From Co-Design to Co-Care: Designing a Collaborative Practice in Care

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Abstract

The design of digital artifacts in general and mobile apps in particular has not been investigated fully from a practice perspective. Mobile apps are commonly designed from a distant, arms-length relationship where they are developed without taking the users’ practices into account. This paper problematizes this notion and takes the point of departure from a collaborative design (co-design) process where the goal was to design a mobile app supporting grocery shopping for the home care sector. We analyse the role of designing a mobile app as a facilitator for collaboration between the elderly’s everyday practice and the caregivers work practice and investigate how these two practices become intertwined. The research questions are: How can the design process be organized in order to foster the formation of a prospective collaborative care practice? What aspects are important to consider when designing with a boundary practice perspective? The findings of this study indicate that organizing the design activities in a certain collaborative manner empowered the elderly and their caregivers and led to the formation of a common, collaborative care practice (herein called co-care). The focus of the design process thereby shifted from designing the digital artifact (framed as a boundary object) to designing the co-care practice (framed as a boundary practice). Our contribution is discussed in terms of design considerations, which can be applied for the facilitation of a collaborative boundary practice. The considerations are of particular relevance for settings where two or more practices are to collaborate and where new conditions are to be created for future co-practice.

Keywords: Co-design, boundaries, boundary practice, practice-oriented research, home care, platforms, platformization, mobile apps.

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Received: 18 April 2017; Revised: 31 January 2018; 20 May 2018; Accepted: 21 June 2018
Accepting Editor: Göran Goldkuhl
1 Introduction

Digital artifacts play a vital role in practices, a notion which has been researched within the field of information systems (IS) for a long while. However, the digital landscape is changing due to the rise of the platform era. The platform era enables mobile apps to be built in a modular manner, which changes the way digital artifacts are designed and built. A consequence of this trend is that almost anybody can build a mobile app for any purpose, rapidly, and often without any consideration of the mobile app’s actual user groups. This development potentially nurtures the detachment of users and practices in speedy development sprints. This detachment between developers, designers and the users of the mobile app can be characterised as an arm’s-length relationship (Levina & Vaast, 2006), where there is a lack of collaboration and intimacy.

However, research on mobile apps for practice has not kept the pace of the technological innovations and the changing digital landscape, and the involvement of practices when designing apps is yet to be determined (Breton, Fuemmeler, & Abroms, 2011). Unfortunately, little is known about how mobile apps feature their practices and what degree of participation the users within the practices should have. Hence, there is a need to focus on how mobile apps should be designed and developed within and for practices. Needs and requirements from the users within the actual practices must be accommodated by adopting a more intimate and collaborative approach (Islind et al., 2016). Goldkuhl (2012, 2015) argues that a digital artifact and the environment in which the digital artifact operates can be called a practice, and what the artifacts do and what the users do must be considered as a whole, for example, in a practice-oriented approach. In this paper, we adopt a practice-oriented approach when designing digital artifacts to understand how participation in the design process should be facilitated. A new digital artifact is to be created through a design process, and a new or transformed practice emerges as a use practice, as a consequence of the design process (Goldkuhl, 2012, 2015). Accordingly, there is a need to dig deeper into how relationships change within and between practices and its members in design processes and how these members collaborate across various practices and form new constellations through the design process (Levina & Vaast, 2006).

Overall, the collaborative design approach (co-design approach) aims to actively involve relevant user groups in the design process, in order to ensure that the results meet their respective needs. It is not sufficient to bluntly state that relevant stakeholders or users need to participate through co-design and the literature varies considerably on who should participate in co-design efforts, as well as when, how, and to what extent (c.f. Sanders & Stappers, 2008). In this paper the term co-design does not refer only to such participation in general, but includes the role of the designer when working with users that are not trained in design. However, the co-design approach is not constructed for the abovementioned changes in the digital landscape, and little is known about co-designing in digital platform contexts, where mobile apps are to be designed. The notion of participation in these changing conditions needs to be disentangled and questions regarding the organization of the design process need to be addressed in order to benefit from such design processes, especially in the current digital landscape of platforms and mobile apps.

