The Citizen Office in a Box – User Requirements and Usability Issues for Mobile Citizen Services

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Abstract

The MoBüD[1] consortium aims to develop a device concept and an infrastructure for mobile citizen services. Citizen consultants will be enabled to go to public places such as hospitals, senior citizen residences, markets, or day-care centres in order to provide services just as stationary offices of citizen services do. This approach combines aspects of e-government services as well as the idea of a central administrative contact point ("one-stop office"). The useful combination of these approaches reflects our understanding of a sufficient, currently feasible m-government service.

Besides administrative and legal aspects (i.e. security requirements) that have to be taken into account and considerations regarding the cost-effectiveness of a service described, a user-centred approach is crucial for the success of a mobile citizen service. In order to develop a service that is acceptable for both, citizens and citizen consultants, a number of activities for gathering the necessary requirements were carried out. These activities include interviews and observations within the consultants' work environment, the development of scenarios, and experiments with different device settings, i.e. Tablet PCs with different screen sizes and input facilities.

The investigations revealed that a hybrid Tablet PC, that comes with a keyboard best adapts to user's requirements. The results could be verified so far by more complex laboratory experiments where comprehensive tasks (connecting to the administrative network, change of personal data, downloading forms and mobile payment for services) were tested with the device concept. Field trials are planned for the near future.

Key words:

m-government; user requirements; technical concept; usability

[1] MoBüD is the acronym for "Mobile Bürgerdienste" (mobile citizen services)

1. Introduction

Many communities try to improve the relationship between administration and citizens. This can be achieved by means of providing online services such as downloading forms or even filling in forms and sending them electronically – so called e-government services. These services already cover a considerable amount of affairs but currently not all affairs can be provided. Since new authentication approaches are not approved by administrations yet, a lot of services need a personal contact between consultants and citizens. Thus, not all services can be handled by e-government solutions by now. On the other hand, not all citizens have access to the Internet or are familiar with its use. In Germany about 56% of the population in the age between 14 and 64 use the Internet [Allensbach (2003)]. This means that at least 44% of the population have no access to e-government services.

A second possibility is to concentrate all services at one contact point – the office of citizen services (citizen office called in the following) – in order to prevent the residents from going from office to office and to allow a comprehensive service at one stop. These citizen offices are mostly located in town halls or similar administrative buildings and provide a very broad range of services, e.g. issuing of passports, id-cards, driving licenses, and wage tax cards, as well as handing out proposals for social benefits such as remissions, etc.

A third approach is to provide mobile services in order to help people who are not able to go to the citizen offices themselves, e.g. elderly, ill, or disabled persons, or to offer services at highly frequented locations (i.e. shopping malls or markets) or at companies having a high demand for public services. This m-government concept contains aspects from both approaches mentioned before. The MoBüD consortium – consisting of a research institute (Fraunhofer HHI), a software company (IVU Traffic Technologies AG), and the City of Berlin – will develop and pilot an m-government service like the one described above.

2. Software tools currently used at citizen offices

The main tool used by citizen consultants is an application called EWW[2] (see Fig.1), a terminal program that allows the consultant's access to the central residents database of Berlin. This is located on a BS2000 server. It is a very old application and does not provide appropriate interfaces to modern software technology.

Another software tool is used to allow the payment by EC/Maestro-card (see Fig.2). Cash payment is not yet allowed at the consultants desk (citizens have to go to a cashier's counter or a special paying machine), but should be possible with the mobile service.

A browser and Java-based information system (see Fig. 3) provides the consultant with a checklist for each specific task. Additionally, it offers the opportunity of a case-management: If a certain case has to be interrupted e.g. because of missing documents, it enables the consultant to take up this case later without being forced to feed in the already known data once again.

[2] EWW - Abbreviation of the German word "Einwohnerwesen", which stands for "residents' affairs"

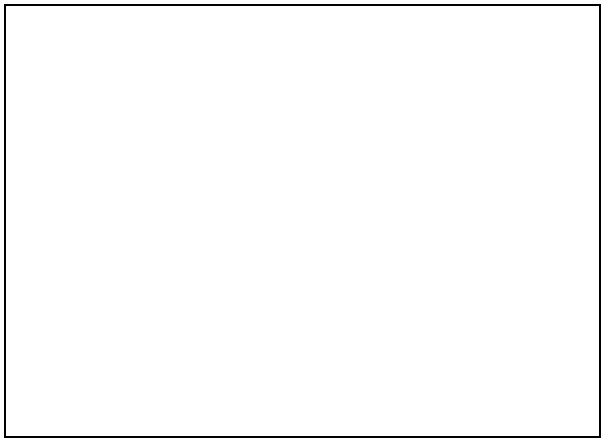

Fig.1: EWW mask – a BS2000 terminal emulation (with a fictive data set)

