

Can Mainstream Smart Technology Support Homeless People Leaving Homelessness?

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ABSTRACT

We present a work to create a user-informed practice on how to use smart technology as support for homeless people. The practice challenge traditional methods used by the Social Service Administration, that may have become obsolete in a digitalized society

The paper presents and reflects on the process from initial qualitative research, over pilot testing and implementation activities up to the presentation of an implementation-handbook. The paper also presents outcomes of interventions with smart technology conducted during the pilot and implementation phase. 36 of the participating 41 homeless people reported on significant functional improvements and 12 of those labelled them as life-changing improvements.

The unique contribution in this paper that we have presented a result on homeless people using smart technology and that such technology can be used in areas where before more costly assistive technology had to be used. Contemporary mainstream devices; smartphones, smartwatches and smart pens together with an assemblage of applications supporting cognitive needs were tested and found useable to fulfil the needs for many homeless people. The cost for such intervention is low and homeless people report on important changes in life when using smart technology. The paper also contributes by describing the Social Service Administrations struggle to adopt to a situation where homeless people want to use digital tools in the interaction.

1 Introduction

Though Sweden is one the most digitalized countries in the world [1], access to the digital society is not evenly distributed in the population and among societal activities [2]. Swedes with impairments lag behind the rest of the population in access to and use of the internet [3]. The overall purpose for the study presented in this paper was to explore how socially vulnerable people with cognitive impairments and/or mental illness could make use of the digitalization of the society. It started with an open-ended explorative approach where researchers, people from the disability movement - The Swedish National Association for Social and Mental Health, RSMH [4], and accessibility experts formed an Action Research (AR) Team and worked together on understanding how socially vulnerable people did use and could make use of digitalization as a tool for improvement in their daily lives. The AR-Team decided to work with homeless people and smart technology, since homeless people seems to struggle with digitalization [5] and pre-knowledge from RSMH-members indicated that homeless people often experienced cognitive impairments and mental illness.

1.1 Homeless people and technology

The definition of homelessness in Sweden is that a homeless person either can be sleeping on the street, living in some kind of institution or shelter, living in a test-apartment of some kind or occasionally and without a contract be staying at a friend's place [6]. It is similar to definitions used for example in the USA [7]. There are diverse reasons for people being homeless and homelessness is a complex phenomenon [8, 9]. The expected life span is significantly shorter for homeless people [10] and the human suffering and the societal costs for homelessness can be counted in very high numbers [11]. It is estimated that the yearly cost for social exclusion for one individual in Sweden can be up to 230 000 EUR [12–14]. Even if the characteristics of homelessness can be similar across countries [15], the way different countries organize support to homeless people differ, from mostly volunteer-driven efforts to activities provided by the state. Most support in Sweden is provided by the state through local municipalities, publicly funded by taxes, and an extensive support structure is available for homeless people. The state funded support is complemented with non-profit organizations and volunteer-activities (see Figure 2).

Previous research indicates that the Social Service Administration (SSA) do not use Information and Communication Technologies (ICT) in the interaction with clients [16, 17]. Neither is ICT used as a tool and device for interventions in order to re-establish and to include homeless people in the society [9]. Homeless people and use of technology have been studied in a number of settings outside Sweden, mostly in the United States.

Rice et al [18] argues that homeless adolescents could benefit from increased access to internet and other forms of mobile communication. They call for research where homeless adolescents examines technology use. Rice and Barman-Adhikari found that homeless youth preferred email in contact with parents, social workers and employers and social media for communicating with peers [19]

Hersberger [20] questions earlier findings [21] on homeless people as being in a state of information poverty and instead give examples of situations where homeless people can get information overload, by extensive information, or information not usable for them [20].

Roberson and Nardi [22] describes laptops, and cell phones as important tools for survival for homeless people. Technology could be linked to collaborative practices, creating social ties to society. Bender et al [23] concludes that cell phones worked best to retain contact with homeless youth over a longer period of time, but regardless of that contact method it was important to be persistent and make several contact attempts. They found that when provided with cell phones several were given away, became broke or stolen. Eyrich-Garg [24] found that for homeless people, mobile phones potentially could be used by health care providers to disseminate information, enhance communication and increase access to prevention and intervention. In another study [25] she found that technology has a potential to provide support to homeless people for a relative low cost. Vasques et al [26] found that ICTs were used to some extent, a relative widespread use of mobile phones (59%), medium to low level use of internet, computers and e-mail and very low use of social networks in a setting of homeless people in Madrid. The use of Facebook was quite similar between a group of homeless youth and college students [27]. Neal and Stevenson [28] found that homeless drug users wanted to engage more with technology, but were hampered by poverty, lack of support and training [29].

Gupta et al [30] introduced a text messaging system to homeless women, used for counselors to send reminders about schedule, information on health and nutrition and encouraging messages. They chose SMS before using calendar functions since many women were familiar with SMS. A similar idea was tested by Le Dantec et al [31] with a web application and mobile phones to keep staff and clients connected at an emergency shelter for homeless mothers. SMS was used but also a shared message board placed at the center. The use of technology shifted how tensions and conflicts were handled between staff and clients and also introduced new tensions between stakeholders. Staff noticed that clients started to educate each other on how the technology worked. Power relations started to shift when technology was introduced. Le Dantec and Edwards [32] present how volunteer organizations might struggle with keeping the pace and modernize computer equipment needed to provide services to homeless people. Le Dantec and Edward also found that homeless people would not sell their cell phones for money. Having a cell phone was found a potent social symbol, a way of mitigating the social stigma by connecting through technology, not revealing the homelessness. [9].

Woelfer and Hendry [33] put up a technology center and developed a curriculum to develop life skills for homeless young people in Seattle, USA. Homeless youth could participate in sessions to improve their skills for example in job seeking. In the same context, Woelfer et al used Value Sensitive Design to work together with homeless youth, service providers, police and community members on how mobile phones could be used for increased safety [34]

1.1.1 Intervene with technology or not intervene?

Palzkill et al. [5] presented work with young homeless people in Seattle, they point at the importance of critical reflection before intervening with technology. It is not imperative that more use of technology equals improvement. In an example where Woelfer and Hendry used Value Sensitive Design (VSD) [35] to guide if a technological intervention is right or wrong they end with a conclusion that in their example, a paper flyer with information to the young homeless community in Seattle, it would be better not to intervene by putting the information on digital display. They used value scenarios [36] as a method for the critical reflection and found that a precautionary design stance is an applicable perspective when working with young homeless people.

