

TV Kiosk: new wine in old vessels to empower care dependent digital outsiders

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Abstract: Driven by the problem of loneliness of elders, who are in majority digital outsiders, we iteratively developed the TV kiosk platform by deploying a user centred design process. This prototype enables a flexible, secure and decentralised solution based on Virtual Personal Network (VPAN) technology. In this paper a detailed description is made of the development steps and the in between research results to make a more inclusive solution. This kind of reporting should become a standard practice when thinking about solving these eChallenges to create more cumulative reflexive insight into the bottlenecks that hinders these kinds of prototypes to evolve into viable business cases.

1. Introduction

Loneliness is an important factor disempowering people to keep an acceptable level of happiness and quality of life. Being at the advent of the exponential increase of aged people with a high care dependency, in combination with an increase of more complex family structures (e.g. divorces and remarriage) and mobility (e.g. increase in mobility for work and study), the prevalence of isolation and loneliness will become a big problem to tackle. We will not be able to cope with this problem by offering more attention of professional caregivers, since a shortage of them is expected as well due to the same age structure changes. The current success of social networks in (re-) connecting people both online and offline could be a solution for the problem of social isolation and loneliness. But the current generation of care dependent is in general not computer literate, which makes them digital outsiders for the current web applications. By choosing the TV as well-known interaction interface we hope to enable this group of digital outsiders to use digital services in an easy and safe way. The digital services are oriented at broadening the perspective to outside world by for example offering more connectivity with relatives and friends, as well as offering more topics for conversation during visits or calls. In this paper we want to report on objectives, the R&D process and lessons learnt of the TV kiosk solution. We think this should be done in a more consistent way, because it is during this R&D process insights about the bottlenecks for scalability, acceptance and commercialization of these types of solutions are gathered.

2. Objectives

At a later age in life there is an increasing risk of loneliness. Due to more complex family structures and mobility, families can become fragmented and members can be living far away. Getting older often coincides with decreases in mobility (e.g. disability to drive or physical impairments like reduced hearing, eyesight or ability to walk) and thus reducing contact with family and friends. ICT solutions could help to maintain contact. However, despite their general popularity, ICT adoption in the daily life of many elderly people remains low for several reasons. The current generation of elderly people is in majority not computer literate, which make them digital outsiders for the current web applications and digital devices that are frequently used by their relatives. There is the age-related decline in cognitive functions, which has a profound effect on the capabilities of elderly in using new technologies [2]. The current interface design does not match these cognitive capabilities [3]. Last but not least, general acceptance is dependent on such as control, trust, privacy, dignity or usability [4].

With the TV kiosk platform we aimed to tackle the identified challenges by putting forward several objectives from the start:

- User-centred design: involvement of all stakeholders during the entire process to enhance usability, increase acceptance and design the services.
- Multi-disciplinary team: a user centred solution for a multifaceted problem requires a team consisting of both technical and user research experts.
- Easy-to-use user interface: using TV, a well known and popular user interface by the target group of digital outsiders.
- Hide technical complexity: to increase acceptance and limit learning curve we hide the technical complexity.
- Focus on social contact stimulation: to avoid social isolation, services should focus on social interaction and the delivery of information both for the inside world, e.g. within the care organisation they live in, and the outside world, e.g. family, friends...

In the remainder of this paper the TV kiosk and the different user centred research steps will be presented in more detail. To show which approaches were tried, how the objectives were met and how we have to evaluate the current result. Therefore we cannot only look at the current user acceptance, but we should reflect on what we learned about our digital outsider target group and the domain for larger scale deployment. Section 3 will report on the user centred methodology we used, followed by a technical description of the TV kiosk demonstrator in section 4. Next, we describe the methods applied as research development steps and the corresponding results. Finally section 6 reflects on the challenges we still have to overcome to make this demonstrator into a viable business case (e.g. scalability, ...), followed by our conclusions in section 7.

3. Methodology

The user centred design methodology for this development started with a domain analysis and a technological road-mapping exercise, resulting in an update of our hypothetical scenario of independent living services in general and creating criteria to define a target group using this care platform under development. The user centeredness of this approach includes the different users of these services: care dependent people, their relatives and caregivers. Their participation was by reflection on concepts and probes. A more active co-design approach was not used in this project.

As a next step the technological research was performed to create a solution to safely transfer data using user friendly, low threshold technology by creating virtual private ad hoc networks (an extension of the VPN technology) between different IP-enabled

devices. Concurrently a proxy technology assessment (PTA) [5] with users was performed, to go beyond the current reference point of the digital outsider target group. During the PTA exercise we enabled three people from our target group to use high-end technology of that moment (2008) to serve as a proxy of the technological solutions of the future (e.g. digital picture frame, robot vacuum cleaner, video phone). After four weeks we reflected with them on the use of these products and on our future scenarios illustrated in a photorealistic storyboard. With these insights a selection within the refined scenarios was made to develop an integrated demonstrator.

