Using Academic Work Places to Involve Older People in the Design of Digital Applications. Presentation of a Methodological Framework to Advance Co-design in Later Life

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Abstract. Methods to involve users in design have long been used to create relevant content and increase the accuracy of product development. Demographic trends have raised the issue of the needs and demands of older people, especially with regard to digitization. In contrast to the high number of publications discussing the importance of involving people in the design of their daily life, very few publications suggest *how* to do it. While participatory design is used with older people, there is no common understanding about which methods are used for what purposes. This paper presents a framework methodology that further advances the opportunity to involve older people in the design process and increase understanding of old people's subjective experience of getting their lives digitized and how to involve them in design. Given that digitalization, with its systemic complexity, requires an understanding of how technology is contextualized, the need to understand what it means to age in today's digital society is part of successful design. One objective is to go beyond stereotypes that often characterize generalizations of older people. We are using the concept of co-design, which is well established but not specifically adapted to older users. The goal is a matrix of tested co-design methods to be used by citizens, researchers, businesses or anyone who is interested in increasing the impact of old people on the design of new technologies.

Keywords: Digitization · Co-design · Old people

1 Introduction

Co-design, defined as a collaboration between users and designers, is one of the concepts used to increase a user's impact on the design of technological artefacts or modification of already-existing artefacts by involving them in the design process. This conceptual thinking has its origin in the democratic ideal of giving people a voice and opportunities to influence functions and forms of new applications as well as gaining more control over the user's situation [1]. Idea of involvement deeply rooted both in the democratisation of society and in the development of consumer markets. In Northern Europe, democratisation of working life and demands for improved working environments, including the Codetermination Act (Medbestämmandelagen – MBL) and the negotiations between partners in the labour market, have for decades had participation and involvement at the core of their collaborations. This development has contributed to the enhancement of methods such as action research and the development of research circles with the aim of educating employees on how they can exert influence over the work, especially the influence over technology developments [2, 3]. Architectural research carries an important piece of the puzzle to understand the move to democratisation and the involvement of users. Planning people's living environments and urban planning contributed to early reflections and methods on how people can be involved [4–6]. Today there are experiences of how community-based design fosters increased participation and ownership of projects among older people [7, 8].

The identification of needs and configuration of users became of particular importance in the development of human computer interaction research. Interface usability and interactions in IT systems became crucial to achieve success in this area and accelerated the development of different methods of understanding the user, for example, human-centered design, experience-centered design, participatory design, and co-design [9]. Several of these conceptual methods are used in design research, such as co-design and participatory design.

Design research, applied in industrial design, aiming at designing for the production of consumer products as well as for procurement of public goods, has generated considerable interest in recent years. Within the design community, there has long been a discourse on design as research and design by using research that points out the close relationships between research and design and the design-like empirical processes used in engineering sciences and theories used in social science [10–12]. In understanding practice, design sciences make use of authors that explain any design, being social design, as not deterministic; scientific laboratories as reconfigurations of natural and social orders; and practice as situational and contextual [13, 14]. With this discourse and the spread of interest in design practices in the broader research community, methods that directly involve users have grown in number such as participatory design, user involvement, mutual learning and action-oriented design [15–18]. One particular kind of participatory method is "Universal design", also known as "Design for all" or as used in the European context, strive to include all citizens in IT-society: "Inclusive design" [18–20]. The concept of inclusive design has similarities and differences with universal design. Inclusive design is seen as a progressive, goal-oriented process while the universal design is more like a genre of design or a performance measure [21, 22].

Universal design builds on the idea that products, buildings and environments should be accessible, as far as possible, to as many people as possible, not least focusing older adults [23]. Universal design guidelines were developed to create a holistic relation between the product and the user covering seven principles, including equitable access, flexibility, simple and intuitive use, perceptible information, tolerance for error, low physical effort and appropriate size and space for approach and use [18, 24]. The holistic relation by Olander in 2011 proved that there is more to this relation beyond physical and functional properties of the product covered by the guidelines, such as emotional experiences, self-identity and strategies to use products that the users didn't choose themselves [25].