1.1.2 Can mainstream devices do the job?

In 2014, Borg et al presented a systematic review on accessibility to electronic communication for people with cognitive impairments [37]. In this paper many of the presented articles concluded that specially adapted devices and interfaces performed better than mainstream equivalents. The same picture was described in 2008 by Pigot et al [38] who characterized mainstream products to:

“...meet a significant portion of client needs and are increasingly present in clinical settings. However, their complex, sometimes unsuitable method of use makes it necessary to design dedicated tools for individuals with cognitive impairments...” (page 220).

Also [37, 38] reported that mainstream smart technology often did not provide the needed support for people with cognitive impairments.

1.2 Participatory Action Research and Theoretical foundations for the project

Participatory Action Research (PAR) is a method within the tradition of qualitative research. PAR is distinguished by its transformative power and its emancipatory and democratic aspirations. Action Research has a focus on “issues of immediate concerns to particular social groups or communities” [39]. The roots in PAR can be found in the work of Lewin [40] and Freire [41]. A critical reflection and the connection between reflection and action is at the core of PAR, alongside with the focus on equalizing power between those involved. Freire described this as *reflection without action is sheer verbalism or armchair revolution and action without reflection is pure activism, or action for action's sake* [41]. The central process in a PAR-project is to understand and improve the world by changing it [42]. PAR is grounded in critical theory and constructivism. Both quantitative and qualitative methods can be used in a PAR-project. Typically, analysis of PAR uses triangulation of at least three data sources. Researchers engage extensively in the community and a typical PAR-project is time consuming. Those who traditionally would have been the research objects are empowered to be partners or co-researchers (moving away from concepts of people participating in research being Users, Respondents or Participants), with equal power as members of the PAR-research team. PAR has been used in various social and health settings [42]. PAR-projects needs carefully methodological adaptations to be accessible for all members in the participating research team, especially if any of the participants have impairments [16, 43].

Research within a social setting can draw from theories of practice. Schatzki defines the social as “...a field of embodied, materially interwoven practices centrally organized around shared practical understandings”. According to him phenomena such as actions, individuals and language can be seen as embedded in practices, while institutions and structures are effects of practices [44, p13]. Similar understanding about practices are developed by, among others, Reckwitz [45]. Pierce et al argues in favour of shifting the analysis from individual action to everyday practice [46], although in this paper also individual interaction between humans and technology, seen as activities are important and can be understood by Activity Theory [47, 48]. The conceptual wheel of practice (COWOP) presented by Entwistle et al has been used as an analysing frame in the study presented in this paper [49]. Kutti and Bannon argues that the field of Human Computer Interaction (HCI) needs to consider how the technology fits into our everyday practices [50]. They argue that the notion of interaction between human and machine is still valid, but we also need to consider how technology fits into our everyday practices. To that Woelfer and Hendry add that when technology becomes ubiquitous values need to be considered to guide us what to do and not to do [5]

2. The study

Departing from a pilot study, presented elsewhere in a finding paper [17] and a method paper [16] each previous project informed the upcoming new project. The work evolved in three consecutive steps, presented as projects, see Figure 1.



Figure 1: Overview of the study, divided into sub-projects. Project 1 is the Pilot study. Project 2 is the Smart Meeting project. Project 3 is the Smart administration by Smart Meetings project.

Project 1 Pilot study: The pilot study informed us that the number one priority for members in RSMH when it comes to technology was to get access and understand how to use technology in general and to specifically use technology in the interaction with all actors involved in giving them support (See figure 2).

Project 2 Smart Meetings: Informed by the results from Project 1, the AR-Team decided to focus on homeless people, as a group being on a frontier of digitalization [5] often presented as socially vulnerable, having cognitive and/or mental issues. AR-Team 2 was formed, now with researchers, accessibility experts and staff from the social service administration in Stockholm. Mainstream smart technology was used together with a group of 20 homeless people to explore if mainstream devices and mainstream applications could be used in the interaction with the organizations to support homeless people, especially focusing on meetings (see Figure 2). AR-team 1 was transformed to a reference group, actively engaged in the reflection process and the analysis of data for the rest of the project.

Project 3 Smart administration by smart meetings: In the final project, 41 homeless people were engaged in using technology, but attention also shifted to Social Service Administration and how to implement digital interaction between support structures and homeless people. Lead was shifted from researchers to staff. AR-Team 2 was complemented with a previously homeless participant now enrolled as a tech-coach and a project leader, previously employed as staff.

