M-Government Safety Services: Evaluation Of Alternatives From Stakeholders' Perspectives.

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Abstract: *Mobile technologies provide many opportunities for innovative applications to improve public safety. In cooperation with a group of stakeholders, alternative applications to improve public safety were proposed and reviewed on their value by voting. In this case the voting shows a considerable level of consensus regarding the services desired most. A framework is introduced to rank the services in order of complexity. The proposed framework is used as a feasibility analysis providing a roadmap for the realization of the services. In order to achieve successful service implementations, the stakeholders need to take into account the complexity of the different services proposed and their current level of expertise. The proposed framework providing a roadmap for service implementation may help governmental organizations to identify services fit for realization in an evolutionary way, at affordable risks.*

Keywords:

1. Introduction

High quality experiences with responsive, integrated private sector information systems are leading citizens to expect the same from public bodies and agencies (Hazlett, 2003). In order to meet these expectations mobile technologies can be applied. Mobile technologies offer tremendous opportunities for the improvement of public services, including the improvement of quality and availability of public safety services (Turban *et al.*, 2004). For the effective design of mobile safety services government agencies have to cooperate and share information which each other. In the Netherlands there is a large debate going on about which type of services can be used to increase the safety and how the information architecture should be designed in such away that it fulfils requirements like privacy, adaptivity, accountability.

Various alternatives are possible which have different implications on the type of services that might be offered and on the information architecture needed for service provisioning. Various kinds of stakeholders, including citizens, police, ministries and social workers have different preferences regarding the type of safety services. In the public sector there is often confusion about the potential of IT and the absence of IT know-how at public management levels (McIvor *et al.,* 2002). Consequently there is a need for more insight in the stakeholder perceptions regarding the preferences and requirements concerning the creation of mobile services. More insight can be provided by a roadmap, Sharma and Gupta (Sharma, 2003) state that planning the transformation to e-government is the single most important issue facing governments today.

This paper describes the outcomes of an opportunity scan regarding mobile safety services in a specific square in Rotterdam in a multi-actor setting. Rotterdam is one of the largest cities of the

Netherlands. In this paper requirements are elicited and alternatives are evaluated. A framework is developed to support an evolutionary approach to service realisation. This framework can be used as a part of the roadmap described earlier.

This paper is structured as follows. Section two describes the research approach, section three describes the case study. The proposed alternatives and results of the voting session are listed in section four. Section five describes a framework to identify the complexity of the proposed services. The last part of the paper consists of the conclusions.

2. Research approach

During 2003 the Center for Public Innovation (CPI) organised a number of workshops aimed at a diverse group of stakeholders. Stakeholder theory states that those who can effect or can affect by a change should be accounted for in the transformation process (Pfeffer, 1981). Because of this a careful selection of participants was made. When relevant actors are not invited to participate in a project like described here, they may start different forms of strategic behaviour to hinder the outcomes of the project (de Bruijn, 1998). The research started with interview sessions regarding the safety situation at the square. These interviews were conducted both with citizens as with professionals.

An important element of these workshops was the presentation of possible ICT solutions to improve safety on the streets and the ranking of these solutions by the stakeholders. The center cooperated with occupants, entrepreneurs, representatives of police services, municipal services, welfare workers, the social reception, youth workers and schools to construct an image of the main problem areas combined with possible solutions. Main objective was to provide insight in the opinions of stakeholders regarding different ICT based solutions for the improvement of public safety.

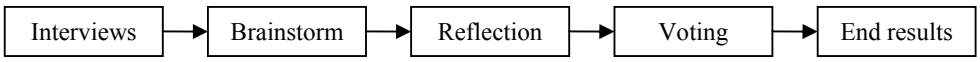

Figure 1. – Actions and research approach.

Figure one indicates the order of the actions performed during the research. At first a number of interviews were conducted with people living and working at the square in Rotterdam. The results of these interviews were used to form an image of the current problems at the square. The findings of the interviews were discussed with the gathered participants. Afterwards a brainstorm session to provide ICT related solutions for the problems was held.