Hence, according to previous publications, appropriate design requires access to users and their own articulation of experiences, needs and preferences, them being experts of their own life situation. A critical aspect is to what extent users should be involved. Arnstein [26] suggests five levels of involvement corresponding to how much influence we can or want to give to users. The highest level representing the most optimal influence is when people themselves are in control, initiating and driving design to accomplish something. The second highest level is when people participate as experts on their own life situation, negotiating and collaborating with designers in partnership. The third level is when people allow commenting on already made-up plans or design. The fourth level is when people receive information and/or are subject to different types of efforts. The lowest level is simply manipulation, where people are objects of other people's actions.

Awareness of the level of user involvement and the consequences it has for designing different solutions is important. There is a tendency for engineers and designers to configure users by scripting appropriate user interaction with technology into its design [27–29]. But we also know that users, in turn, can challenge such scripts and reconfigure technologies when they are interacting with the "lived realities" of users [28] and can become eventful figures in the practice of design [30], also in involvement of different set of practices and practitioners [31]. This paper is based on a social science perspective, drawing from both Design Sciences, Science and Technology Studies (STS) and Critical Gerontology [37, 55]. The ambition with this perspective is to contribute to a richer understanding of how technologies are contextualized and made meaningful and over time become domesticated and embedded in people's lives [32, 33, 56]. In doing this, unnecessary restrictions can be avoided. Technologies being artefacts - man-made - reflect relations, values and norms, not only in the interplay with users but also from the very start of designing and engineering technological artefacts. Whether we are aware of it or not, the image of the user is fundamentally included as we create and design the technology. That image represents our understanding of who that person is and what assumptions we make about their abilities and preferences [34].

2   Purpose

The purpose of developing the design framework presented in this paper is to advance the opportunities to involve older people in the design processes and increase understanding of older people's subjective experience of getting their lives digitised, inviting them to

participate as co-designers, allowing them the role of being consultants and experts of their own lives. In doing so, the design framework methodology contributes to closing the gap between the extensive and rapid digitalisation of our societies and the lack of methods to confidently involve older people in the design. The goal is a matrix of tested co-design methods accessible for the research community, including designers and involved stakeholders. The long-term goal is to provide older people with access to relevant digital resources through methods where they own the interpretation of their own needs and expectations, as a way to emancipate from the stereotypes and limitations underlying design and innovation for older users.

Older people as users of technology and inhabitants of today's digital society are at the centre of the methodological framework presented in this paper. Demographic trends with growing older populations have raised the issue of design related to the needs and demands of old people, especially with regard to digitisation [35]. Despite major investments and efforts to develop digital applications with older people as a target group, the uptake of some digital interventions has proved disappointing [36, 37]. In contrast to the high number of publications, convincing readers that involvement of older people is both important and possible, very few publications suggest *how* to do it [32, 38, 39]. In this paper, older adults are resources for design, sharing their lifelong experiences from technology use and technological change in the societies they endured. Regarding age, this research analyzes cohorts that were born between 1939 and 1963, a group that spans a period of 25 years.

To be involved is to be responsible for the result of the design. Since older people, voluntarily or involuntarily, may depend on other people in some way, they become exposed to the attitudes and expectations of others. The technology today discussed in connection with increased needs for health care and social services, risks limiting their social roles to only patients and care receivers and forgetting that they are also citizens, consumers and fellow human beings, not least experienced ones. For these reasons the framework methodology presented in this paper also includes older people's social resources such as friends, families, caregivers and others that have an influence on technologies used by old people, for example, engineers, designers and planners.

Focusing on older adults in this project, mainly contributes to increased knowledge and method development about co-design with older users but also to general knowledge about user involvement. First, it contributes to concretise the user concept by defining whom we are talking about, not generalising human aspects but, as universal design states, as far as possible, designing for as many people as possible. To select older people as a target group also raises issues, since older people are far from a homogenous group of people with similar needs and demands. As shown in the methodology section below, we solve this by carefully defining which groups of older people we work with in co-design [47].

Second, involving older users, we are challenging an area that is still driven by outdated perceptions of older people. Technology development and design for older users are still guided by stereotypes and outdated images [33, 40–42]. A co-design approach can in this regard prevent misleading design and take the edge off patronising attitudes to user groups such as older people, describing ageing as merely a downhill

process. While physical losses may well be expected, too little attention has been given to the growing experience that comes from lifelong learning [53].