This paper is based on empirical data from a 2-year co-design project in the Swedish home care sector. The digital artifact to be designed is a mobile app for a specific home care service, namely online shopping of groceries. The app was built for a tablet,
where the elderly can select their groceries with help from their caregiver as a part of the home care services. Imparting dignity to the elderly enables them to reclaim an independent and well-functioning daily life with sound and healthy decisions in grocery selections as a part of this effort. Home care as the choice of the empirical setting represents an example of the global challenges linked to the advancement of medicine and the demographic reality of an aging society (Kalache, Aboderin, & Hoskins, 2002; Pin & Spini, 2016). Although these advancements are mainly positive, an aging population certainly brings new societal challenges to the world. The home care sector needs to undergo a transformation in order to cope with fewer caregivers per care recipient (e.g. elderly). The increasing need for caregivers for the elderly is expected to increase by 67%–76% between 2010 and 2050 (Ekholm, 2010, 2016). According to the World Health Organization, there will be fewer children under the age of 5 than elderly over 60 by 2020 (WHO, 2014). This has never been the case in the world before. By 2050, WHO (2014) expects people older than 60 years old to total 2 billion (currently, the number is approximately 840 million) (Pin & Spini, 2016; United Nations, 2013; WHO, 2014). The number of centenarians is also expected to increase, from 441,000 in 2013 to 3.4 million in 2050 (Pin & Spini, 2016; United Nations, 2013). In this regard, there is a growing need to identify alternative ways to facilitate care. Creative digital solutions, such as mobile apps, offer new means of communication between caregivers and the elderly and can be one way of meeting the challenges of higher productivity and efficiency while simultaneously enhancing the quality of care. The empowerment of an aging society is also important, now more than ever, because the elderly will occupy a larger segment of society in the near future. The co-design process of a mobile app with elderly users and their caregivers is thereby the focus of analysis in this paper.

In this paper, we investigate a co-design process and the role of designing the mobile app as a facilitator for collaboration between the practice of the elderly and the practice of their caregivers as two separate practices. More specifically, we regard the everyday life activities of the elderly as one practice, and the daily work activities of the caregivers as another practice, and analyse the interaction between the two practices. These two practices were disparate and had limited collaboration before the co-design process was initiated. The overall aim of this study is to develop new insights from collaborative design work on how to facilitate participation and collaboration between two practices, in order to foster the formation of a new prospective collaboration practice supported by digital artifacts. We address the following research question: How can the design process be organized in order to foster the formation of a prospective collaborative care practice? What aspects are important to consider when designing with a boundary practice perspective?

Due to the focus on the formation of a prospective practice through co-design, the practice perspective, alongside the boundary perspective, have served as guiding theoretical concepts. We argue that the insights from this study of a co-design process can function as a useful resource for shedding light on how new practices can be created out of a co-design process. We will provide in-depth empirical insights on the importance of collaboration in an authentic setting when co-designing with heterogeneous practices as well as the importance of the designer’s role and engagement in such a process. Our conceptualisation of the co-design process will contribute to the practice-oriented perspective by providing design consideration as important aspects to take care of in co-design processes, where the goal is to facilitate formation of new types of collaboration across boundaries. In our study, it is contextualised in co-care (collaborative
care) practice, where the elderly and the caregivers collaborated with the digital artifact and created a new boundary practice.

The remainder of the paper is organized in the following manner. In section 2, the theoretical perspective with descriptions of the main concepts that are used for the analysis are presented—that is, the practice perspective, the boundary concepts and the co-design approach. In section 3, the research approach is described. In sections 4 and 5, the findings are described and analysed, and the main implications and contributions to the co-design and practice research are discussed by concluding with design considerations. In section 6, the conclusion of this study is presented.

2 Theoretical Concepts and Related Work

2.1 Practices

The practice lens has been used by various IS researchers in different forms. There has been focus on different aspects of what emerges out of the practice of everyday work (Leonardi, 2015). For example, Wenger (1998) focuses on how social skills emerge out of the practice of work, Orlikowski (2000) focuses on how people develop shared technology patterns, Barley & Kunda (2001) focus on how networks emerge from the practice of work, Brown & Duguid (2001) focused on how knowledge emerges, Carlile (2004) on coordination, and Nicolini, Mengis, and Swan (2012) on people’s ability to collaborate.