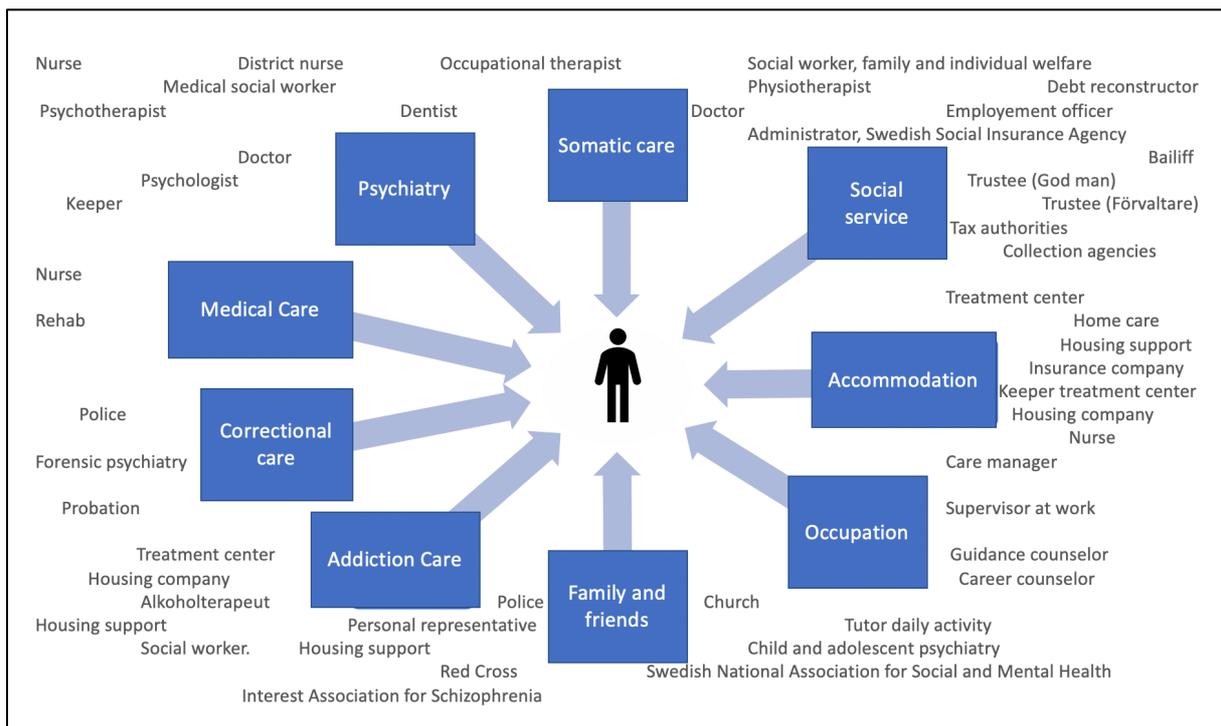


Figure 2: Mapping of resources available for a homeless person in Sweden. Project 1 introduced the map. Project 2 showed that it is common that a homeless person had contact with 10-15 resources at the time, resulting in several scheduled meetings every week.

2.1 Interventions with Smart Technology

A criterion for all devices was that they should be contemporary mainstream devices and not special assistive technology. Project 2 started with the AR-team 1 exploring potential useful devices. Informed by the results from Project 1 they focused on smartphones and other devices that were portable and had a supporting potential in regard to cognitive issues. After consultation with experts on assistive technology and testing, an assemblage of devices was chosen: Smartphones (both IOS and Android), Smart pen (Echo and Livescribe), Smart watches (initially Pebble and then several other), and a scanner pen (C-pen).

The assemblage of devices was presented to participants, but each participant had the liberty to select the devices and applications they wanted to use, and it was possible to shift or add devices and applications according to insights and experiences gained during the study. According to their personal preferences, the participants were educated in using the devices and applications they had chosen. They were also encouraged to explore and use the equipment on their own and together with other participants. Participants could demand as much support they wanted. In Project 2, support was formalized by employing a tech-coach. Inspired by Banduras [51] the coach was recruited among the homeless participants from Project 1. Being a skilled technology user, this person could function as a role model and help other homeless users with mastery experiences.

Project 1 tested different ways of introducing technology to the homeless participants and also on how to educate and support them and how to follow up. Informed by the results in Project 1 this was formalized in Project 2 (See figure 3).

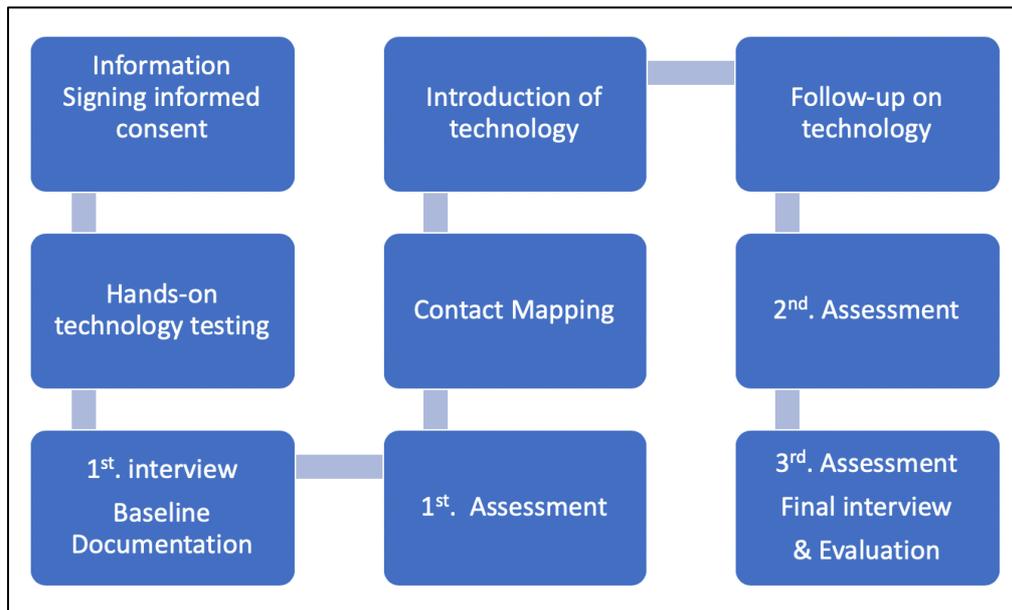


Figure 3: The formalized model from Project 2. The model presents how technology was introduced, a baseline of personal needs was established, devices were chosen, contact maps were documented and follow ups on needs, progress, perceived self-efficacy and use were conducted in iterative steps until the end of the study.

Staff was invited to seminars to discuss how to use digital tools to interact with homeless people and to interact with staff from other representatives from the support structure around a homeless person (see fig 2). Staff was also offered education and training in using for example digital calendars and Skype meetings.

2.2 Participants

Homeless people were recruited from two units within the Social Service Administration in Stockholm: Bandhagshemmet and FOT (Swedish abbreviation for Test and training apartments). At Bandhagshemmet a homeless person can get a room, regular meals, a dedicated support person in the staff, weekly or daily visits in their rooms and regular drug-testing. There were 65 rooms at Bandhagshemmet and 32 staff working to support the clients. Clients stay at Bandhagshemmet for a couple of months up to several years, depending on the progress in the process to leave homelessness. The city of Stockholm has several other places like Bandhagshemmet to support homeless. FOT organizes possibilities for clients to live in training apartments or test-rent an apartment. If the person proves to manage the situation, they can get a permanent contract for the apartment. Each person has a dedicated support person, but they are supposed to live more autonomous than clients at Bandhagshemmet. Approximately 800 clients and some 400 staff are involved. Apartments are located all over Stockholm and integrated among apartments that can be rented by anyone.

Project 2: The smart meeting project involved 15 homeless people, 11 from Bandhagshemmet and 4 from FOT. Six persons moved away from Bandhagshemmet during the project, four to a training-apartment and we lost contact with two. Two participants left the project but were still living at Bandhagshemmet. Two participants were women and nine men. A vast majority of clients are male both at Bandhagshemmet and FOT. The Smart Meeting project also engaged staff at Bandhagshemmet and FOT.

