

Easierphone: Participative Development of a Senior-Friendly Smartphone Application

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Abstract: Ageing and digitalization are two major developments of the 21st century. Particularly, smartphone ownership increased to about over 80 % globally. Meanwhile, smartphones also gained great popularity among older adults, nonetheless, many still show fear of contact. The multi-national project *Easierphone* aims at empowering older adults and other vulnerable persons to effectively use smartphones. A senior-friendly app, *Easierphone*, simplifies smartphones while replacing the common android interface with an easier-to-use one. In addition, the *Easierphone* app enables two smartphones to be connected remotely to facilitate virtual assistance. A participative design is applied to conduct tests with older adults in three different pilots, in three different countries. Semi-structured interviews, try-out of the app, individual follow-up discussions and co-creation workshops are conducted to collect data. The *Easierphone* app to date is received positively by potential end-users. Many of the diverse functionalities of the app could be improved with feedback from test participants. The development process is an iterative one, in between each pilot, to achieve best possible adjustments to the app. The preliminary results indicate that fear of contact still prevails, nonetheless. The simplified interface seems to provide a basis for older adults to use their smartphones with more confidence.


1 INTRODUCTION


Growing numbers of older adults in society and the parallel progress of digitalization represent two major global developments of the 21st century. Today, the proportion of older people is increasing fast and there are already more people aged 60 years and older than children younger than five (UNDESA, 2022). At the same time, the smartphone ownership per person increased globally to more than 83% in emerging economies, and over 94% in advanced economies (Pew Research Center, 2019). These two developments are the frontrunners in Western


European countries. In the age group of 55-64 years, an average of 60% of European Union citizens used smartphones for private purposes. Among older adults aged 65-74 years, usage was found to account for about 40% (Eurostat, 2018).


In Switzerland, high use of information communication technology (ICT) was found among older adults (Seifert et al., 2021). A total of 69% of older adults above 65 years are using smartphones, and the majority of them regularly (Seifert et al., 2020). However, far less older adults over 85 years use smartphones regularly (25%). These numbers highlight a so-called digital divide. It is a difference

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in access and use of ICT among different age groups (Francis et al., 2019). The gap exists even within the different age groups of older adults, which once more underlines how heterogeneous this population group of older adults is. The “grey digital divide” describes the fact that older-old adults use ICT far less compared to younger-old adults (Friemel, 2016; Neves & Vetere, 2019; Seifert et al., 2020).

The Covid-19 pandemic played an important role in use of digital devices and acceleration of their development, while at the same time showing the importance of not leaving anyone behind. During this time many groups were marginalized due to, e.g., isolation, lack of mobility, and limited social network. Especially older adults were affected, making them more vulnerable in our society (Seifert & Charness, 2022). To approach this societal challenge, older adults are being moved more into the focus of digitalization. Additionally, the discourse has shifted towards “what is possible” and is looking at older adults’ digital competences rather than their deficits. Reisdorf and Rhinesmith (2020) encourage finding ways to alleviate the so-called digital divide and the accompanying age-related inequalities. It must be ensured that all citizens are included in this progress of digitalization, particularly older adults.

Our EU research project titled *Easierphone* starts precisely at this point and aims to facilitate access to digital opportunities and the possibilities offered by smartphones for older adults. The *Easierphone* app is especially developed for a less tech-savvy target group. The project aims to simplify smartphone usage for mainly older adults but as well for other vulnerable people. In doing so, the app intends to replace the common android interface with an easier-to-use one (e.g., bigger font, better overview, contrast), that is uniquely adaptable to the end-user’s respective abilities. In addition, the *Easierphone* app enables two smartphones to be connected remotely to facilitate virtual assistance in the use of smartphones (tandem). Here, the older adult’s smartphone screen gets mirrored on the assistant’s device screen. This assistance can be provided by close family members, trusted neighbours, or (in)formal caregivers. A machine learning algorithm is currently under development, aimed to detect changes in the older adult’s smartphone usage to determine the well-being of the older person by analysing smartphone usage patterns and geolocation data.