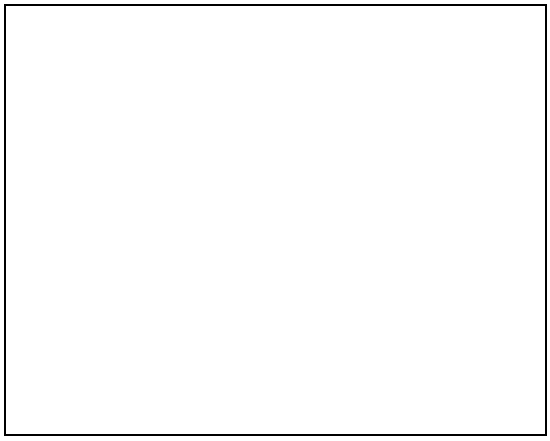

Fig.2: Payment tool

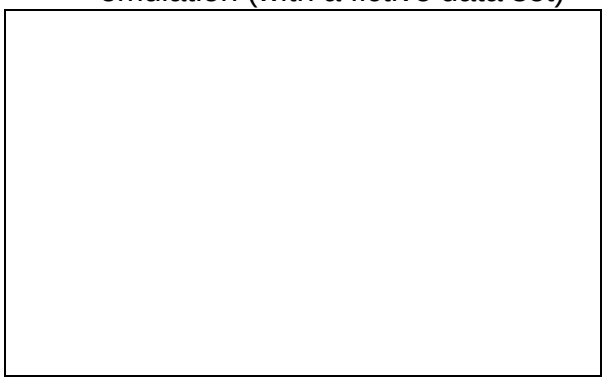

Fig.3: Information system

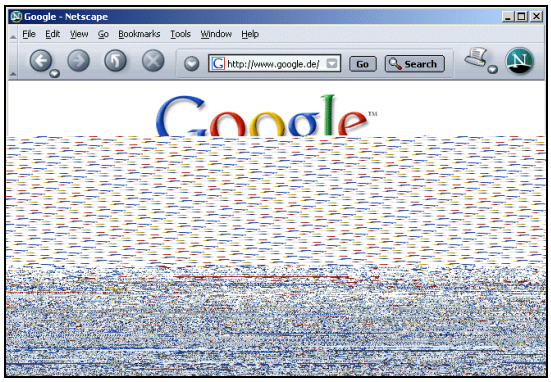

Fig.4: Internet Search engine

Some consultants have access to the Internet to provide the citizens with additional information as an extra service (e.g. addresses and opening hours of other administration offices, public transportation timetables to get there, etc.). The consultants of the different districts of Berlin are familiar with different browsers, so that all these different browsers have be installed on the mobile computer (see Fig.4 here Netscape with Google search engine).

3. Requirements, approaches and resulting technical concepts

Usually, citizen offices are highly frequented by citizens and the waiting time is very long. Thus, a system to enable the tasks in a citizen office needs to be highly efficient and easy to use – last but not least because of the sensitive personal data these offices are dealing with. These factors are also important for the trustworthiness of a mobile service from the citizen's point of view. A poor usability of the system may also be regarded as a "trustbuster" for the citizens [Riegelsberger, J. and Sasse, M.A. (2001)] if the consultant's behaviour is interpreted to be unconfident. In order to develop a device concept and software concept that suits best to the tasks and to the staff qualifications, several techniques were applied such as interviews, observations, scenario constructions, and experiments.

Among other things, interviews and observations were carried out at information desks and consultancy desks in order to identify communication needs and workflow aspects in the citizen office.

Scenarios were developed in order to provide a very detailed view on prerequisites, location specific aspects, technical equipment, and staffing qualifications needed for single services at selected locations. Locations were chosen by relevance considerations and services were selected from the top 10 services residents frequently ask for [Projekt Bürgerdienste (2002)]. Citizen consultants later reviewed the scenarios.

3.1 Device concept for a mobile citizen office

Interviews and observations revealed various requirements for the device concept. For example, the mobile device should offer the same services as the stationary citizen office. It should be small and light, to allow easy transportation to different locations, and it should be easy to use, in order to ensure an efficient treatment of the citizen's requests.