The demonstrator we discuss in this paper was first extensively tested internally with team members and external users coming to the lab. Finally, two subsequent trials (5 months in 2009, 4 months in 2010) were done with 3 and 4 networks of people in a local retirement home (care dependant, relative, caregiver). Between both trials the technical design and user interface were improved based on the user feedback. In the next section we describe the technological implementation incorporating user feedback at different stages of the realisation.

4. Technology Description

Looking at the TV kiosk from the outside we developed an accessible and easy-to-use user interface for care dependent people on their TV. With a simple dedicated remote control the user can access the service of choice with a few steps. The remote has as few buttons as possible; a home button enables them to return to the start screen at any time. The start screen corresponds with the groups the user is member of. Also, on the top of every screen there is an indication of the remote control buttons and a short description of the resulting actions. All this makes navigation as easy as possible, as stated in the objectives.

Figure 1 depicts schematically where the content can originate from in our prototype setup. A daughter to her mother in the care centre for example shares the pictures shown in the family group. Another group able to share pictures is the group of the care centre. Behind the scenes, these family or care centre groups are actually mapped to trusted networks, which are implemented using the Virtual Private Ad-Hoc Network (VPAN) platform [6]. This platform combines ad hoc networking, peer-to-peer techniques and ubiquitous computing aspects to realize communication between trusted groups of devices [7]. In this way unlike most other centralized solutions controlled by a single provider, we offer a peer-to-peer decentralized solution, to enable a flexible, self-organizing solution interconnecting all actors (e.g. care dependent, family, caregivers) over the Internet in a secure way. So this is a non-server based model, and pictures or other data do not have to be uploaded to a server, but all data stays on the local devices. This is different from the solutions produced in other European projects, for an overview we refer to previous work. [6]



Figure 1: TV Kiosk Prototype

Figure 2 illustrates how the VPAN technology is now being used in the TV kiosk platform. Secure and separated VPANs allow users to easily interact with each other. The “Care dependant VPAN” offers services related to the care center. All residents are member of this group. On the other hand, every resident can be member of a private (for his family) “Family VPAN”, which allows family members to offer services such as photo sharing from their home. In addition to this picture sharing service, there was a possibility to share messages, and on demand of the users the possibility to share music was added.

Next to content delivered using VPAN networks it is also possible with this TV kiosk platform to access Internet services (See Fig 1 Public services) on condition that these are simple, preferably tailored with the target group in mind, and being integrated in the user interface. This is also a service only added later to the prototype, and will be discussed in the next section. So although at the outside the technological complexity is hidden, a complex technological system is created that constitutes an open and extensible platform. Using a plug-in system, new services can be easily created and added.

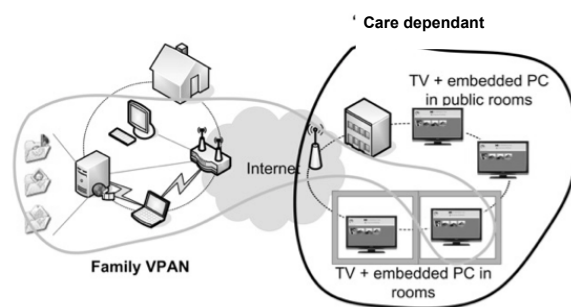


Figure 2 Family and care dependant home VPAN

5. Developments and results

In this section we want to explain how we proceeded from the user needs towards the prototype we piloted by applying systematically an interdisciplinary user centred methodology. Therefore we recount the steps taken from the broad opportunity of greying society towards the selection of concepts. Subsequently we discuss our trajectory from a concept to services, and the step from services to piloting in two trials, to illustrate how this interdisciplinary development can develop in practice.

5.1 From need to concept: from independent living to concept intergenerational contact

Our research project started in 2007 from the need to develop e-care services supporting better care with less (skilled) personal to take care of the challenges a greying society poses. Based on our domain analysis studying the multiple actors in the care process, we questioned the loose defined group of “elder people” and defined the other actors needs that should be sufficiently taken into account, that of relatives and that of professional caregivers. We defined our specific primary user group more specific as people beyond 65 who are not mobile, but still have enough orientation in time and space and have at least one informal caregiver. The first criterion limits us to a retired population. The second was chosen because of the affordance of ICT to compensate for mobility through connection to the outside world over the Internet. The cognitive inclusion criterion was chosen to ensure basic understanding standard ICT tools. The final criterion of informal care was to specify an opportunity to diminish the burden of physical presence of the primary informal carer, and extend the communication with other relatives. Thus supporting the need of care dependent elder people to have more social contact being bounded to the own residence, while grand-children and children nearby and at a distance living busy lives. Another

opportunity was seen in the current practice of memory training and emotional therapy “lifebooks” using pictures as well as stories. Next to role of relatives and friends as a second user group, the third user group in the system is the professional caregiver, who wants to limit administrative burden and free time to give care.