2 FOSTERING DIGITAL INCLUSION THROUGH A SENIOR-FRIENDLY DESIGN

ICTs such as smartphones play an important role as older adults strive for an independent and self-determined life in their own homes, while still wanting to feel safe and socially connected (Hedtke-Becker et al., 2012; Marek & Rantz, 2000; Pani-Harreman et al., 2021). These ICTs were proven to provide access to social resources and to enhance seniors’ quality of life (Francis et al., 2019). Generally, smartphones are becoming the primary access point for social interactions, information, and services in our society (Castells, 2011; Seifert & Rössel, 2019). Hence, to sustain a self-determined life nowadays, older adults are increasingly confronted with the demands of digitalization (Seifert et al., 2021), particularly smartphones. Being able to use smartphone functionalities has the potential to considerably lower older adults’ vulnerability and increase their social connectedness to family, peers, and formal support networks (Fernández-Ardèvol et al., 2019). However, many senior users are unable to fully utilize modern smartphones due to their complexity (Awan et al., 2021).

Possessing a smartphone does not necessarily equate to actually using the device. Older adults may find it difficult to use modern smartphones. For the heterogeneous group of older adults, however, classic “senior phones” are not a satisfactory alternative. The distinctive design, which greatly differs from a conventional smartphone, as well as the reduction of functionalities to mainly provide assistance functionalities (e.g., emergency calls, localization) can have a patronizing, stigmatizing, and discriminating effect (Unterstell, 2007). At the same time, the label “senior phone” evokes resistance from an older user group as they do not perceive themselves as a homogeneous group and do not want to be addressed as “old” or “seniors” (Röbbing, 2007).

The attitude of older adults towards digital services is mainly predicted by their interest in technology, as well as knowledge, and willingness to use it (Seifert & Charness, 2022; Siren & Knudsen, 2017). Some older adults are limited in their use due to health issues and face barriers (e.g., complexity, accessibility, security concerns, high effort to learn new technology, or cognitive decline) which can further limit their access (Darvisy et al., 2021; Seifert et al., 2020; Seifert et al., 2021). A digital divide between the young and old generation does not only exist for the use of smartphones, but as well

regarding digital literacy in general (i.e., access to, and understanding of information from smartphones; Wang et al., 2011). Digital literacy is especially relevant for the use of services enabling a self-determined life, such as e-health services, e-government, or gathering of information (Tsai et al., 2017). The lower digital literacy among older adults can be a problem, as smartphones have evolved to becoming the main enabler of social communication, and other instrumental tasks required to fully participate and function in modern society (Blažič & Blažič, 2020). Various factors such as personal characteristics (e.g., age, health, gender), socio-economic and facilitating conditions (e.g., education, expectations of social network), engagement with ICT and digital literacy, as well as smartphone-related beliefs and attitudes have been found to predict older adults' smartphone acceptance (Chen, K. & Chan, A. H., 2014; Guo et al., 2013; Ma et al., 2016; Petrovičič et al., 2018; Piper et al., 2016; Xue et al., 2012; Zhou et al., 2013).

With these challenges in mind, the *Easierphone* app is not only trying to simplify a smartphone's surface for easier handling, but to find and provide a way for older adults to keep up with the times, for example, by having a fashionable smartphone without being stigmatized for using a clumsy "senior phone". Further, older adults should also benefit from the various apps and functionalities that modern smartphones entail. The *Easierphone* app aims to address the challenges older adults face when using their smartphones in daily life, to facilitate the usage of fashionable devices and dispel some older adults' fears in using modern digital devices. Further, the project intends to provide an opportunity for older adults to keep in touch with their friends and family more easily, and simultaneously to get support for their smartphone usage most easy.