In addition to the functions of the stationary citizen office, devices for location independent connection to Berlin's administrative network have to be provided. In order to be able to select the working environment as flexibly as possible, different kinds of access to the administrative network are planned. These are mobile wireless techniques like GPRS, WLAN, or later UMTS, but also cable-bound access using ISDN or a company LAN. Thus, consultants have to execute additional unfamiliar procedures before starting their actual work, i.e. to identify themselves clearly to the system and to establish the connection to the administrative network. These applications should be easy to use and as independent as possible concerning the underlying infrastructure.

A special case was developed with a device configuration consisting of a notebook, a mobile printer, a smart card reader for authentication, a multi-function terminal for the payment of the services by EC/Maestro-card and different devices for the access to the administrative network. This configuration differs from the equipment at stationary citizen offices particularly by its size. That means that the citizen consultants have to work with smaller keyboards, smaller screens, and unfamiliar devices.

Instead of regular notebooks Tablet PCs were considered. If approved by the government in the near future the handwriting facilities of a Tablet PC technically enable a digital signing in electronic forms by having one lightweight device. Tablet PCs were regarded to be appropriate for the tasks, since they allow to interact with the system in a very natural manner (see Fig.5). Principally, a keyboard is not required anymore. Thus, it would allow a more simple device concept.

Experiments were conducted using Tablet PCs as substitute for Desktop PCs.
Three different interaction techniques were tested comparatively: mouse and keyboard (as usual), pen based interaction by means of using a virtual keyboard on screen, and pen based interaction by means of using hand writing recognition.
In a further variation of the experiment a hybrid Tablet PC equipped with a larger screen and a keyboard was tested against the plain Tablet PC (see Table 1).

Keyboard input Plain Tablet PC (with docking station)	Pen-based input by means of hand writing and/or typing (Plain Tablet PC)

Fig.5: Interaction techniques tested in the first experiments

14 consultants participated in the experiment. The devices were tested by independent samples. Eight subjects were asked to work with the plain Tablet PC, six subjects used the hybrid Tablet PC.

Device : **Interaction technique :**	**Plain Tablet PC**	**Hybrid Tablet PC**
Keyboard	Standard	Notebook
Pen typing	X	X
Pen writing	X	X

Table1: Investigation plan

Consultants were asked to carry out tasks such as logon and logout, accessing personal data in the residents' database, and finding a workflow checklist for the procedure for applying for a new passport within a help system. Thus, each consultant had to accomplish 12 tasks. The sequence of tasks was varied systematically in order to balance sequence effects. The data were gathered by means of protocols from observations and from applying the "thinking aloud technique", questionnaires after each task, a final interview and measures of time and success of accomplishing a task.

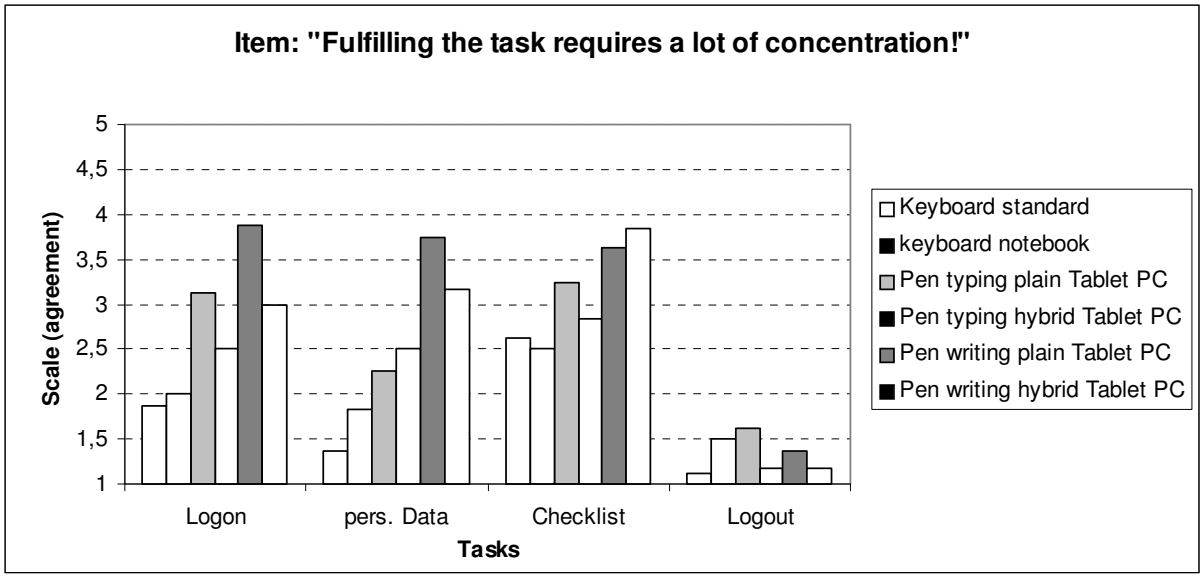

Fig.6: Concentration required for fulfilling tasks (1 = disagree, 5 = agree)