The large number of alternative solutions was sorted and ordered during a number of reflection sessions organized by the members of the CPI. The CPI presented a structured set of alternative services to the stakeholders at a voting session. The different alternatives where explained by members of the CPI and voted on by the stakeholders.

After the CPI had counted the votes, the voting results were presented to the stakeholders and participants in form of a book describing promising opportunities for services to improve public safety.

3. Case study: Public Square in the city of Rotterdam

The case under investigation is the area around the square of Rotterdam, called ‘Pijnackerplein’. Rotterdam is one of the largest cities of the Netherlands, with a high level of criminal activities. The square is notorious for its many accidents and several public agencies try to improve the safety. Each agency has it’s own way of working and an already existing information architecture. Currently they operate relatively independent of each other. By sharing of information and using mobile services the effectiveness of their actions can increase. For example they might decide to visit a place together

instead of separately and share data about persons so they know about a possible history of violence. The square in Rotterdam can be analysed from the following three views (Bekkers, 2004):

- The *living* space consists of the physical area round the square in Rotterdam. The living space relates to the perception of safety by different stakeholders. It relates to the day-to-day situation and problems at the square in Rotterdam.

- The *administrative* space (or system space) is formed by all governmental organizations performing tasks related to the square. These organizations all have a different point of view, different challenges, responsibilities and competencies.

- The *mental* space exists only in the minds of people thinking about the square. It is connected to the concept of a square, the expectations and habits. It deals wit the different cultural perceptions of the concept of usage of public space.

This paper focuses on the administrative space and on 'administrative crowdedness', this considers the fact that many governmental organizations are active at the square. For these governmental organizations becomes difficult to understand who exactly is responsible for what. It also becomes unclear who the responsible persons are and how they can be contacted.

3.1 Actors

This section lists the main actors involved in the brainstorm and voting sessions, please see also figure one in paragraph two. The workshops organized by the Center for Public Innovation (CPI) provide the means to combine problems and solutions using a garbage-can method (Cohen, 1972). It is both possible to search solutions for problems as to combine problems with existing solutions.

3.1.1 Municipality of Rotterdam

Rotterdam is the second city and the industrial heart of the Netherlands and the economic, social and cultural center of the Rijnmond ('Rhine Estuary') region. More than one million people from 162 countries live in the Rotterdam region. About half a 600.000 people live in the City of Rotterdam. Rotterdam consists of 13 sub-municipalities.

3.1.2 Municipality of Rotterdam North

Rotterdam north is one of 13 sub municipalities; it has a more localized work field. The sub-municipality is positioned closer to the citizens. In principle, every contact between municipality and citizens is managed by the sub municipality offices. The sub municipalities provide all kinds of services (renewal of driving licenses, handout of passports) directly to citizens. A sub municipality has its own administration, budget and administrative machinery.

3.1.3 KLPD – National Police Force

The KLPD together with 25 regional police forces forms the Dutch police. The KLPD operates within the Dutch police force both on national and international level it has independent, supportive and coordinating tasks. In specific cases the KLPD supports the regional forces or coordinates collective activities. About 4500 people are working at the KLPD.

3.1.4 Police Force Rotterdam Rijnmond

The Local police force of the Rotterdam Rijnmond Region is one of the 25 regional forces. Many information systems of the police are organized at regional level. One of the most important applications which keeps track of incidents, locations and reaction of the police force (who went to the incident location, when, with what equipment) is called BPS.

3.1.5 Program Agency Public Safety (Programmabureau Veilig)

The program agency public safety is the administrative pivot in the municipal safety policy.
The bureau stimulates coordinates and reports about the safety levels in Rotterdam. It provides advice to the alderman occupied with Safety and public health issues and to the mayor of Rotterdam. The

agency cooperates with diverse partners, like sub municipalities, the police, the Public Prosecution Service and municipal services.