3 RESEARCH DESIGN AND APPLIED METHODS

3.1 *Easierphone*: A Multi-National Project

Easierphone is a research project embedded within the European Assisted Active Living (AAL) funding programme which aims to create better quality of life for older adults, fostering cooperation between research and industry. The duration of the entire project spans 30 months, starting in April 2021 and is expected to finish September 2023. The project consists of six project partners from Switzerland¹, the Netherlands², and Poland³. *Easierphone* is not only designed for older adults, but also with older adults by using participatory design methods.

To ensure good progress in developing the app, it is tested continuously during three sequential project phases (pilot 1, 2 and 3) in usability tests with potential end-users (seniors, relatives). In pilot 1, the assistance functionality for tandem use was neither developed nor used. Pilot 1 aimed to get familiar with the app and to collect general information about smartphone use and challenges in daily life of older adults. Pilot 2 mainly tests the assistance functionality of *Easierphone*, a tandem functionality which is used together with an assisting person. In addition, an artificial intelligence module (AI module, which consists of activity tracking, i.e., pedometer and daily routes taken) is planned to be integrated. Here, questions regarding privacy, data protection and ethics (as seen from the perspective of the participants) are of central interest⁴, as transparency is of utmost relevance for end-users of *Easierphone*. During the testing, we meticulously explain to participants what the app tracks, how the tracking can be turned off, and how the participants themselves have control over various functionalities.

For this position paper, we focus on the cases of pilot 1 and 2 in Switzerland. Each team involved in end-user testing is responsible for their own data collection in its respective country. So far, the team of the Institute for Ageing Research (IAF) has completed pilot 1 and is currently in the process of pilot 2. In each pilot, the IAF team execute interviews

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⁴ The development of the *Easierphone* app is based on the ethical guidelines of the European Assisted Active Living

(AAL) funding programme. From an ethical point of view, the use of new technologies is acceptable if they do not conflict with the integrity interests of the users, e.g., do not restrict self-determination and safety, and the dignity of the users is preserved (Remmers (2019)).

with three individual participants and seven tandems⁵, resulting in a total of 30 tests in Switzerland. The individual participant, as well as the main participant of the tandem must be at least 65 years old. The age of the tandem assistants is less relevant. Most participants who were selected for testing are people who do not feel confident using their smartphones. The end-user tests include a try-out of the already implemented and developed functionalities of the current version of *Easierphone*.

3.2 Applied Methods

Data collection is based on semi-structured guideline interviews, testing the app in real life conditions with the support of the researchers, follow-up discussions in between the different sessions, and consecutive co-creation workshops. Each pilot includes interviews along with a try-out of the app. A full pilot's procedure follows this process: Each field test is based on three dates with face-to-face interviews (Misoch, 2019). In the case of *Easierphone*, the first meeting with the participant(s) intends to install the app together with the researchers on the participants' private smartphones. A first impression of the app is surveyed and additional information about the participants' general smartphone use is collected. During the tests, participants are asked what additional functionalities could be useful for them to implement. The project's approach is based on a user-centred design (Tullis & Albert, 2013), where the app is being tested in a real-life setting over several weeks to allow the participants the opportunity to get to know the app and to assess it comprehensively in an everyday setting. This enables a deeper insight into their actual user needs. In addition to assessing user needs (e.g., which functionalities of the application were used, and which ones were missing), the focus lies on questions of usability (e.g., what problems arise during use), as well as acceptance (e.g., which framework conditions are central to acceptance).

The second meeting focuses on the challenges that came up in between the first and second testing regarding usability and further needs from the user concerning the app. In the third meeting, testing focuses again on questions regarding usability, pending needs, as well as opinions on the AI modules.