Third, despite the fact that participatory design is well established, very few attempts have been made to involve older people in co-design. The notion that adoption of new technologies among older people is constantly lower than for younger age groups has for a long time perpetuated images of older users as less innovative and in need of more support [43]. Recent studies are questioning these notions by reporting on the great potential to include older adults as sources of innovations [32, 33, 44]. Including older people and their experiences of their daily life have contributed both to innovations and to an increased knowledge of the older people's preferences and the conditions of ageing in digitised societies. These examples encompass designing buildings [45], bikes [46], telerobots [54], furniture [48], digital communications [49], digital games [50, 51, 57, 58], as well as methodological developments [39] and using daily experiences [50, 59].

The technology in focus for this paper are digital applications and systems, especially smart home technologies, for example, "voice smart speakers", smart phones or any other digital application to be used for communication and information transfer in the home or between the home and the world outside the home. Being artefacts, technologies are part of sociotechnical systems shaped by the actors being involved in design. We are not solely focusing on singular applications but the interplay between artefacts, later life and digitised societies.

3 Methodology

The methodological framework presented in this paper is part of the BCON-NECT@HOME project, (https://www.jp-demographic.eu/wp-content/uploads/2017/01/BCONNECT_2017_conf2018_brochure.pdf), which is an international collaboration within the European programme, More Years Better Life, between Trent University in Peterborough, Canada, Utrecht University Netherlands, Open University of Catalonia in Barcelona, Spain and the Royal Institute of Technology, KTH, in Stockholm, Sweden. Establishing "Academic Work Places" (AWP) aiming "at bringing academics and practitioners together, on a continuous basis, to work on a common project, in order to make practice more evidence-based as well as to make academic evidence more practice-based" (Van Woerkum and Renes 2010, p. 573), are located at these universities, we have systematically investigated which types and methods are most suitable to involve older participants and stakeholders. With this set-up, workshop procedures are tested and compared. AWP are resources and there are networks available in every partner country. Some universities collaborate with social movements organising old people or older citizens who form opinion in order to bring about political change. Other universities collaborate with businesses.

The Canadian AWP has mobilized a variety of resources and networks to facilitate their research, including technology and aging networks, such as AGE-WELL NCE (Aging Gracefully across Environments using Technology to Support Wellness, Engagement and Long Life NCE Inc.) and more local research centres, including TCAS (The Trent Centre for Aging & Society). Additionally, the Canadian AWP has intentionally sought to reach and engage with older people not always accessible through organized groups.

In Netherlands workshops are taken place in the GET-Lab (health technology lab), Academie for Health Care, Avans University of Applied Sciences, Breda. The focus is older people's smart phone everyday practises and about the creative things our respondents did with their smart phones.

In Barcelona (Catalonia, Spain), the focus of study was a real-life participatory design activity that involved young and older participants. The observation comprised the design activities in their different stages (from instruments of data collection to answers, the results and the final design implementations). The real-life project observed is an EU-supported project conducted at the Open University of Catalonia, entitled "Decentralised Citizens Owned Data Ecosystem (DECODE) (https://www.decodeproject.eu/). One technology was selected, a mobile app that allows petitions to be signed anonymously but with authentication requirements, which should provide any citizen control over their data.

In Sweden this project is tied into KTH's long-term partnership with a number of businesses designing digital technologies and joint public projects such as Stockholm Digital Care.

A preliminary design workshop procedure was tested at a BCONNECT@HOME project meeting in 2018 in Stockholm. The purpose was to test the procedure and discuss how to apply this procedure developed as part of the Swedish team's AWP to the social and cultural context in the four participating countries. The pilot workshop was a combination of product design described above and a modification of the procedure presented by Joshi and Bratteteig [39].

Older adults are defined as a heterogeneous group of people aged 55 and over, which reflects the objective to include older people not yet at the very end of life. At the same time the groups of older people who will be involved and carefully described differ between the four countries involved. In Canada, older citizens, care providers and designers are involved in a series of focus groups to understand: what are older adults' understandings and insights regarding the use of technologies in their daily lives; where, how, and why are these technologies used (or not used); and in what ways do the stakeholder groups' understandings of technological design and applications coincide with or differ from older adults' experiences? In the Netherlands, experiments about the resourceful and creative daily use of smart phones by older people is ongoing. In Barcelona, the focus is to observe participatory design methods in action, in particular how designers/engineers implement usability test, to evaluate a prototype of a digital platform to control personal data on the Internet. In Sweden, design workshops are conducted with retired engineers and other retired citizens, teachers of a health care college, producers and designers. These activities will be completed and presented in 2020.