Although the hand writing recognition was regarded to be of astonishing good quality, the time to solve a task was increasing dramatically. The concentration required for accomplishing a task was the highest when using this interaction technique (see Fig.6). Best ratings are given to the plain Tablet PC in combination with a standard keyboard, but the small screen of the plain Tablet PC (10.4") was considered to be problematic by some of the consultants, even though having the mobile use in mind. The virtual keyboard often hides other widgets that are needed for continuing tasks. The sensitivity of the pen was also regarded to be problematic with the plain Tablet PC. Some subjects had difficulties to hit and activate icons on the desktop.

Correspondingly, the satisfaction with the accomplishment of the tasks was the highest with the hybrid Tablet PC (see Fig.7). Here, no problems with the screen size (12.1") were reported. The work with a smaller keyboard was found to be unfamiliar, but acceptable.

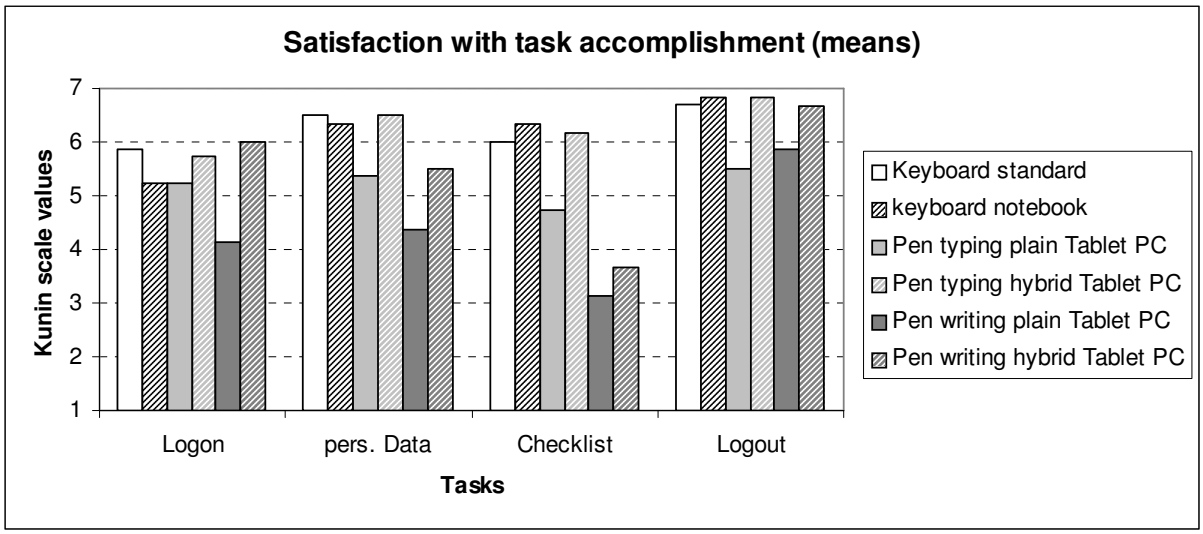

Fig. 7: Satisfaction with task accomplishment (7-point Kunin scale [Kunin (1955)])

According to these results, the hybrid Tablet PC is the best solution meeting the device concept.

3.2 Security demands and measures

Security challenges arise from the fact that public and in many cases wireless networks will be used to connect to servers located within Berlin's administrative network and that the mobile equipment will be used in more or less insecure environments. Therefore, a secure extranet is required for mobile citizen services, which is realised by connecting the mobile client to the administrative network through a virtual private network (VPN) tunnel. Internet protocol security (IPSec) is used for tunnel encryption and authentication.

Many security problems arise from the portability of the terminal. Portable equipment is more at risk to be stolen, and a thief could gain access either to the intranet or to data stored on the computer. A notebook can be protected against theft by using a security cable that fits into a lock socket on most notebooks and allows the notebook to be secured to a desk, table or other fixed objects. But even in the case that an unauthorised person gets hold on the notebook the whole system must still remain protected. Therefore, personal data must be saved on the

notebook only temporarily, and in the case that they have been downloaded and changed they must be deleted after a successful upload of the changes. Furthermore, all stored data must be encrypted, and decryption must require a token (smart card) and additional knowledge (PIN). This token may also be used for VPN tunnel encryption and authentication.