As the study aims to gain a broader understanding of older adults' smartphone use, the researchers were taking side notes on specific observations of smartphone usage or challenges that came up during

testing (e.g., language and font size settings). Alongside the interviews, paper and pen journaling (done by participants) to write down challenges or questions while using the app in absence of the researchers was applied. The diary entries or questions of the participants were then discussed in the following meetings. Drawing on the experience already gained, the feedbacks from participants, and lessons learned from previous pilots, the app can be further developed by programmers according to specific needs and suggestions for improvement.

All interviews are audio recorded. For pilot 1, the interviews conducted were protocolized and anonymized by IAF staff. For the ongoing pilot 2, the interviews are fully transcribed and anonymized with the support of student assistants at IAF. Afterwards, all text data are translated to English by IAF staff and shared with the entire *Easierphone* project team to ensure transparency of information. The coding, categorization and prioritization are done in an iterative technology development process where the IAF and Pappy GmbH are working together.

To enrich the collected data from the interviews, co-creation workshops are held following each pilot with volunteer participants. In the co-creation sessions selected issues from the tests are discussed in more detail to improve future developments of the *Easierphone* app. The inclusion of potential end-users in a participative manner along the process, creates a more tangible project for all sides, participants, caretakers, as well as researchers, and developers (Greenhalgh et al., 2016).

4 PRELIMINARY FINDINGS

This section first describes the results from pilot 1, starting with end-users' fears and concerns, followed by the main findings of pilot 1. Next, preliminary findings from pilot 2 are outlined. In preparation for improvement of the app, the interview protocols (containing the most relevant issues to discuss) of each pilot are transferred to a table. Potential solutions for the problems that came up during the tests are then suggested by programmers and Pappy GmbH. These issues are divided into the following main categories: i) General Issues, ii) On-boarding, iii) Phone & Contacts, iv) Messages, v) Camera & Images, vi) Web & Alarm Clock & Magnifier, vii) Emergency, viii) Settings, ix) 3rd party apps, and x)

⁵ A tandem composes an older adult and her/his adult child, grandchild, other relatives or trustworthy friends and neighbours.

Purchase. A few examples of these categories and issues are shown under 4.2.

4.1 End-Users' Fears and Concerns

The great heterogeneity among the participants mirrors their habits and skills in handling their smartphones. This also applies to other apps they use: While some use their smartphone only for calls, one person of the sample even uses it for e-banking. In general, smartphones are mainly used for communication and information search, in some cases for purchasing tickets for public transport. Among the participants, communication is an important driver for buying and using a smartphone. Further, security concerns appeared to be an important topic for the participants. Most participants say that they always carry their smartphone with them when they are outdoors, so they can notify someone in case of an emergency.

The following list summarizes the most common fears and concerns that crystallized from the interviews:

- Multitude of preinstalled apps are confusing users, or make it difficult to orientate and find relevant apps;
- Issues with or lack of knowledge on how to personalize the home screen, or arranging apps as needed (sometimes due to fear of accidentally deleting relevant apps);
- Difficulty downloading and installing apps;
- Difficulty sending pictures from the gallery;

- Issues with differing logic of various apps (e.g., sending a message via e-mail app, compared to WhatsApp, or SMS app);
- Lack of practice with functionalities or rarely used apps;
- Fear of deleting important content or impairing the functioning of the device (e.g., due to clicking the wrong button), hindering trial and error use of the smartphone or apps;
- Inexperienced and insecure users are overwhelmed by constant changes in digital products;
- Feeling like a burden and therefore holding back on asking social contacts for help.

4.2 Main Findings and Suggested Adjustments from Pilot 1

Most of our participants liked the fact that the *Easierphone* home screen is much clearer and easier to read compared to the standard home screen of their Android smartphone. They particularly favoured the appearance of the icons arranged one below the other. The size of the icons and the larger font in general were also found to be positive. After the installation of the *Easierphone* app, "Contacts", "Phone" and "SMS" functionalities were automatically synchronized, i.e., all corresponding content was imported into *Easierphone*. This was rated very positively by our participants. The opportunity to have an emergency functionality was considered very important.