This project has combined focus groups and design workshops to more fully explore insights from older people, which have collectively contributed to the team's development of the methodology for their own AWP co-design workshops. The purpose of focus groups, organised in a variety of ways, is to listen, interact with, learn from and gather information on a defined area of interest, not to design artefacts [32]. Design workshops, on the other hand, are aiming at creating or modifying design ideas, mock

ups (prototypes or physical models of ideas) or modifications of already existing technologies. Both models are used in this project and part of the framework methodology. The Canadian team has held a series of four focus groups with 29 older adults. These focus groups were intentionally advertised in less-conventional spaces and as a result, researchers were fortunate to recruit and speak with older people from a wide array of life experiences. Researchers facilitated focus groups lasting between 90–105 min in length. Focus groups started with a question asking what digital technologies older participants use. Conversations covered topics covered topics including the place of technology itself in everyday living, the costs, breakdowns, age-neglectful design, and what kinds of technologies might be desirable and (in)appropriate.

The pilot workshop held in Stockholm in September 2018 was an attempt for the project partners to become part of a design procedure themselves and evaluate its usefulness for developing a methodological framework among the four partner countries. The pilot was a simulation of what a design process can be about. Observations of the evolving social process that took place was documented by the second author of this paper. The social process evolved as three phases. First, a phase of discomfort among the participants in order to get started. Second, finding a way to collaborate in spite of different backgrounds: scientifically and culturally. Third, a phase of slowly socialising with each other.

The scientific and cultural differences were reflected in the set-up of the AWP and in the design ideas that came out of the pilot workshop. Infrastructures, payment models and organisation of welfare services are different in the four partner countries and are expected to influence old people's access to digital technologies and use of digital services. Different stakeholders are available to varying degrees depending on what the collaboration looks like between ageing communities, researchers and business. Cultural values was discussed during the design workshop in Stockholm, for example ongoing transitions from a marriage culture to a divorce/single culture. The personas selected during the workshop were partly based on the nuclear family and traditional values, even though they were divorced and single. Being an older foreigner was one aspect. Technology was associated with being either connected with family as in Spain and Sweden, or to connect with family as in Canada. Scientific differences also became evident during the design workshop and reflect the project participants' scientific background that comes from Design Sciences, Critical Gerontology and Science and Technology Studies (STS).

4 Towards a Co-design Framework

Building on insights from all four AWP, the Swedish team model has developed as outlined in the following three sections:

4.1 Workshop Participants and Stakeholders

Three kinds of workshop participants are defined. First, older participants with lifelong experience and experience of later life. Second, stakeholders involved in the production of technological artefacts: engineers, designers, and business. Third, stakeholders involved as employees to provide home health care or home help services to older people.

One reason behind this selection is to make it possible to make comparisons between the three stakeholder groups, to see if participation in design workshops makes any difference. If such a comparison is planned, one recommendation from the pilot workshop was to hold the workshop with older participants last to give them the opportunity to comment on the result from previous workshops.

4.2 Procedure for Co-design Workshops

The co-design workshop was developed out of the Joshi and Bratteteig [39] four step procedure: create choices; select among choices; concretise choices; and evaluate choices added two steps of importance: introduction and closing the workshop. This procedure is estimated to last two hours, which includes a break for refreshments. The introduction considered as important for the participants to feel socially comfortable and to make sure that they get appropriate and enough information about the workshop. One aspect is ethical issues that should be raised and discussed, i.e. will sensitive data be collected that might run the risk of violating the personal integrity; how to sue the result of the workshop and how to get feedback from the workshop organisers to the participants. The closing of the workshop is important for the same reasons. The proposed six steps are illustrated in Table 1.

