mobile".

3.   Mobile Government services

As a conclusion of the mobility description given above, mobile government can be a whole range of government services and applications, available via various mobile networks and designed for a broad range of devices and presentation layers. Since the aims of mobile services can be summed up as helping to face uncertainty and reducing complexity, mobile government also has to fulfil this task.

However, discussion about mobile government is often confined to a question of feasibility from a technological viewpoint. The development of technologically driven innovation often excludes the anticipation of user-needs. While markets tend to solve this problem by customer approval and thus a way of selection with market mechanisms, public sector services work in a somewhat monopolistic environment. The

only competition available is between the channels in which certain products and services are offered (depending on the administrative structure there might also evolve competition between municipalities, though to a much lower degree).

At the same time as the back-office of government administration can be forced to surrender to new technologies (the organizational and personal consequences left aside), the customers (citizen and business) have a choice to revert to respectively stick with their preferred bearing technology and way of dealing with their government and administration.

In order to avoid the creation of services not accepted by the target group and thus wasting money on technology whilst already working on a tight budget, a more user-centric view is proposed here.

3.2   Assessing service mobility

It is good if every thing is possible, but not everything possible is good.
Neglecting the fascination of technical feasibility, it is vital for the further development to first assess the mobility needs of a given services, as a next step some key questions to define user needs will be developed.
At this point the above made statements on degrees and levels of mobility shall be met with different sophistication levels of mobile services. These different levels of complexity on the front- and the backend have been observed in a survey of mobile government services in Germany (Plum, Roggenkamp 2003).
For the development of a mobile government strategy these sophistication levels are of importance, because they include an evolutionary element allowing for a step-by-step implementation(Anonymous 2001; Chang, Kannan 2002). They are:

- mobile access,
- mobile content,
- mobile application.

The first level of sophistication is a mere porting of available online services allowing for *mobile access*. If adapted for mobile use, the information made available is presented using a "wireless" markup languages like WML (WAP) or cHTML (i-mode) and screen scraping website interfaces or by syndicating content for SMS. Not the content itself is hereby reduced, but only it's display, e.g. graphical information is compressed or one web page is split into several WAP pages or condensed into one SMS. Up to now, many G2C-services can be found on this level, mostly tourist information or reminder services.

One step further, content is not only visually adapted for mobile use. Filters reduce it to match the context of retrieval, by incorporating a dedicated mobile logic (where, when, who) on the basis of available device, network and user information and by offering a dedicated channel for feedback and data manipulation. The outcome might be called *mobile content*. Within government organizations, a usual example can be the application for licenses, e.g. on building sites. Also, resource management can be located on this level.

This highest level of sophistication does not only include rendering and filtering of information for any mobile context. A (genuine) *mobile application* also allows for complete transactional services. Security issues are met and access controls are imposed (more strictly). Device and service mobility is of concern in order to fulfil the proposition of delivering the right thing at the right time at the right place for the right person. This level currently is applicable to many G2G-services, since there still are many limits to authentication and device accessibility. These can be effectively addressed within a closed user group like the police or other government employees working outside an office.
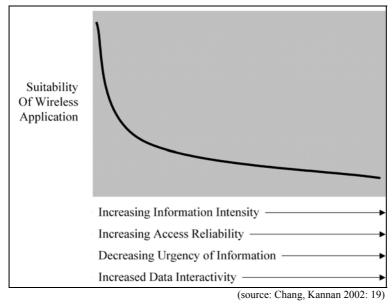

<div align="right">(source: Chang, Kannan 2002: 19)</div>

Figure 1: Suitability of Wireless Applications

Each of these sophistication levels matches with a certain information need. This can be measured along the parameters of

- intensity and complexity,
- urgency,
- reliability (of service),
- interactivity

of the information (and the underlying service).

Part of the intensity and complexity of information, especially for governmental transactions, is security. Urgency of information defines the need for mobile information access. If not necessarily instantaneous action is needed, the cost of providing certain content for mobile users would exceed the gains. The same is true for services depending on a reliable access. Manipulation data for example relies on constantly being able to connect to databases, otherwise redundancies might occur. The more interaction is needed, the more steady connectedness is of importance.
All this does not take into account general evaluation of processes and products and the cost and values created by making a process digitally accessible. This should be part of

an overall e-government strategy. Also, looking at mobility needs of a process does not consider possibly needed reorganization processes beforehand. To evaluate single processes and government products, it is necessary to exactly know the available portfolio of interaction, as is true for e-government in general. The above shown indicators do not help assessing a common necessity but just the level of mobility needed.

If a process' mobility need has been estimated and located within the three sophistication levels, a set of possible bearing technologies can be defined. This paper will not go into detail on the subject of finding the proper technology for a service, a short overview is given in the table below. Constant technological innovation and the already available infrastructure of an organization has to be considered, also openness of standards, scalability and interoperability. Many countries have existing guidelines which also apply to mobile government (e.g. SAGA in Germany, EGIF in the UK).