5.2 From concept to service: from intergenerational contact to services of TV Kiosk

The TV set was chosen as a primary interaction screen for the care dependent elder users, a PC set up for the other involved users. This takes into account our insight from the previous domain analysis describing the limited PC and internet skills of today elder citizens, and their on average use of 4 hours of TV per day [8]. From the reflection on the future scenario with users and the use of the digital picture frame in specific (PTA analysis), we learned that the possibility of adding old pictures by the elder themselves was not important. On the contrary they could be too confronting. Old pictures in general (non-personal) at the other hand were liked. The heterogeneity of requirements, of users and technologies to be connected, called for a very flexible, safe and easy to use technology. The VPAN (Virtual Private Ad Hoc Networking) technology afforded to alleviate this mix of needs. This served as input for the development of the first TV Kiosk version making use of the VPAN technology.

5.3 From service to trial: from services of TV Kiosk to trials in care centre “De Vijvers”

The applications on this first TV kiosk were developed in close collaboration with the people working at the site where the trials would take place. They saw the TV kiosk as a potentially more dynamic alternative of their static info channel, and embraced the opportunities in sharing of pictures and messages between family and residents. The early design versions were extensively tested and re-designed in lab by collaborators and 8 external users with the targeted profile of the informal caregivers and child or grandchild. A further simplification was made, using more screens contra more information on one screen. Not only keyboard and mouse were not appropriate for the targeted users, also the use of well-known icons for Internet users could not be re-used. A new dedicated controller was made with the same icons as on the TV screen, to increase the ease of use for the care dependant. For the service providers, such as staff in the care centre and family members, a PC version of the software is available with plug-ins to share and/or create content. For both versions a manual was made.

Meanwhile in the care centre the technical infrastructure was analyzed and bottlenecks like the connectivity were solved. A search for residents and relatives to test with was done. These selected residents got the system added to their TV as a separate channel. Their relatives were helped to install the system on their laptops or a laptop was supplied with the plug-ins installed on. The ergotherapist explained the use and motivated all actors to participate. We did interviews at installation, after some weeks and after the test period of 4 months. From the three interviews with each time three networks (elder, caregiver, family) we gave recommendations for improvement. Between trials adaptations were made. In the first period, we saw high expectations of our participants. The network of the elder is limited to close family, mainly children. Not every family has harmonious relations, which could be better managed by adding more “groups” (VPAN). The use of the TV not for its “main purpose”, watching programs, but for other services felt odd. Also handling two remote controls is difficult for the care dependent testers. The content displayed on TV is thought to be public, and therefore it is needed to emphasize the personal and secured organization even more to the users. Also extra feedback on newly added items was needed on screen. Next to adding pictures about the recent family events,

music was seen as interesting content to share. In general one wants to be able to have easy conversation topics when calling or visiting, that is why the pictures of the activities at the centre were also valued. The researchers were surprised by the variety and older versions of the operating systems and computers used by the children, as well as the time their computer was not connected to the Internet. In the second version music sharing was added, a star marking if in a section new content was added, as well as a local caching of content near the TV of the care dependent elder. Finally, the first test learned the need for a technical control system to enable the researchers to check the functioning from a distance, which was developed for the second trial. During the second trial, the services were used in a limited way. The test users need a constant reminder of the service or it should be integrated as a reminder on their normal television screen. Currently there is a parallel info channel of the care centre next to the test channel. It is difficult to remember, and keeping two channels updated gives a huge overhead for the personnel. However the personnel still longs to spread the service to all their inhabitants. Both trials showed that the learning curve was still high for the elder testers. Putting new wine in old vessels seems difficult. The picture-sharing feature was liked, but more interactivity was expected (e.g. not only knowing what is on the menu, but also being able to choose a menu). Since we also saw that installing the plug-ins was not easy for the children, a Facebook plug-in was created recently to share pictures easier. This should also enable more family members to join this feature, and increase the number of users. For the side of the care dependant a web application was built to access messages and pictures posted by a relative using this Facebook plug-in. This also nicely illustrates how widely used web services can be easily integrated into our platform and complement our services running on top of the decentralized VPAN platform.

This kind of improvements can help to make this e-care service into an empowering tool, which is not yet achieved. But not only functionalities are barriers for this empowerment. In the next section we discuss the barriers keeping us from making this prototype into a product.