Project 3: Smart administration by smart meetings involved 41 homeless people, some continued from the previous project and the rest entered the study at this point. Again, staff at Bandhagshemmet and FOT participated. Two participants died during the project and we totally lost contact with another ten. Contact with another twelve was with an on-and-off-relation meaning they sometimes turned up for assessments and interviews and sometimes did not. Seventeen participants participated in the final assessments in the end of the project.

Participants from Bandhagshemmet and FOT were recruited after introduction meetings. The possibility to use smart technology was introduced and devices could be tested. We discussed technology and how it could be used, and people could ask questions. In the first project it was the researcher who facilitated the meeting and presented the possibility to participate. In the second project it was a previously homeless person, now tech-coach, who

facilitated the meetings – with the researcher in the background. In the second project people also could report interest to participate at any time. Informed consent was given from participant at the point they decided to actively take part.

Those interested in participating could sign a list and within a couple of days they were called to an interview. There were two inclusion criteria at this point: They needed to have some ongoing interactions with society, and they had to accept to be interviewed during the time of the project. A baseline was established. The baseline provided information about each person's current situation, in what situations they met problem in their daily life. During the first meeting it was discussed and decided what smart technology the person wanted to start using. The devices were then delivered within maximum a week and preferably as soon as possible.

Most homeless participants had a record of drug addiction (alcohol/narcotics/medicine). Some participants were supervised by forensic psychiatry due to earlier criminal records. Many of the participants had experienced long-term mental illnesses, such as depression, anxiety, psychosis, bipolarity and schizophrenia. Many had an ongoing medical treatment for mental illness. All homeless participants could describe typical characteristics of cognitive impairments, but only a few of the participants were diagnosed. The cognitive difficulties the participants described could be related to, for example; time management, organization and planning, short term memory, handling stress, undertaking tasks and completing tasks, problem solving, sustaining and shifting attention.

2.3 Data collection and data analysis

Every participant was interviewed on a regular basis, with a semi-structured interview scheme. Staffs were engaged in both focus groups and interviews, also with a semi-structured interview scheme. Staff, researchers and personnel from the SSA IT-department had regular meetings to discuss problems identified in the process. Interviews with the participants were recorded and transcribed. Also direct observations, focus groups with staff, physical artefacts, photos, videos, screen-shots, e-mail messages, documents and personal reflections from researchers have been collected and formed a rich data set for analysis [52]. Contact Maps [17] were used to visualize the number of institutions and the number of meetings each participant were engaged in.

In the end of Project 2 an assessment tool was developed to monitor the progress of each participant, starting with a baseline when they entered the project and bi-monthly follow-ups until the end of Project 3. An introductory interview and screening process to establish the support needs was formalized as a protocol was introduced at the start of Project 3, as a result of an evaluation of earlier introduction process for on-boarding new participants. Project 2 also introduced a measure of self-efficacy.

Data has been analysed by triangulation of the collected data where reflection was followed by action and action was followed by reflection in an iterative process. The AR-Team 2 documented the result of this process in a manual [53].

Data have been analysed by qualitative content analysis. Our a priori knowledge influenced both how we structured data and our coding system [54]. Categories and codes have been revised during the analysis process [55–57]. Reflection on data, on progress and drawbacks have been done in AR-team 1 and in AR-team 2.

3. Results

The knowledge about technology varied from very good to almost no knowledge at all. Some of the homeless persons were highly skilled and trained professionals in for example programming or had used technology extensively at school or at work. Other could not for example enter a contact into their phone or connect to a Wi-Fi. All participants were allowed to keep the devices they used after the end of the final project. Researchers are still in contact with some, who have reported both progress and setbacks.

The devices the participants could use was either was new Android or recycled iPhone smartphones. They could also use Pebble or Samsung Smart Watches and Echo Smart Pens for recordings and note taking. They could also use C-pen for scanning information from paper into a digital format.

41 of the participants feel more included in the digital society. 41 of the participants have also improved their ability to handle meetings, manage time, and manage information. 12 participants describe their improvements as life changing. Areas most participants reported improvements where; Get to meeting on time and Remember info from meeting, wake up in the morning, Paying bills. Participants also reported improvements in self-efficacy.

3.1 Mobile phones

All homeless people participated in Project 1 and 2 had a cell phone prior to participating in the study. But most of those phones could not be described as Smartphones, as they were cheap and often older cell phones, often with

poor usability. In some cases, the phones were broken, held together by tape. Periodically people were not able to use cell phones since they were stolen or broken and that they could not afford buying a new one. When entering the study, homeless people with too old phones were offered a smartphone. Sometimes a recycled and sometimes a new one. They were also offered other devices from the assemblage. Except using smartphones, 28 participants started to use smart pens, and 10 used smart watches. The significance of having a functioning mobile phone connected to the internet with a functioning subscription is clear. At the time participants were connected they can report on major advantages being online. But for many this relation is an on-and-off-relation. Phones can be broken or stolen, phones or phones operating systems can be obsolete when equipment get too old and modern applications stop working (which happened during the project with the Mobile BankID-application, a much-needed identification app in Sweden), connection to the Internet could be restricted to places with free Wi-Fi or to periods when participants could re-fill their internet subscription. In the start of the project there were no free Wi-Fi provided by the SSA at their different locations. In the end of the project the policy had been upgraded and all locations are supposed to provide free Wi-Fi to all locations. To get the project 2 going two homeless participants were engaged to set up a temporary network with routers and transponders. Staff did not have the skills to manage the installation, but with the right equipment the two homeless persons put up the network in less than a day, allowing all people living at Bandhagshemmet free surf. This was reported especially important in the end of the months, when many ran out of access and could not afford re-fill and at the same time, they were supposed to do a lot of online activities such as paying bills, send in reports to authorities, applying for jobs etc.

A phone was regarded as a highly valued artefact by many participants. Some had a very personal relation to it. One woman had a phone that could be folded so it became egg-shaped. She could describe the feeling of having this egg in her hands as comforting. Even when offered a new phone she would not let the old one go, so she tried to learn the new smartphone but kept the old one.