Voice over IP (VoIP)	3G	Internet Email	SMS/ GPRS
Moving Images	3G	Chat	SMS/ GPRS
File Transfer	3G	Remote Monitoring	SMS/ GPRS
Web Browsing	GPRS/ 3G	Instant Messaging	SMS/ GPRS
Collaborative Working	GPRS/ 3G	Simple Messaging	SMS
Electronic Agents	GPRS/ 3G	Electronic commerce	SMS
Job Dispatch	GPRS	Customer Service	SMS
Still Images	GPRS	Vehicle Positioning	SMS
Information Services	SMS / GPRS		

(source: Buckingham 2001)

Table 1: Applications and preferred bearer technology

Concerning the development of Mobile Government, these steps help to plan a roll-out strategy. Up to now, however, the user has only been regarded as a consumer of available (though somehow rendered for mobile use) processes.

Since especially mobile applications offer options for more personalized, context- and location-aware services, these filters should not only be imposed on current processes being mobilized. Considering the "user" as a combination of roles and contexts, embedded in various environments, the focus should not be put on technical feasibility but on the utility of a mobile application. Apart from these and other limitations such as security, cost and revenue which apply to any computerized government process, it is the actual need of mobile users helping to narrow down the spectrum of technically feasible applications to a few, needed services.

4.   User needs

While technology only describes many possibilities, a government process consists of a set of requirements which are crucial for its fulfilment - like accessibility and security; looking at mobile government processes among others requirements such as data integrity and -security, privacy, cost and reliability can be added. Above all, though, there are users who have to accept and work with new applications to realize the estimated gains. They themselves have their own set of possibilities and requirements, sometimes in sharp contrast to the technically possible and the procedurally needed. To

match these user needs, in the process of developing new mobile applications, existing processes need to be looked at neither from a technological nor a government point of view but from a user perspective. This will lead to new services which may demand new modules, a re-building of processes and products.

In other words, user requirements build the first filter. The outcome should then be matched with technological possibilities and government requirements.

Assessing or even quantifying user needs is a "wicked problem" (Gerstheimer, Lupp 2001) when it comes to technology innovation. "Social shaping factors […] are certainly necessary to understand and bear in mind in planning, technology development, and in business strategy. A failure to take such factors into account will potentially undermine the commercial opportunities" (UMTS Forum 2003: 3). To survey existing experiences with similar technologies can help to define areas to look at, e.g. when planning for the transition from GSM networks via GPRS to UMTS. In this case, a key finding was that "mobile telephony created an addition to people's lives" (UMTS Forum 2003: 7) rather than substituting other services. Reasons are manifold, but planning with this knowledge can also turn out to be an informed guess. For example Multimedia Messaging is considered as an improved SMS service. Nevertheless, the acceptance of this service is not nearly as impressive as was the case for SMS (which itself was hardly more than a by-product initially not even marketed). The point to be made here is, that studying recent developments with the methodology of market survey helps to build indicators for further innovation, but often restricts these to improving what is already available.

As a case in point, the Federal Criminal Police Office in Germany has started a programme (*sms-fahndung.de*) aiming at supporting police investigations by informing registered users in a region of suspects being searched for. Though legal and technical problems were solved, the project is about to be stopped because of to few interested users.

Emphasizing this point once more, it is most important to assess user and not organizational or technical need when developing new services – unless it is acceptable if they are not widely used.

Typical methods of market surveys on customer-needs today and tomorrow can only lead to innovation "by improvement" (Gerstheimer, Lupp 2001) – but not by mapping out new contexts and approaches to services.

Especially the (still) emerging mobile applications and services in the government sector, a widely uncharted set of possibilities and requirements (in addition to technical feasibility), offer a disruptive push which may lead to a not only improved but actually innovative and extended set of offerings in and by public sector agencies. It may also lead to deserted pilot projects which appeared "useful" from within an organization but proved to be unwanted or even inconsistent with a broader strategy and its implementation.

To find out about user need it first has to be asked how prepared a user group is to apply certain technological innovation, followed by the determination of the willingness to do so. This estimation of possibilities (a narrowed down version of the overall possible)

should then be matched with a set of requirements named by the user. From this, a possible application field can be extracted which includes possible user needs.

4.3 User readiness

Before starting to consider fancy applications which promise to have an enormous impact but depend on a vast user experience, the current level of available user experience and the readiness of users on the in- and outside of a providing organization has to be determined.