This research is also grounded in different theoretical standpoints. Orlikowski (2000) applied Giddens’ structuration theory, Levina and Vaast (2005) applied Bourdieu’s theory of practice, and Klein and Hirschheim (2008) applied Lave and Wenger’s lens to understand practice. Carlile (2002, 2004) conceptualized division in practice and the creation of knowledge boundaries among different collaborating expert groups. However, in one form or another, the stream of literature is oriented towards the consensus of a practice being an ongoing production which emerges through everyday actions at work (Leonardi, 2015; Nicolini et al., 2012 Pickering, 2001; Knorr-Cetina, 2001). The understanding of what constitutes a practice is the foundation for our research.

Assuming a practice is an ongoing production, which emerges through everyday actions at work, allows for the possibility of many practices within one setting. Practices are often complex and a practice is not an isolated instance; instead, one practice is often intertwined with other practices (Nicolini et al., 2012), and as practices emerge, it is interesting to see what happens when new collaborations are initiated with other practices.

To understand what happens when two practices meet, we want to dig into the concept of boundaries, which is a concept rooted in the idea of practice and originates from Wenger’s (1998) communities of practice. Akkerman and Bakker (2011) discuss how boundaries are becoming more explicit, because specialization is increasing and new ways of mapping and mobilizing across various cultural and social practices are emerging. Boundaries can include organizational, social, and/or cultural distances among different stakeholder groups or practices in a collaborative setting. Practitioners or users need to cross boundaries when collaborating with new and unfamiliar work territories and thereby learn how to work with other types of professionals or in new contexts (Suchman, 1993). Such boundary-crossing collaboration is challenging because it requires learning and communicating with new and different practices.
We apply Wenger’s (1998) perspective, in which the concept is based upon the notion that the organization can be considered a ‘constellation of practices’ that is interconnected through boundary spanning and boundary objects (Vashist, McKay, & Marshall, 2010). Wenger (1998) described boundary spanning as encompassing activities that are performed by practitioners to connect; on the other hand, connections can, over time, be called boundary practice as the purpose of those practices is to sustain the connections among ‘several organizational practices’ by ‘addressing conflicts, reconciling perspectives, and finding resolution’ (Wenger, 1998, p. 114). During this process, a boundary practice has the potential to be co-created by the members participating in it.

2.2 Boundaries

Within the research focusing on aspects of practices and their boundaries, boundary objects denote when an artifact fulfills a specific function in bridging intersecting practices (Star, 1990; Star & Griesemer, 1989) or facilitating the creation of new practices. For different practices or actor groups to develop what can be understood as common understanding and facilitate the creation of a boundary practice, the boundary object or a representation of a thought has the potential to be a central resource. An object becomes a boundary object when it serves as a device for transformation, translation, and negotiation at the practice boundaries (Bartel & Garud, 2003; Bechky, 2003; Boland & Tenkasi, 1995; Carlile, 2002, 2004; Natalia Levina & Vaast, 2005; Nicolini et al., 2012; Pawlowski & Robey, 2004; Star & Griesemer, 1989). What is needed to make this happen is models and applications, which can serve as boundary object systems to support knowledge sharing and co-creation of meaning (Boland & Tenkasi, 1995). However, boundary objects can facilitate only parts of the communication surrounding—for example, a digital artifact—and thus, cannot replace communication and collaboration (Akkerman & Bakker, 2011). Boundary objects are often technological artifacts, but can also be other artifacts that link professions or stakeholders, such as drawings or prototypes. Carlile (2004) shows the importance of collaborative practices that span boundaries among different practices and emphasizes the capability of a well-structured boundary object as a representation of each group’s effort in the design process.

Since boundary objects can be considered as links in the communication process, the lens of boundary objects herein constitutes an artifact that has the ability to function as an object that facilitates the crossing of pre-existing boundaries. A boundary object can function as a facilitator of cross-practice collaborations, can be differentiated in its physical form, and can change throughout the collaboration (Islind & Lundh Snis, 2017). As such, these objects can start off as design concepts and evolve and change continuously throughout the design process (Dalsgaard, Halskov, & Basballe, 2014; Islind et al., Forthcoming).