Table 1. Procedure for co-design workshops

Steps	Content	Milestone
1. Introduction	Presentation of the purpose of the workshop Presentation of the participants and time limits	Participants informed and socially comfortable
2. Creating alternatives	The workshop leader presents a number of digital applications (pictures or gadgets). Participants can add more alternatives Take time to look at them and discuss	Alternatives on the table
3. Priorities of digital applications	Participants select alternatives that seem to be useful and meaningful to modify or that are creating new ideas Discuss why	A few alternatives selected

(continued)

Steps	Content	Milestone
4. Concretise	Participants discuss how the selected alternatives or the new ideas can be developed and modified to be of use Elaborate in small groups Illustrate and motivate	Alternatives to be modified or invented, concretized and illustrated
5. Evaluation	Participants jointly evaluate every alternative a) General question: Why is this alternative important? Meaningful? Enjoyable? b) Question on preferred changes: How to make the most out of the usefulness? c) Question for this particular user group: Why is this useful for you?	Alternatives evaluated
6. End of workshop	The workshop ends Inform participants how to get feedback from the project	Content participants

4.3   Documentation and Analysis

During and after the co-design workshop, notes should be taken about how each of the groups contributed in each decision. If the results of the design workshops will be compared, this will sort the data with sufficient detail, see Table 2.

Table 2. Organisation of the matrix

	Stakeholder group 1	Stakeholder group 2	Stakeholder group …….etc.
A. Inputs provided when creating alternatives 1. How did the group contribute? 2. What are the suggested alternatives provided by the group? 3. What are the reasons put forward for these suggestions? 4. What level of participation was the group in according to Arnstein? 5. What can be said about the influence of this group in this choice? Did it matter what they said?			

Table 2. (*continued*)

	Stakeholder group 1	Stakeholder group 2	Stakeholder group …….etc.
B. Inputs provided when selecting alternatives 1. How did the group contribute? 2. What are the alternatives prioritised by the group? 3. What are the reasons put forward for these priorities? 4. What level of participation was the group in? 5. What can be said about the influence of this group in this choice? Did it matter what they said?			
C. Inputs provided when modifying or concretising ideas 1. How did the group contribute? 2. What are the modifications or concrete ideas provided by the group? 3. What are the reasons put forward for these modifications and ideas? 4. What level of participation was the group in? 5. What can be said about the influence of this group in this choice? Did it matter what they said?			
D. Inputs provided for evaluating the preferred alternatives 1. How did the group contribute? 2. What is the feedback provided by the group? 3. What are the reasons put forward for this feedback? 4. What level of participation was the group in? 5. What can be said about the influence of this group in this choice? Did it matter what they said?			

It is important for the researchers and designers to realise their role in facilitating and empowering the users to encourage them to participate [1]. This means that we need to critically examine at which level the different groups are actually involved in the co-design workshop and critically examine the organizers' participations.

The result, the experiences working with the design workshop procedure and with the focus group model will be published in future publications.

5   Concluding Remarks

This paper discusses a preliminary design framework methodology aiming at giving older people experiencing digitisation a voice and possibilities to take part in design workshops or interviews. This is an attempt both to learn more about their situation in digitised societies and the role of technology in their daily life. Does it make a difference? Does involving users increase their influence in any way? If the design framework methodology discussed in this paper will increase older people's influence over digitization will show in the evaluation of the trials in 2020. Since there is no actual engineering or design competence involved in the project, a direct influence is not part of the project goal. However, it definitely is an impact goal. The AWPs that are tied into the project are networks and organisations with older people that have great opportunities to create political opinions and businesses with designers and engineers that have old people as target groups for their products and services. With these connections, the project results expect to increase older people's influence of design. Also, the result – the design framework methodology – is supposed to be useful and usable for any stakeholder.

Comparisons of the results from design workshops and with different stakeholders will also add to the knowledge of where the gaps are between old people and stakeholders trying to articulate needs and preferences of older populations. Do they agree or how big are the differences between old people and other stakeholders?

The development work described in this paper is unique in that it allows social scientists to use their knowledge to improve older people's possibilities to make their voice heard. Having competence in social practices, later life and its conditions and combining this with established design procedures and design research will give a new flavour to technology developments, not least critical perspectives on how society's norms and values affect the situation of old people in connection with digitalisation. Should later life be digitised and to what extent? What are their needs, problems, visions and dreams and what is the role of technology in accomplishing this? What makes them becoming wired into technology in an unfamiliar way or more comfortable [52]?

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