Since users are not only citizen usually coming to pick up their passports but also employees of an administration or other governmental organizations, both groups have to be considered. When deploying a wireless network accessible for employees of one office, it has to be asked how this will effect the day-to-day business of an organization – will people be gathering around the coffee machine while hacking on their laptops or will they stay in their offices because they are not ready to embrace this new technology? When it gets to more sophisticated, mobile technologies using mobile phones or PDAs, this question is all the more relevant because of the cost of supplying the devices. "Technology readiness is an overall state of mind and not a measure of technology competency." (Chang, Kannan 2002: 27). A lower technology readiness also implies a lower openness towards new (mobile) technology. correlates with previous

User expectation toward a technology and the **perception** of how it will be used and useful changes with growing **user experience** (once someone has learned how to type on a PDA, it will be a lot easier to ask this person to handle more complex tasks on such a device) – Palen, Salzman and Youngs (2000) showed that this can happen quite quickly, though.

4.4 User willingness

User willingness to use new applications and services is obviously connected to previous experiences with similar functionalities. This invokes certain perceptions on the utility of new services. "Sometimes this carryover model is helpful but at other times, it can be misleading." (Palen et.al. 2000: 8). To avoid misperceptions the real added value has to be revealed to designated users. Within government structures, several measures can be taken to increase user willingness (Chang, Kannan 2002: 29), the first should be training and supporting users. Taking measures is a lot more problematic when offering services to the public. Not only is there a multitude of devices, operating systems and transmission networks – for many users getting in touch with government is not part of their job but plainly their duty as a citizen. For this user group, readiness to accept a technology is generally easier to achieve than creating the will to use it for interacting with government services. Whereas simple information services can be marketed with being of value in certain, mostly mobile moments, more complex services risk not being approved by users as necessary on a mobile device without offering incentives – especially when they cause additional cost, e.g. for downloading information or sending SMS to invoke a process.

4.5 User requirements

Even when users are "technology ready" and willing to generally embrace a mobile application for whatever reason, the question if they need a special application is dependent on their current requirements.

For mobile communication Gerstheimer and Lupp (2001) have developed a model defining a set of possibilities and of requirements.
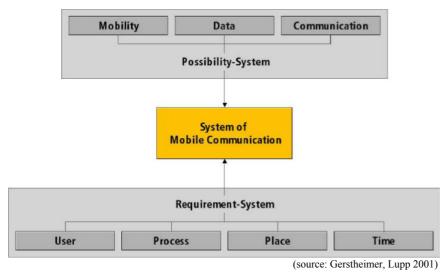

(source: Gerstheimer, Lupp 2001)
Figure 2: Possibility- and Requirement-System of Mobile Communication

The Possibility-System helps to identify benefits to the user, e.g. potentials resulting from being mobile. Linking the potentials of each subsystem, a set of possibilities can be extracted. This view is quite abstract, but it can be extended or limited according to currently available and suitable options. A possible extensions in a government context could be an authentication process .

On the opposite side is the Requirement-System, aiming to describe parameters with which to refine application scenarios. Developing an M-Government application, possible parameters could be first the user as a citizen (G2C), as part of a business organization (G2B) or other administrations (G2G). A second set of parameters could be formed by available products of a government, each having certain requirements or already "assembled" in a process of their own. Place and time are of course vital aspects since the goal is to find mobile applications. Some unique government requirements could also be placed here, for example the need to

Taking one parameter as a starting point, relations between this and the other requirement-parameters lead to possible scenarios and from there to a pool of user needs. A simplified example could be a citizen (user), needing a new passport (product/process) at the airport (place) immediately (time). With the possibilities of multi-media communication (camera phone) and data transfer (GPRS), he could hand in all the necessary information to receive a new passport. He might even be able to pay for it with his mobile device …

However, if such a scenario can be realized depends on many of the previously mentioned assessments and on the willingness and readiness of user and provider alike.

5.   Conclusion

Mobile technologies seem to be promising when thinking about new applications and services for Mobile Government. Many things could be technically realized, but their usefulness has to be proven beforehand to avoid the risk of failure on a high level. The utility and thus the gains achieved by a mobile government service need to be assessed from a user perspective. Already available services show different sophistication levels. Mobile information services mainly for citizen, communication applications for business users and within government structures, more complex transactional services on mobile devices are currently almost only in use for government administrations. When assessing a process' mobility, the more complexity of information and the lesser the service mobility due to the diversity of available tools, the lesser is the mobility of the viewed process. Apart from this, the readiness of user and provider to embrace new technology and the willingness to do so is of importance. When a service is not used voluntarily, this aspect has to be accounted for even more.

To find new application fields for Mobile Government, this paper is proposing a systematic approach by examining possible user needs within a set of possibilities (being mobile and mobile technology) and requirements (role of the user, available products and processes of a government organization, context of use). Though this might at first sight lead to naïve ideas which do not consider government structures, maybe this could start some rethinking of these latter structures.

In general it needs to be said that Mobile Government has to appreciate existing Government strategies and available solutions. Not only from the point of technology readiness, but also to avoid redundant developments. Thinking about police services developing applications for 3G networks and at the same time similar solutions for TETRA networks does not seem to be very considerate.

Nevertheless, even though this would be very handy for future development, this paper did not find a concluding solution on how to fully assess user needs – but it has shown ways of how to approach this unknown but moving target.

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