All previous literature, which stems from different theoretical strands, and applies the practice lens in one form or another, does have one fundamental aspect in common: it focuses on practices at work, or on how different practices can collaborate at work. Since the main characteristic of co-design is that designers and users perform design activities together, situations frequently occur in which people with different backgrounds, competences, experiences, and expertise collaborate and conduct design work together as equal partners, even though one practice is part of the elderly’s every day activities. Understanding design processes from this boundary lens means shedding light on the mechanisms that tie the practices together or separate them.
2.3 Co-Design

When participatory design, and later, collaborative design (which was ultimately termed co-design) emerged in the literature, they often took on the design of a specific service. However, we are not only designing products for or with users now; we are also designing complete future experiences and products that construct cultures and new practices that have great impact. In such participatory approaches, the user is regarded as a partner who actively contributes to the design process; the fundamentals of such co-design approaches entail the users having a voice in the design processes that ultimately affect their everyday lives (Joshi & Bratteteig, 2016; Kensing & Greenbaum, 2013). On account of these fundamentals, and the fundamentals of empowering the elderly, co-design was the design vision in this particular design process where the elderly are involved.

The fundamental of co-design involves relevant stakeholders who will subsequently become the users of the digital artifact early on in the design process (Joshi & Bratteteig, 2016). In more complex user situations, where the users consist of more than one stakeholder group, the core of the co-design efforts is bridging the prevailing boundaries. The source of boundaries in co-design is rooted in the interface and dynamics among use practices, design practices, and work practices. In these design situations, pre-existing boundaries are embedded in differences related to competence, professions, values, interests, age, social status, or power. For example, this approach puts together the expertise of the designers and practitioners with the situated expertise of the people whose situations will be impacted by the intended change. According to Malmborg, Binder, and Brandt (2010), a co-design approach in the area of elderly care creates a number of other issues that are related to identity, self-image, and stigmatization when selecting users as co-designers. Accordingly, in a successful co-design process, where elderly users are involved, it is vital that the user participants are able to identify themselves as being future users (Malmborg et al., 2010). Facilitating the collaboration between the elderly and their caregivers early on can thereby function as a basis for the future use situation.

3 Research approach

This paper is based on a qualitative research method that follows the methodology of action research (AR). AR is essentially a change-oriented approach (Cole, Purao, Rossi, & Sein, 2005) and the core activity is to study complex social processes to the fullest (Avison, Lau, Myers, & Nielsen, 1999; R. Baskerville, 1999). AR goes beyond the notion that action can inform practice, as theory can be created through practice, and AR emphasises the collaboration between practitioners and researchers (Avison et al., 1999; R. Baskerville, 1999; Brydon-Miller, Greenwood, & Maguire, 2003; McKay & Marshall, 2001). To achieve collaboration, action research suggests the introduction of change into the social processes and encourages the researcher to use observations to study the effects through interventions in practice (Avison, Baskerville, & Myers, 2001; Baskerville, 2000; R. L. Baskerville, 1999). This approach emphasizes the collaboration between practitioners and researchers, and it is essentially a change-oriented approach (Cole et al., 2005). In addition, it is a democratic and participatory approach that aims to create practical knowledge in order to bring together action and reflection (Brydon-Miller et al., 2003; McKay & Marshall, 2001; Reason & Bradbury, 2001). Both the work situation and the digital artifact has been designed within the purview of
co-design, in collaboration with the caregivers and the care recipients, with an involvement of researchers through interventions in practice. The core activity in this particular AR project was an in-depth study of complex social processes (i.e., the co-design process) (Avison et al., 1999; R. Baskerville, 1999).

AR is not without problems and the control structures in AR projects have been discussed as one of the main challenges (Avison et al., 2001). The control structures relate to issues of so-called authority warrant and initiation, which were carefully considered in this research initiative. Firstly, in regards to authority warrant, appointing internal members from the home care practice and municipality management (who already possess authority of action) in addition to the researchers in a formal reference committee enabled so-called staged domination as an authority warrant. This staged domination made the AR interventions more collaborative and legitimised (Avison et al., 2001). The interventions were then organised by the researchers and analysed as specific interventions that probe the practices. Secondly, the initiation of this study was genuinely collaborative. The welfare challenge was the original starting point and, then we identified the more concrete problem in home care practice—the grocery shopping process. This concrete problem was ‘discovered’ by the researchers and agreed upon by the practitioners (Avison et al., 2001). Further, the development of the digital artifact, whose function was to probe the organization to change and learn, was also legitimized through the collaborative initiation. Thus, all research activities focused on change through action, as well as learning through reflection. The three interventions that were conducted are described in the results section.