Table 1: Extract of the Table of Categories and Related Issues from Pilot 1.

Category	Issue	Issue description
General issues	Contact app icon	In the case of the "Contacts" tile, one participant would rather have a symbol that looks like the usual contact apps (e.g., icon with a head instead of icon with an address book)
Phone & contacts	Difficult to delete contact	It is unclear how to delete a contact due to the scrolling.
	Accept phone call	Participants are used to tap the button instead of "swipe" motion to accept a call
	Accept phone call	Participants prefer a bigger icon size for the phone call receiver. Participants are used to the colours red and green instead of the ones used in the app
	Contact same as phone	Some participants were confused that a Contact and a Phone icon exist, as they thought it was the same thing
	Updating contacts outside of <i>Easierphone</i>	Participants noticed that updating contacts in the original contact app outside of <i>Easierphone</i> it is not synchronized
Settings	Contact app naming	The "Contacts" tile naming (instead of e.g., "Address Book") was confusing for some participants

Based on these feedbacks and inputs from the participants, Pappy GmbH created a table based on the raw data, which was then used as a foundation to prioritize the issues and aligned all with the entire team. A few issues have already been implemented in the new version of the *Easierphone* app for testing in pilot 2. Two examples of issues that have been improved after the first testing are: a) WhatsApp, the most frequently used app by the participants, is now already integrated in *Easierphone* by default and does not have to be added manually, and b) emergency calls can now be triggered with one click. In the first version, the emergency call required several clicks which was considered too cumbersome by the participants.

Referring to the main categories under section 4, a few are illustrated in table 1. The main categories were further subdivided into subcategories concerning specific issues. For example, the category of iii) Phone & Contacts was further split into, e.g., “accept phone call”, “contact same as phone” to crystallize the problem and describe it more precisely (see column “Issue description” of table 1). The summarizing and categorizing of the diverse issues helped to gain an overview and to find solutions to improve the app.

4.3 Preliminary Findings from Pilot 2

As in pilot 1, participants like the idea, that navigation on the smartphone is simplified by *Easierphone* app as all significant apps are merged into one app and are shown below each other on the *Easierphone* home screen. Some were very pleased that they can see all their apps sorted alphabetically when clicking on the functionality “open other apps”. Most of the participants are not aware that they could arrange apps on their usual home screen to find them easier, and that the alphabetically ordered list of all their apps could be accessed via system settings anyway.

Through the testing process, participants discovered new possibilities how they can use their smartphones. This further shows the importance of an initial instruction of the app (via a researcher, or guided instruction by the app itself). At first glance, most participants regard the app as easy to use, but they still need instructions for all basic steps. Some participants mentioned that the *Easierphone* app would be most helpful for “newbies” who are only starting to use a smartphone. If usage patterns with the conventional home screen and conventional apps are already present, the switch to *Easierphone* may be irritating to some extent (e.g., because icons may look different).

The meaning and use behind an integrated AI module (providing a pedometer, recording mobility patterns and apps being used) was not yet clear to most the participants who have been interviewed so far. However, we found that a few participants already use a fitness tracker or a smartwatch (which were not connected to their smartphones). Explanation for this was, they would benefit more from a tracking system they wear on the body while being at home because their smartphones are placed on a table or shelf, not tracking or recording anything.

The app installation process is largely determined by the Android system requirements. Here, *Easierphone* attempts to make the process as simple as possible while complying to Android guidelines (e.g., asking for various permissions directly on the device). Our participants agreed to give all permissions, but some were irritated by the quantity of permissions they had to give during the installation process. Asked about their feelings regarding online privacy, most of them reply they have nothing to hide anyway. Some participants reported that they generally do not read the terms of use or privacy settings in the digital world carefully. Nonetheless, they still agree to them, so they are able to use an app or a digital service. Another reason mentioned, was that they are unwilling to invest too much time in reading the terms of use, even though they think, they should read the terms of use carefully.