The main activities of this office are:

- Managing and coordination the execution of the council program 2002 – 2006, chapter of public safety and coordination of the five year action program 'Improvement of Safety in Rotterdam'
- Designing and applying methods at the area of violence, drug inconvenience and youth crime
- Supporting the sub municipalities in the design and execution of district safety programs
- Publishing the yearly safety index numbers for the safety levels in all 62 districts of Rotterdam.

3.2 Identified challenges

The identified challenges all relate to the question whether it is possible to improve information sharing related to different actions of the governmental agencies concerning the safety situation at the square in Rotterdam. How can these persons and organizations be contacted? What kind of information do the different organizations have access to? These are all knowledge management related questions.

Two opposing knowledge management strategies can be discerned; codification and personalisation. Codification aims at improving the access to distributed knowledge by means of the creation and management of a central knowledge storage accessible to all. Personalisation aims at improving the accessibility of knowledge related to the specific wishes of a person. Personalisation is more focussed on inter-personal communication and easier implemented than codification systems.

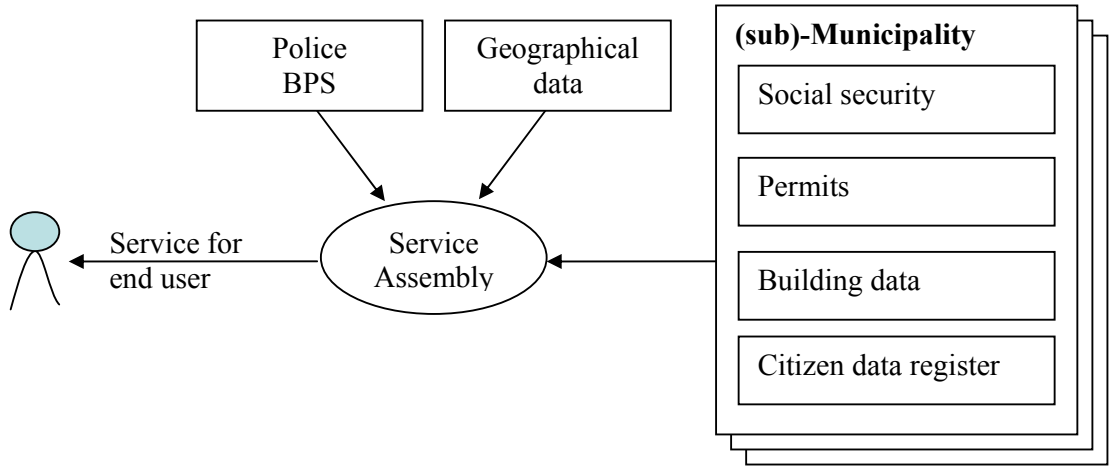

Figure 2. – Data required for service assembly.

Figure two shows essential components of a end user service. Most services are related to events at a certain time and location. It is therefore important to make use of the BPS system of the police services. This system keeps track of incidents, locations and reaction of the police force (who went to the incident location, when, with what equipment). Geographical data will be needed to be able to draw maps, to plot interesting points on maps and to calculate routes.

Each sub-municipality has access to specific data concerning citizens in that area. The social security data concerns people who get a social allowance. The permits data holds among other things records of driver's licenses. The building data relates to buildings and housing. The citizen data register records information about the people living in a sub-municipality; their names, surname and marital

status for example. In order to provide service, an intelligent assembly of the data of the different actors has to be made. It is required to specify exactly who the end user is for a specific service, it is advisable to start service development using scenario's and storylines (van de Kar, 2004). At a later stage of the implementation project the storylines will form the basis for UML use cases (Arlow, 2002).

4. Proposed alternatives

During the group sessions, the participants brainstormed and voted on the following type of alternatives in the administrative space:

1. Overview / network accessibility

A large number of organizations are active within the public safety area. The tasks of individual employees are not always clear to everyone. This solution aims to improve the transparency of this knowledge network by creating a network of contact information.

2. Yellow pages of the neighbourhood

In the stakeholder view it becomes increasingly important to support an integral policy-making and policy maintenance strategy. To support this concept a knowledge map application is proposed. Knowledge maps show interesting facts about areas, groups of inhabitants and individual committers of crime.