3.1 Data Collection and Analysis

The empirical material for this paper includes semi-structured interviews, workshops, and home visits. Representatives from i) the caregivers, ii) the elderly, and iii) the designer participated during the entire design process in different constellations. Their participation entailed fifteen separate-group activities, of which seven were with caregivers and eight were with the elderly. These included three workshops per group and nine semi-structured individual interviews. Furthermore, we carried out fifty-four mixed-group activities involving participants from both groups. These activities all focused on aspects of the co-design process under study. The mixed-group activities consisted of six workshops and forty-eight design activities ranging from design ideas and requirements elicitation to mock-ups and prototype testing. The designer (the first author) played an active role in the project as a researcher as well. Therefore, the designer was engaged in all data collection activities—the workshops, the semi-structured interviews, and the observations during the home visits, where design activities were conducted. The second author was involved in the project as a researcher during the 2-year period.

One of the data collection methods for this research initiative was home visits. The reason for this was partially practical, as not all the elderly were physically able leave their homes. Spending time in the homes of the elderly during the design of the artifact was highly informative for the design process, and this involvement in everyday practice provided insights into the work of the caregivers, the elderly in their authentic setting, and their interactions with each other.

The material was analysed using a qualitative interpretative thematic analysis (Boyatzis, 1998; Yin, 2013) where recurrent themes were identified and then sorted into
categories inspired by the literature on boundaries, practice and co-design. The analytical focus was on the formation of a boundary practice (i.e. a collaborative care practice, co-care) through involvement in the co-design process. The boundary concepts were used as the analytical tools to study the formation of a new practice through engagement in the co-design process and to determine whether participation and collaboration across diverse practices can be facilitated despite existing boundaries. From this, the designer’s role throughout the design process was explored. During the analysis, three activity types (interventions) were analysed: 1) separate user group activities (where the caregivers and the elderly met in separate groups and designed independently of each other), 2) mixed user group activities (the elderly and the caregivers designed partially together in larger group settings), and 3) mixed design activities in an authentic setting (the caregivers and the elderly co-designed together in the elderly’s homes).

3.2 Design Setting and AR interventions

The stakeholders involved in the co-design process were the elderly, their caregivers, and the designer. At the time, the home care organization consisted of forty-three caregivers and twenty-six senior citizens. The elderly were mostly senior citizens, but also included several disabled individuals who still lived at home. Their age spanned from 45 to 96 years of age. The caregivers comprised people with various backgrounds; most had a diploma from an upper secondary school as auxiliary nurses, but some had no education beyond compulsory school. The elderly and the caregivers brought their own expertise to the table. This perspective puts the design process in a social context, where the relations and connections of several user groups and activities take place across various types of boundaries.

The designer was a traditional one, in terms of taking design elicitations, personas, user story development, user experience design, interaction design, and other practical design work while also facilitating the collaboration between the elderly and the caregivers. The designer was also the software architect (and took care of the software requirements) and also functioned as a researcher for the project. Therefore, the role of the designer was to facilitate the collaboration of the other practices, designing the digital artifact in terms of user experience and interaction design while also eliciting software requirement. Herein, we regard the role of the designer as a role, not as a practice.

The AR interventions, through the design process, were performed in three conceptual phases (illustrated in Figure 1). The first intervention was to probe the practices involved in design activities with the elderly, which were separate from the caregivers and vice versa. The second intervention involved combining the two groups into mixed groups in a neutral but unfamiliar setting for both groups. The third intervention involved combining the two groups in more authentic and intimate settings in the elderly’s homes, where they had the authority warrant in a sense and owned the situation much more. However, the caregivers had already been to the homes of the elderly, which implied it was also a familiar setting for them. In contrast to the setting, where the third intervention was conducted, the first and second interventions were performed where none of the participants lived or worked.
There are limitations due to the dual role of a designer and researcher. The limitations can include that a designer will pursue his/her own design agenda. However, as this project was genuinely an action research project, the legitimization of both the actual research question and the actual practical question were conducted in collaboration with the care sector management in the municipality. Thus, the dual role was discussed and reflected on at an early stage, both within the municipality organisation and the research group. The second author of this paper further acted as an impartial researcher, and together we reflected on the results continuously to ensure the quality of the AR process.