In addition to the mobile access, encryption and authentication again require unfamiliar procedures, which have to be executed by the consultant before starting his actual work. These applications have to be easy to use.

Last but not least a breach of confidentiality can simply be caused by the open environment, which a mobile office sometimes is forced to operate in. Here it may be pretty easy for unauthorised persons to overhear a confidential conversation or to look at the display or a confidential paper form. These risks can be minimised by positioning movable walls or blinds accordingly, by adapting the volume of oral conversations to the surroundings, and by other organisational measures.

4. Laboratory Experiments

According to the results of the experiments described before more complex tasks were tested with the device concept resulting from the requirements capture. These tasks reflected comprehensive procedures in the citizen offices, such as enabling tasks (choosing a suitable connection to the administrative network, starting required applications), data access and data input in the resident's database, payment with cash or EC/Maestro-cards, using the information system for downloading forms, and using the Internet. In this case the Tablet PC had to be connected with the administrative network via GPRS.
Ten consultants participated in the experiments running with software applications mostly known from the stationary offices.

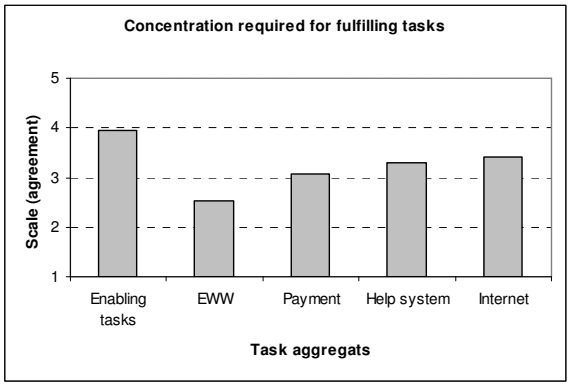

Fig. 8: Concentration needed for fulfilling comprehensive tasks

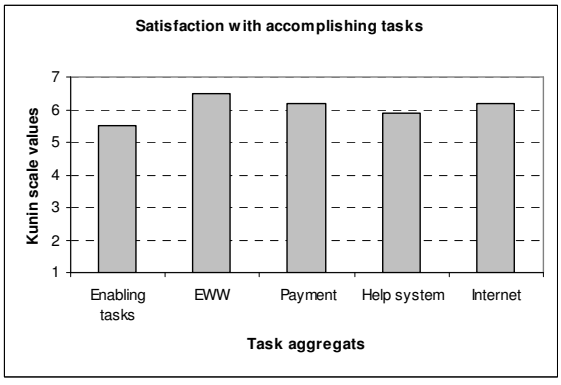

Fig. 9: Satisfaction with accomplishing comprehensive tasks

The tests revealed that the chosen equipment is suitable for a mobile citizen office. The screen size was regarded to be sufficient and also the response times were mostly seen to be acceptable. Some of the procedures need to be improved. Particularly, the enabling procedures were regarded to be uncomfortable and too slow. A number of inputs (passwords, device selections, etc.) needed to be done. Some improvements need to be implemented with reference to the low integration of the individual software tools. Although online available

forms can be filled in electronically, consultants print out the empty forms. The old BS2000 terminal emulation also provides a printing function by means of a screen mask. Since consultants have to do data inputs in the resident's database anyway, they mostly prefer putting the empty form in the printer again. This procedure needs to be optimised by means of enabling an automatic or at least semiautomatic transfer of data from the EWW into corresponding electronic forms.

5. Summary & Outlook

In order to tailor the mobile citizen office to the needs of citizen consultants several activities for gathering the necessary requirements were carried out.
The laboratory experiments revealed that the chosen device concept is suitable for a mobile citizen office, at least in general. Notebooks with a screen size starting from 12" are currently the most sufficient devices for the software applications used in the citizen offices. With regard to possible future legislative changes Tablet PCs are still interesting. They allow direct digital signing in electronic forms. Therefore, hybrid Tablet PCs (equipped with a keyboard) are chosen for the mobile citizen office.
This conclusion will be proofed in field trials at hospitals, schools, and libraries that are planned for the near future.

Some inconvenience results from the low integration of the applied software. It is not possible to exchange data between the information system and the old EWW application, so that multiple inputs of the same personal data are often required. This lack of software integration often prevents an optimal workflow. In order to allow an optimised workflow an integrated software concept will be developed. This integrated version is also planned to be tested in laboratory experiments and will also be used in field trials.

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