3. Overview of incidents/accidents

For different stakeholders is difficult to maintain an up-to-date overview of the situation at the square. Each stakeholder needs an update from its own viewpoint. A central storage and retrieval system for incidents and accidents is proposed. It should support different access levels (related to privacy issues) for all stakeholders.

4. Event broadcasting

Event broadcasting can be interesting for front-line governmental employees to inform each other about the current situation. It can also be used as a warning system to improve the safety for the employees themselves. Next to text messages it also becomes possible to use voice or image files. Different profiles or message filters can reduce the danger of 'information overload'.

5. Geographical information as basis to combine data

Keeping order is mostly a location oriented task. Because of this, geographical information systems offer interesting possibilities to connect several types of order related and policy related information in a single view. Based on the needs of participating organizations, different views can be developed to assist in the development and execution of policy programs.

6. Portals as a means to improve information chains

A major challenge in the improvement of the public safety level in Rotterdam (and elsewhere) is to share relevant information between organizations involved. Different chains of organizations exist, for example at the area of criminal law, youth protection or youth social work. Improvements can be made supporting these chains with portals where information relevant to specific cases (like people who commit a large amount of small crimes within a short period of time) is collected in a single portal.

7. Supporting communities for the execution of processes in value chains

Projects at the area of information chain optimization tend to focus to the exchange of exactly specified data between participants in the network. These projects mostly concern IT related issues. Virtual communities are a form of chain optimization without emphasis on IT and data exchange issues.

4.1 Results of brainstorm and voting

Each participant is able to vote three times for ideas that he or she sees as important to improve the safety situation at the square. It is not required to cast all three the votes. Table one shows the results of the voting session.

Service Description	Number of votes	Service number
Geographical data as basis for access to services and information	8	5
Access to persons, finding responsible persons	6	1
Event broadcasting	6	4
Improving access to and understanding about current events	4	2
Portals in value chains	4	6
Yellow pages of the neighbourhood	4	3
Communities to support service delivery in value chains	1	7

Table 1. – Results ranked in decreasing order of absolute number of votes.

Geographical information is seen as a very important connection area. It is important to the participants to know what is happening in the neighbourhood, where exactly it happens and who can do something about it. The use of geographical information directly leads to several technical requirements. In order to be able to use geographical information one must be able to draw maps, place interesting objects on those maps and to determine the current position of several kinds of objects (persons, vehicles etc.).

5. Service complexity ranking framework

It is possible to specify the required level of IT systems integration and the dependency on location based information in a single graph, figure three shows this graph. The figure also shows an indication of the number of votes by means of the size of the circles drawn round the numbers representing the alternatives.

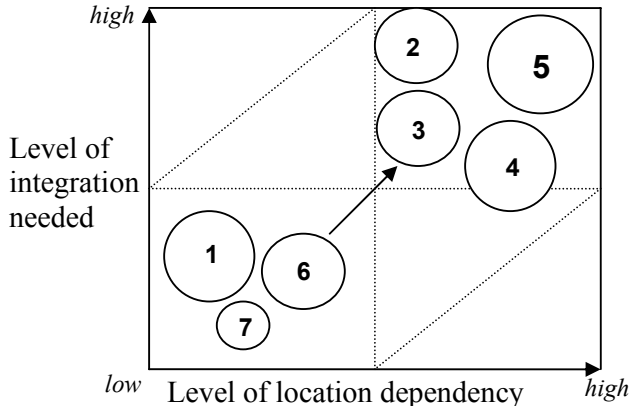

Figure 3. – Plot of the integration and location dependence levels of the proposed solutions. The circle size indicates the number of votes.

The level of integration is the degree of mutual dependency between different functionality-providing components of the different actors in order to provide the end-user service. The level of location dependence expresses to what extent the service relies on GPS (Global Position System) location data.