5 DISCUSSION AND OUTLOOK

This study sets out to empower older adults to effectively use a smartphone through a simple, clear home screen and easy-to-use app for Android smartphones. With the *Easierphone* app, the main user can be remotely supported with the tandem functionality which is simultaneously installed and used by a family member, trusted friend, or neighbour. *Easierphone* is conceived as an open and expandable platform with the primary user’s screen mirrored on the secondary user’s device in the tandem function.

So far, pilot 1 is completed and pilot 2 underway with data collection. For an interim conclusion we can state that *Easierphone* app is appealing to older adults, providing an easy-to-use surface on their smartphones. Overall, it was possible to get very critical, detailed and thus helpful feedback from the test participants in pilot 1. It was possible to integrate many of their wishes and improvement inputs in the further development of following versions of the app. Simplifying smartphone usage and offering support

(remotely via a tandem option) was identified to be a clear need of the participants.

Overall, participants appreciated the idea of a simplification of using their smartphones very much. The field tests over longer time periods shed light on many interesting usability topics raised by the participants. Nonetheless, the heterogeneity of the participants in our study with a relatively small sample size ($N = 30$) is high. There is great diversity in usage habits and skills in handling smartphones. While some of them try to solve problems by themselves and as independently as possible, others were found to be highly dependent on assistance (tandem) and showed little self-confidence in handling their devices. When it comes to support and help with smartphone use, family, friends, and stores of telecommunications providers play an important role for older adults. Within this continuous development the voices of older people must be heard to understand their needs and overcome usability and accessibility barriers. This inclusion refers to the goal of overcoming the digital divide (Wang et al., 2011).

A clear limitation of this study is the relatively small sample size ($N = 30$). Nonetheless, the aim of the tests is not at all to be representative but mainly to test through the app with end-users, find bugs in the current versions of the app and to include further wishes expressed by the participants. Unfortunately, apart from Swiss-German participants, no potential participants from another language region of Switzerland were included. We strive for a balanced participation of men and women, however, in pilot 1 only two men could be recruited as main testers of *Easierphone*. In the current pilot 2, gender distribution at this point of time is about fifty-fifty. Furthermore, according to the socio-demographic data, most of the participants are of higher economical and educational background, as is often the case with older adults volunteering to participate in studies in general.

Another observation made by the IAF team is the lack of well-established accessibility guidelines, which could have been used already in the early design stages of the *Easierphone* app. A range of accessibility guidelines have been developed to address the needs of vulnerable users (e.g., Web Content Accessibility Guidelines; W3C, 2005). Recommendations have been developed also for smartphones and mobile apps (e.g., Darvishy et al., 2021; Darvishy & Hutter, 2017). We believe these should be considered in future development and improvements of the *Easierphone* app to make it more accessible, and attractive to end-users.

Regarding the issue of privacy and data protection, participants conveyed feelings of ambiguity. Participants showed a differentiation of what they think they should (read terms of use carefully) and what they actually do (just accept to continue). This is an interesting observation we could make during the tests and can be subsumed as privacy paradox (Zeissig et al., 2017): Users know regarding privacy they should be careful in the digital world, but they resign to complexity of it and choose the easy way. The privacy paradox will be more thoroughly examined in pilot 2 and 3. Currently it is being discussed in the *Easierphone* project team if a hardware solution (smartphones with *Easierphone* pre-installed) might be a simpler way to set up and bypass terms of use for an end-user as all permissions could be set up by the programmers. However, this option was not (yet) implemented for the current project.

Continued efforts are made by the *Easierphone* project team to make smartphones more accessible to older adults and other vulnerable people in our society. As soon as *Easierphone* app finds a more widespread use, a quantitative survey to further improve the app could be conducted. Nonetheless, the great heterogeneity of end-users needs to be kept in mind for further development.

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