3.2 Applications

Apps were used for reminders, wayfinding, wake up calls, recording, memos & checklists, messaging, and lifestyle changes. A group of participants were very active and frequently tested applications, abandoned some and went on testing new ones. Those persons worked as a small research unit on their own and provided AR-Teams, participants and staff with an inflow of new stuff to test. A funny episode is when one of them tested a wake-up application that demanded the person to take a picture and then it would stop alarming until exactly the same picture was taken again. Only that the test person took a picture of one of Stockholm's most famous buildings and had to "get up, take the metro, go there and take the picture before the bloody telephone stopped".

Calendar and Time Management

Calendars and Time Management was at the core of the interventions. Since homeless people face a lot of meetings, organization of meeting activities is important. Only a few of the participants used digital calendars on regular basis. Many managed meetings by keeping letters and sometimes hand-written notes on meetings or a paper calendar. Staff used a large paper-calendar with a week-display, trying to enter important appointments for clients by writing it down. Project 2 and then 3 introduced digital calendars to staff, staff was sent to training provided by the SSA but for a number of reasons staff still uses the paper calendar. Moving away from paper to digital Time Management proved more difficult for staff than participants. Many participants would prefer digital invitations to meetings, where they can click accept and the meeting goes into the calendar or the simpler; an invitation to a meeting by SMS. They want reminders in the phone, some prefer up to three reminders. One reminder on upcoming events for the next day, one in the morning for the upcoming events during the day and the last reminder when it is time to leave to be in time for the meeting. Staff did not have smartphones as working devices, leadership hesitated in a technological shift. Some staff solved this by communicating with clients using their private phone, since they noticed the significant improvement on client time management when supported by digital tools.

A special problem for many participants was to figure out when to leave to get to an appointment in time. This procedure could include collecting things to take with you, leave the location, walk, take a bus, shift to metro, perhaps shift again, walk to destination, enter location for appointment. To calculate time needed to be allocated for this procedure was difficult for many, resulting in late arrivals as the most common problem but for some who overcompensated it resulted in them arriving up to two hours ahead of the scheduled time.

Wake up calls

To wake up in the morning is a common problem, also confirmed by staff. Conflicts between clients and staff at Bandhagshemmet around the wake-up procedure was common, with staff knocking on client's door and client feeling either bad or irritated. Another conflict was medicine. Directly after wake-up clients are supposed to attend at staff's office to take their medicine. They are not allowed to have medicine on their room. By introducing invasive technology into the wake-up procedure the tension between staff and clients decreased. Of course many participants have tested sound alarm before but as one described it "I have become sort of immune from sounds,

it doesn't matter how loud, I keep on sleeping, driving other people mad". Tactile vibrations from the smartwatch worked well for many participants and also apps (with both vibration and sound) forcing people to get up and do a pre-planned activity (such as taking a specific picture or solving a math problem).

Memory support

Some participants used their Smartphone to record meetings, to make notes, take pictures – all for information storage and to support a bad memory. Others use the Smart Pen (see below). A majority of participants reported memory related problems, especially in combination with stress.

Way finding

Another important feature was way-finding technology, not only maps but applications who reminded them on when to get going, what to take with them and where and when buses or trains were coming and leaving. Several participants reported problems with finding the way, re-find it when getting lost or to figure out how to go from point A to point B.

Behavior changes

A small group of participants started to explore applications for behavior change. One participant started to use an app called SuperBetter. He wanted to improve his ability to run a household; do the dishes, clean, make the bed etc. He set up goals and started to use the app and reported significant progress. He had an overarching goal of being allowed to have his son to stay with him for a night. Due to earlier drug use and admitting not being capable of providing for his son he now wanted to prove him worthy and ready to take responsibility. The app both worked as a motivational tool and a tool to record activities, useful when arguing he has made improvement.

3.3 Smart Watches

An important quality of a Smart Watch is the ability to vibrate directly on the human skin. The close attachment between device and skin proved really important especially for participants having trouble to wake up. One participant describes this as a life changing moment. For years he had struggled and failed with his wake-up process. "I have tested everything, ending up with driving my neighbors mad with me still asleep". When using a Smart Watch as alarm device he had no problem to get up in the morning. This resulted in him testing different jobs, educations and eventually move to a test department, realizing that he had a new problem, earlier concealed by the wake-up problem, that was described as an endurance-problem. When you wake up and get a job or start an education the next problem can be to stay there.

Smart watches also worked well as reminders, since a quick glance at the watch can be helpful to keep track of the schedule of the day. Getting a feed of activities one by one in the small interface of the watch was for some easier than looking at a calendar display of a whole day or a week. An interplay between watch and calendar could be noticed among some participants where they entered information in the large calendar and then make use of the information by the watch. Also, a Smart watch is a cool device. Not that many people in Sweden have them. Exposing a Smart Watch makes you a cool person and to talk about how it works with other people in the community puts the homeless person in an unusual but pleasant position.

3.4 Smart Pens

The Smart Pen would not be so smart without the smart paper. The pen and paper interact in that way that the pen is recording and by writing notes on the paper the user can navigate in the discussion by tapping on a word on the paper. The paper has recording buttons such as record, stop, paus, play. Participants used the pen as a recording device on meetings and as a memory and planning device after meetings. For example, some re-played the meeting for their support person. Staff noticed an increase of reported information from clients. Having returned from a meeting and when staff asked for an oral information on what happened they got far less information than was recorded.

Some participants reported an interesting reaction on the design. There are recording functions in Smartphones and there are stand-alone recording devices, often shaped like small boxes. A homeless woman had used a stand-alone device before and got a lot of negative reactions from people being recorded. It was questioned why she recorded them and some even refused (although it is allowed according to Swedish law to record meetings that you personally attend to). When introducing the Smart Pen suspicion was replaced by curiosity. People found the device interesting and cool. The woman reflected: "They talk about it as a James Bond type of thing, they want to know how the magic with the paper works, and then they let me record them.". For people frequently using the pen it resulted in a large number of recordings and some wanted to use them as an archive. That was more difficult than to use it as a short-term memory device. They call for some solution where they automatically could transcribe recordings to text, since it is easier to search in text than recordings, but when tested with different speech to text technology the quality of the recordings from the pen did not allow transcription.

3.5 Scanner Pen

A few participants used the scanner pen, but not for a long time. Their intention was to use it to scan OCR-codes simplifying the process of paying bills. This turned out to be too complex and the device was abandoned. The process of paying bills is regarded too difficult among a majority of the participants, meaning they frequently fail to pay, even when they got money. The Scanner Pen was a candidate to solve this problem, but it did not turn out that way.