The axis for the level of location dependency is used because of the fact that public safety is almost always related to certain events at certain locations and times in the real world. Network players react depending on their own possibilities, responsibilities, character, properties, functions and means. The axis for level of IT system integration is chosen because of the reason it is an indicator for the effort it will take in a multi actor network to realize a specific service.

The plot shows that four out of seven alternatives share a relatively high level of integration and location dependence. Alternatives one, six and seven have a low level of integration and location dependence. Of these alternatives, number one has acquired six votes, it can be viewed as a 'quick win'; relatively easy to implement and seen as important by the meeting participants.

Alternatives three and four share a high level of location dependence and a reasonable level of integration. The proposed solutions two and five will prove challenging to realize. Both the level of integration among the IT systems of different participants as the dependence on location information are high.

The services in the lower left quadrant can be viewed as the 'low hanging fruit'. These services are relatively easy to implement and share a relatively low level of complexity. The services in the upper right quadrant can be characterized as the 'stars'. These services provide a high level of added value and innovation, at a high complexity and higher risks for implementation. It is advisable to use an evolutionary approach to service development, to start service development in the lower left quadrant and to gradually move – as experience increases – to implementing services of the upper right quadrant.

It is noticeable no services exist in the upper left or the lower right quadrant. It is believed this is related to the nature of the problem of improving the public safety situation at a specific location. More complex services will require both a higher level of integration as a higher level of accuracy of location data.

In order to benefit from services, for end users it is required to have easy access to a set of relevant services related to their context. The context consists for example of time, place, task, available equipment etc. End users will require useful functions while performing every day tasks.

From a more technical point of view it is essential to have an overview of how the services are assembled out of components provided by the participating organizations. In order to realize the service the processes executed using these components have to be identified, along with the flow of information. Services oriented computing where applications are offered as services both within and across organizations (Curbera, 2003) is likely to provide a suitable base for the realization of the proposed security related services because of the support for processes in a multi-actor network.

Preferably the system specifications are expressed in a standard modelling language like UML (e.g. use cases and sequence diagrams). Component boundaries can be identified by means of a high level use-case analysis. This is the first step taken to identify the required components (Arsanjani, 2002).

The process of service assembly comes down to decision making regarding the use of components. The services have to be expressed in general terms relevant to end users. It is undesirable to express services and components using the semantics of a single organization. Services should be expressed using general terms or Enduring Business Themes (Cline, 2000). Enduring Business Themes are relevant to end users and hide the specific implementation details of a service provided by a single actor. Enduring Business Themes can help to reduce the complexity of the proposed system to avoid the Manager's Dilemma described by Stallings (Stallings, 1998). The dilemma consists of the fact that so many options to realize a system exist, it becomes impossible to choose and to realize the system.

A trend emerges form service design and development to service configuration. Service Oriented Architectures can provide a reusable set of basic services enabling the realization of many different

end user services through alternate configurations. The implications of and recommendations for the use of Service Oriented Architectures might prove a valuable field for further research.

6. Conclusions and Further Research

When designing solutions for mobile applications related to public safety it is important to separate between the living world (living space), the administrative world (administrative space) and the desired image of a safe and normal situation (mental space). The separation of issues has proven valuable in brainstorm and voting sessions.

Two key factors for service design are level of system integration and the level of location dependence. A framework is developed based on a plot of these factors a quick estimation of the complexity of a service can be given. The framework can be used to define an evolutionary approach to service development.

Service assembly essentially comes down to decision making regarding the use of service components. It has to be clear which components are available, what their characteristics are, who is responsible for providing that component and how the different components are assembled into a single service.

When realizing demonstrators or pilot projects, it is at a certain moment essential to focus on inviting participants with sufficient technical knowledge of the different data structures owned by the participating organizations. At a certain stage the process will otherwise come to a hold at an abstract story line level without further advancements to implementation. The services described are related to knowledge management, to the improvement of the use of data available in organizations. Each organization has its own partial view on the total dataset available. In order to be able to benefit from services based on services combining these data, the access to of the data is essential.

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