6. Challenges to come to a viable business case

During the small-scale field trial we received positive feedback from several stakeholders: end users, family members, the care centre where the field trial took place... Both the users and the care centre see several benefits of the installed system. For example, by looking at family pictures or messages from grandchildren, the elderly people feel again more involved and have something to talk about upon a next visit or with other residents of the care centre. Also the care centre uses the platform to support group activities and to spread information. Within the care centre this has resulted in the request to implement and organize large-scale tests. In addition, a press conference has been held during which TV kiosk was presented, resulting in national press coverage. This in turn, has led to new contacts with other care centres and industrial partners that showed interest in the developed services, creating momentum to turn the TV kiosk platform into a real product and bring it to the market. However, several challenges have to be tackled in order to realize these goals, which will be further discussed in this section.

6.1 Challenges to upscale the current platform

So far, only a limited field pilot was done, making use of off-the-shelf hardware. In order to roll out to more users and thus create extra momentum for becoming an empowerment tool in view of social inclusion, additional software development has to take place and a dedicated hardware platform has to be selected. It is clear that at this stage, industrial partners should come in. The VPAN platform is decentralized and distributed in nature,

introducing new challenges in view of scalability, manageability, quality testing and software support not encountered so far. Its 'openness' offers flexible and dynamic means of building trusted networks. On the other hand due to the very heterogeneous public that will connect through the platform, security and privacy will need to be managed and safeguarded due to the vulnerability of the care dependant people. Its openness also offers opportunities for developers to develop novel services on top of the platform. However, the decentralized nature, openness and flexibility will introduce additional complexity compared to more centralized solutions. Regarding the hardware platform two potential routes are envisaged. One is the roadmap on IPTV, having a slower penetration on the market than expected, but this will open up the TV screen even more for digital applications. Second is the user pull dynamic, as a lot of care providers show active interest in the TV kiosk pilot.

6.2 Decentralized versus centralized

Setting up larger scale pilots or turning the platform into a product ready for the market, requires the involvement of industrial partners. Until now industry is not keen on investing in products based on 'decentralised' and 'open platform' solutions such as the VPAN. They prefer (web-based) centralized solutions offering the same set of services (i.e. a central server that delivers content to set-top boxes), since it allows them to keep in full control of the services being offered, an attractive model for the service provider itself. With a centralized solution the initial management and development cost could be lower. However, even with a centralized solution, there will be a lot of technological complexity in creating a trusted platform, tailoring it to the TV interface, hiding all technological complexity, creating a plugin-based framework for services... As such, both approaches have their (dis)advantages and any industrial partner will evaluate the trade-offs before making a decision.

6.3 Business model

Apart from the technological complexity, a viable business model should be established. It is at this stage unclear how economic profit can be gained with the TV kiosk platform and this uncertain ROI (Return on Investment) hinder the upscaling and product shaping. The most straightforward approach would probably be to sell the platform to care centres, which have it installed in the rooms of the residents. The lack of Internet connectivity in every room could be an important hurdle or represent a significant additional cost for many care centres. When installing the platform, the care centre could in turn charge their residents for the services offered, e.g. by raising the day price of their rooms. However, this is not straightforward considering the already high cost involved with the stay in a care centre. In order to convince the care centre, the platform should offer a sufficient number of services that represent an added value for the care centre itself (e.g. services for spreading information). Additional complexity is added when family members are involved. New services can be added, but it is not clear how these should be charged. Does the resident have to pay or is a more complex model including micropayments by family members in place? It is clear that there are still many open questions on how to create a viable business model for the TV kiosk platform in a market where most expenditure goes to health care services as such.

6.4 Financing from governmental organizations

The stakeholders state that a certain facilitating or contribution is expected from governmental organisations. However, social inclusion is until now not a 'care' aspect.

Future developments will show if this attitude will change, due to the expected shortage of professional caregivers and increasing number of care dependants. Currently, TV kiosk has focused on the delivery of information (infotainment/entertainment), but can be extended with more health-related services. As such, it can become a customizable system that grows with the evolving needs of its users. In addition, TV kiosk can be easily extended to the transmural case, offering services to senior citizens living independently. The organisation of large-scale tests, the development of novel services and the extension to a transmural setting, can help to show the impact on the healthcare system challenges and could create a case for convincing organisations in control of the healthcare financing.

7. Conclusions

Putting new wine in old vessels can give extra flavour to the final product, however mixing new ingredients for creation of a new end product needs to be done in a careful and well-considered way. For example copying existing services on the information loop was not a success, or technical literacy is easily overestimated. The methodology used for the design, prototyping and testing of this new application has been described in detail. It resulted in a well-accepted and easy-to-use prototype attracting a lot of positive interest from the stakeholders. More social contact through this new TV kiosk of digital outsiders still needs more appropriation to become a daily routine to look at pictures, read messages etc. New applications, such a certain bidirectional functionality, needs to adapt the TV kiosk more to the actual needs of the target group. The main steps to take from here however is finding industrial partners to exploit this service pilot into a production phase and make it a commercial offer to formal and informal caregivers.

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