3.6 Meetings

Participants often had several meetings per week. The participants with the most scheduled meetings had between 100-250 meetings on a yearly basis. As presented in Figure 2 a large number of actors “kick in” and provide support, probation and treatment. Managing meetings and managing time connected to meetings is reported as very difficult by a majority of participants. This is also confirmed by staff and observations from researchers. Most calls for meetings either was agreed upon orally in the end of the previous meetings or distributed by postal letter to their registered address (every Swede needs to have a registered address, but this creates difficulties for homeless people, since many of them for different reasons do not regularly visit those addresses or do not remember the address). For many participants the process of entering information about a meeting from a paper invitation to a calendar (see figure 4) was difficult and often resulted in errors. People picked the wrong day, the wrong time, the wrong place or the wrong name of the person to meet. A common mistake was to not enter additional information given in the letter into the calendar. If this information urged the participant to for example prepare something and bring it to the meeting, the whole point of having the meeting disappear if this is neglected. When this procedure was replaced with calendar-invitations a click on the “accept-button” automatically entered all information correctly. This also allowed participants to use automatic reminders.

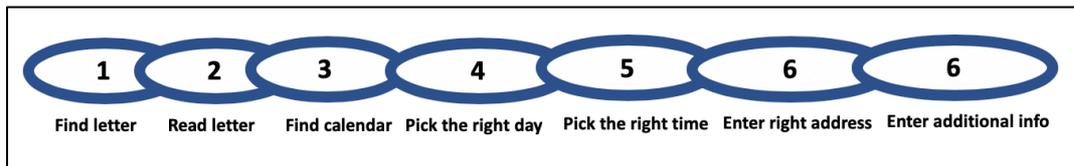


Figure 4: The process of moving information about a meeting from paper into a calendar.

For a meeting to make sense it should result in something, moving a process forward. Many participants described at least one third of the meetings as pointless. “They could do some of the meetings by a Skype-call, not having me to travel all day across town” as one participant say, indicating that at least some meetings could be arranged as online meetings.

When analyzing data from the participants AR-Team 1 started to paint a picture of the cognitive load related to a meeting. Participants often described a meeting as starting already in the morning. Every participant described problems that could be attached to one or many of the steps presented in figure 5.

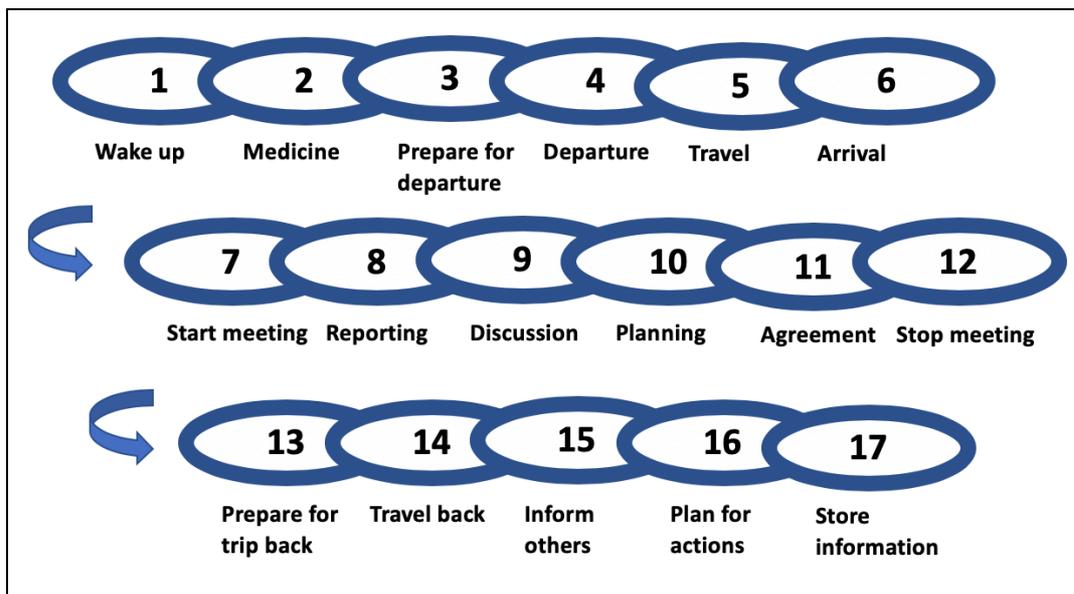


Figure 5: A meeting, broken down in steps. Each step can be cognitively challenging for the homeless person. Most meetings were arranged without any cognitive support for the homeless. A homeless person can have several important meetings per week. Staff have access to multiple cognitive support (calendars, journals, software for scheduling, planning and documentation, tools for communication with other staff etc).

Reminders in a digital calendar worked well and some participants set up intricate schedules for the reminding process. A 3-step model was often useful. The first reminder the evening before, the second in the morning and the third when it was time to go. In some cases, staff tried to do something similar without technology but so many things could happen preventing them to execute a reminder, resulting in the homeless person missing a meeting. The procedure of departure might seem simple but for some participants this was the main issue “I go to bed, and in the evening, I am sort of the world champion on planning my next day. When the next day comes, nothing gets done. I cannot manage to leave my room ending up with another day in the sofa, knowing I’m letting myself and other people down”. Even if calendars were useful, they were regarded as difficult by many participants. The need for support on calendar issues existed equally by participants and staff.

3.7 Tech-coach

The tech-coach (previously homeless), established a close relation to many participants and could use that intimacy to explore what could be done with technology. As an example, he often used YouTube or newspaper websites as onboarding applications before for example introducing calendars, GPS and other more practical applications. In one case the opening to use technology come through playlists. A person with severe cognitive issues, living isolated at his room started to be more social, attend in the canteen etc. after starting to listen to music that he could remember from his youth. He was fascinated with the possibility to create lists of music. He could not do that for himself, but the tech-coach created playlists with the songs the man remembered. In a way no-one was able to explain, this also made it easier for the man to engage in some of the daily activities.

As the tech-coach spent time on a regular basis “on the floor” participants and staff could approach him, asking for support or just discuss new cool things about technology. This allowed for instant solving of problem. A cause for abandoning technology, identified in project 2, was too long time between a technical problem occur and its being solved. Many participants were not confident as technology users and instant support is an important quality to maintain the use of technology.

In project 3, Tech-coach substituted researchers in performing interviews, assessments, technology introduction etc. This was a way to test how SSA could implement technological support when researchers move away.

3.8 Cost for intervention

The average technology-cost for intervention per participant was 5 000 SEK (approximately 530 EUR). In relation to the annual cost of a person being homeless this is a tiny amount of money. Even so, the main obstacle to implement digital technology in the social support is to allocate this money to the homeless person. As it turns out, staff can easily prolong the stay at Bandhagshemmet (900 SEK per night) for several months but they do not have the mandate to buy smart technology and give as assistive tools for homeless people.

3.9 Implementation in social service organization

Project 3 worked with implementation of project-findings into everyday work practice. Theoretically SSA-management could recognize the potential of improvements in the service and at the same time achieve cost-reduction. The task for AR-Team 2 was to find out and test ways of implementing findings. At the time for this work the SSA-administration was forced to do a major re-organization, let staff go and move staff around. Management had to focus on that process, leaving support to the implementation project behind. The AR-Team 2 identified eight key components for a successful implementation:

1. Infrastructure; locations need to have Wi-Fi, staff need to have mobile digital devices, there need to be space for online meetings that protects privacy. Computers need to have cameras and sound cards to be useful for online meetings.

2. Smart technology as assistive devices; Since many homeless people cannot afford to buy the devices, SSA need to provide them for free. Products classified as Assistive Technology (AT) can be provided for free in Sweden, but mainstream products are not classified as AT. A bureaucratic border between city of Stockholm and Region of Stockholm needs to be handled. It is the region who is responsible to provide citizens with assistive technology, but the region and the SSA do not cooperate. Clients at SSA find it hard to search support from the region.

3. Skills; Staff need to be trained in using technology, and to use the methods and instruments provided by the study.

4. Trust; Staff need to feel confident in handling devices and that there will be support if something goes wrong. The need to feel that management support them in the transformation to a digitalized work place.

5. Reformed organization; Tech-coach is a new role that has to be implemented in the organization and the number of tech-coaches need to be estimated. Staff can shift to have shorter online meetings mixed with longer meetings eye-to-eye. Communication across organization-borders have to be established.

6. Power relations, prejudice; Technology and the methods used provide clients with more power and relations between staff, clients and technology can shift and tensions can occur. Organization needs to acknowledge homeless people as competent technology users, but also that homeless people might have cognitive impairments that requires life long support.

7. Policy, rules and practices; Digitalizing SSA-support to homeless people leads to a need of change in policy and how policy is carried out by rules in everyday practices.

8. Cognitive Accessibility; analyzing activities, practices, policy and rules set focus on barriers in how the support to homeless people is carried out. It also sets focus on how to enable the support.

In the end of the study and when finalizing Project 3, AR-Team 2 concluded that findings made during the study was not implemented in the SSA-organization. The big paper calendar at Bandhagshemmet was still in business at the last follow-up meeting. Local management described that there was no time, no resources and no support from top management to move ahead. All focus was to get through the day, trying to re-organize after the downshift, almost with a completely new staff.

4. Discussion and conclusions

In this Action Research study, two Action Research Team have been working with homeless people and staff to explore if mainstream smart devices can support homeless people in Stockholm in the process of leaving homelessness. Furthermore, the study has explored how findings from the study could be implemented in the everyday practice of the Social Service Administration. This is in line with the call from Rice et al to do more research where homeless people examines technology and explores the potential in being online using mobile communication [18]

Contemporary mainstream devices; smartphones, smartwatches and smart pens together with an assemblage of applications supporting cognitive needs were tested and found useable to fulfil the needs for many homeless people. The cost for such intervention is low. Even if given away for free and with free access to the internet, the monthly cost for devices and internet surf is less than the cost for one night at Bandhagshemmet. There is a need for a new profession (tech-coach) but the number of staffs can potentially be reduced if the number of nights spent at Bandhagshemmet or in a FOT-apartment decreases due to a more effective meeting and rehabilitation process. Policy and regulations could not be changed in favor to implement the findings. Most problematic was that the organization could not find any way to pay for devices even with a positive cost-benefit analysis. Either could the organization make space for a tech-coach. It was not possible to change the SSA-organization during the timespan for Project 3. The potential of providing support to homeless people at a low cost is in line with earlier findings by Eyrich-Garg [24]. But, instead of taking care of the cognitive problem the SSA-organization is occupied by handling the consequences caused by the cognitive problems.

Informed by Entwistle's "Wheel of practice" [49], the implementation process identified eight key components and proposed an implementation procedure in a manual. As a complement to the wheel of practice we added the component of Cognitive Accessibility. Assessing activities and practices but also policy through a lens of accessibility provided new insights in how homeless people cope with the process to leave homelessness. Project 3 introduced an assessment tool making it possible to scan new clients for accessibility related issues. By doing this we could present a list of common problems; time management, organization and planning, short term memory, handling stress, undertaking tasks and completing tasks, problem solving, sustaining and shifting attention. When tackled as accessibility problems there is an opening for providing the right kind of support, training or applying different strategies to remove barriers. That provided SSA with totally new insights, since they usually apply more psychosocial rationales to explain why a homeless person for example fails in attending a meeting.

Our finding is that homeless people are capable of using smart technology but there is a constant need for support, training, and replacement of broken or stolen devices. This is in line with earlier research by for example Woelfer and Hendry [58]. What we can add to the picture is the potential for homeless people supporting themselves (also recognized by Le Dantec and Edwards [31]), and the potential in enrolling earlier homeless people as role-models in the support of other homeless people succeeding in what Bandura describes as master experiences [51]. Earlier

research concluded that mainstream technology was too complicated for people with cognitive impairments [37, 38]. Our findings indicate that contemporary mainstream technology now often are regarded as capable of providing support to people with cognitive impairments.

Stigma, shame, prejudices and low self-esteem are factors that can make inclusion in society hard. Earlier research shows that a digital society may offer yet another arena of exclusion [20]. But, there is also an inclusive potential, reported among others by Johansson et al [17]. In describing a model of integration for people with disabilities van de Ven et al [59] argues that “integration consists of five elements: functioning ordinarily without receiving special attention, mixing with others that are not disabled, taking part in society, trying to realize one’s potential and directing one’s own life”. In this study we have addressed several of those elements. Instead of using specialized technology (often described as ugly) we used mainstream technology and some of the artifacts in the assemblage are beautifully designed. They look cool and participants used them with pride. For one participant the possibility to own an iPhone was something really special. It did not matter that it was an older recycled one. He came to Sweden under the second world war from Finland and have lived a hard life ever since. He was really proud to be able to call his sister and tell her that he was making a phone call from his own iPhone. Other participants report on being treated with more respect and less suspicion. The Smart Pen is the best example. Using the pen as a recording device released tension between recorder and recorded and turned a difficult situation into something exciting. We have noticed shifts in power relations, moving power in the direction to the homeless technology users away from staff and SSA. Many of the users felt more included in the digital society and they reported improvement on self-efficacy This is in line with earlier findings by Le Dantec and Edwards and as they did, we also noticed that homeless people would not sell their smartphone for money [9, 60].

Herzberger’s findings that homeless people can be suffering from information overload [20] while other researchers point at information poverty [21] can according to our analysis be explained as a distribution problem. Information is often distributed in a cognitively challenging format and the result can be both too much and too little information. If calls for meetings are given word-of-mouth or on postal letters participants describe even a few as overload, while they can handle a lot of exactly the same information when distributed as meeting invitations in a calendar or as text messages.

Le Dantec and Edward and also Palzkill describes situations where use of technology can weaken the ties between homeless people and providers of support, emphasizing the special quality in human-to-human communication. We have found that in some cases human-to-technology communication release tensions that are present in human-to-human communication. The best examples in our result can be found in wake-up-calls and reminders of taking medicine. Staff noticed that they were liberated from a nagging role when technology took over wake up and reminders. Participants noticed that technology can be neutral. It can remind of something as many times as you want, without being moralizing or irritated. Staff noticed that they could use the time they spent on nagging to be more encouraging. Le Dantec and Edwards found a potential for technology to multiply the number of connections the homeless people have to institutions [9], but in a Swedish context technology rather should be used to reduce the number of meetings and mix online contacts with physical meetings.

In line with almost all other research on homeless people and technology use is the importance of a mobile phone. What we can add to earlier findings is the importance of a smart mobile phone connected to the Internet and the importance of an accessible ecosystem around the homeless technology user. By that we mean for example support, training, belonging to technology using networks and being in technology using contexts, having rules and regulations adapted to provide the homeless person with devices and access. The smartphone as a tool was easy or at least possible to learn how to use for all participants. Many functions and applications worked. One central function is a digital calendar and on that point many participants found calendars still too difficult. There is a need for more cognitively accessible calendars. Not as separate assistive devices more like applications that could be downloaded, used in the preferred device, and collaborating with other people’s calendars. In line with many other research text messaging is something that most homeless people can use.

4.1 Meetings

Figure 2 presents an array of actors that potentially can help a homeless person. Every actor uses the personal meeting as the main communication channel. This results in a lot of meetings. One of the participants had approximately 250 meetings every year and around 100 meetings seems normal for many homeless people entering the path to an ordinary housing. By focusing on those meetings and study them in detail a potential in technology can be revealed. Many of the cognitive limitations described by the homeless people are at play before, during and after a meeting. A chain of activities take place in that process and if one of the links are broken the whole point of having a meeting can be lost. Instead of the meeting moving the homeless person forward in the process it results in a standstill or even reverse the process, prolonging the time for the SSA support-effort with months and years.

4.2 The transfer of one practice to another

Reflecting on the study from a practice perspective unfold the difficulties in changing how an organization works. Kuuti and Bannon [50] describes the practice as the unit of intervention, not only technology but everything intertwined in the performance. As we have presented earlier, technology have a potential connected to specific activities and activities bundled around meetings. Technology have the potential to support dramatical personal change. But embedded in the Social Service Administration Practice the intervention did not work. Project 3 refined the way of onboarding, screen for cognitive issues, introduce technology etc. But implementing those experiences into a new organizational practice basically failed, despite hard work from the AR-team 2 and initial support from leadership from the SSA. As it developed, leadership was not ready and other more short-term related problems had to be prioritized. For example, the whole organization was down-sized, with re-location of staff and some staff had to go. Technology for online meetings proved to be hard to install. For example, there were no space at Bandhagshemmet to locate to Skype meetings. Having online meetings create a need for a private place where you can go online and no such place was available, computers did not have cameras, and some did not even have soundcard installed. Staff was not prepared to arrange online meeting, and staff was not equipped with smartphones, and unfamiliar with digital calendars. Even if the SSA use digital tools for intra-communication and for keeping journals etc., the shift to external communication with clients turned out to be really difficult. Information between staff and client need to be secure-classified, according to the IT-department and city-regulations. The homeless participants did not agree: “My life is already at display as miserable, if someone get this information by reading a message sent to me from my social worker – I would not bother. It is more of an infringement to keep me on the streets prevent me from proper treatment and a home of my own”.

4.3 Limitations and further research

The nature of an action research study is that it is local, small scale and connected to a specific context (Burns 1999). Future research should include other contexts and apply other approaches. A special limitation when following homeless people over a longer period of time is that some of them just disappear and rules of secrecy prevent staff and researchers to track where they are. This is in line with findings from other research with homeless people. Our recruitment methods did not reach homeless people with low technological self-efficacy. Perhaps this can be described as a new frontier – how to introduce technology to socially vulnerable people not believing they could master the use of the technology.

It is hard to say how transferable our findings are. Giving away devices and broadband connections for free might not work in all countries. But homeless people facing a lot of meetings seems to be common in many parts of the world, also that homeless people often have cognitive impairments and that impairment can be tackled with a focus on accessibility and universal design. The importance of the mobile phone as a hub and a lifeline is unquestionable. Reflecting on the Action Research process Project 3 was too short to implement changes in a big organization as SSA. It was perhaps a bit naïve to believe a small project to be able to shift a well-rooted practice in such a short time.

In the end of Project 2, inspired by some of the participants, researchers introduced the idea of using game metaphors to do a more visual presentation of the problems faced by specific homeless persons. The most severe problem the person faced was visualized as boss fights and the smaller ones as fights aiming to collect power to take on a ‘boss fight’. Problems were visualized on a timeline with levels, telling the homeless person in what order to tackle the fights. This was found appealing to some and they found this way better than the extensive written documentation. Now the AR-team 3 is formed to do further work on this matter. The team consists of researchers, accessibility experts, UX-expert, illustrators, staff and 5 homeless people. AR-team 1 is still around as reference group.

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