### 3.3 Mobile App and Platform Ecology

In this study, the digital artifact is a tablet application (a mobile app built on a digital platform) for grocery shopping in which the elderly still living at home designed the artifact with their caregivers. The digital artifact was designed in an iterative manner throughout the process with the elderly and the caregivers. Due to the iterative design process, the artifact assumed different forms and changed during the design process. This is elaborated in the Findings section.

The software development method was agile (Scrum). The first prototype was paper, and then an interactive prototype was developed. The app was first developed as a stand-alone application only for Android (the third phase in the Findings section). This version of the app was fully functional, but to further explore the development on platforms, the software development continued, and the application was developed again from scratch into a full-scale application on the Cloudbees software development platform. This full-scale app was built for all operating systems. This application had complex integrations and was built using a modular architecture, thereby implying that some modules existed on the platform from the development of other apps prior to this one. The modular architecture implied that certain functions were easier to build, and the platform structure also allowed for more complex software architecture. This platform initiative is discussed further in Islind et al. (2016) and Islind (2014).
4 Findings

In this section, the home care and its two practices are described. The following analysis is structured according to the three interventions (the three phases in the design process): The activities in phase 1 involve workshop and were conducted in separate groups of only the caregivers or the only elderly, that is, not in mixed groups. The activities in phase 2 took place in an unfamiliar location, which implied that the elderly had to move to another place (or they were together in a group at a retirement home a bit away from their homes), and the caregivers were there too, thereby implying that the activities were in larger mixed groups. The activities in phase 3 took place back in the homes of the elderly, which is the natural context for the elderly and the location where the meetings between caregivers and the elderly normally take place.

4.1 Home Care and the Two Practices

In Sweden, the elderly often become dependent on the delivery of home care services. Rather than moving to a nursing or retirement home, living at home with the help of home care is encouraged for those who have the ability. Home care practitioners (i.e., the caregivers) take care of the needs and wants of the elderly who have been assessed as qualifying for such care. The municipality conducts this assessment and takes into account the degree of help a person needs, for example, having groceries bought for them by the home care organization. As this is one of the biggest service delivery aspects for the elderly, who continue living at home, the process of grocery shopping needs to run smoothly and efficiently. Previously, the caregivers collected handwritten shopping lists and cash money and then went shopping for five elderly clients at a time. This process involves various human factors, such as the elderly accusing the caregivers of stealing money due to vague memories of how much money they gave the caregivers the day before when the caregivers came to pick up the shopping list and the money. Occasionally, there were also cases of wrong groceries being delivered later on. Other incidents that led to disputes have also been reported. In summary, the handling of money has been severely dysfunctional, and other problems included lack of quality in service delivery and mistrust. To hand money or a payment card over to a caregiver, who an elderly person might be meeting for the first time, is precarious since there is not always sufficient time to establish important trust. Similarly, the caregivers did not consider it optimal or feel right handling money and having the forced responsibility of bringing the right change back to the elderly. Although such incidents usually had a logical explanation and were resolved in a good manner, they put unnecessary stress on all parties involved.

The elderly were frail older adults, and most of them had a hard time leaving their homes. Some elderly lived in apartment buildings without an elevator, and their need for mobility aid or a wheelchair meant that their ability to go outdoors was limited. Others had age-related memory loss or similar age-related issues that restricted their daily activities. However, the elderly had plenty of time, and most missed being part of a social context. The everyday practice of the elderly included writing handwritten shopping lists, preparing the money, and handing over their shopping task to the caregivers once a week. This implied that there was no room for spontaneous shopping on a Friday for example, because the shopping list had to be ready on a Tuesday for the shopping that was to be done on Wednesday.
In sum, the caregivers’ practice involved gathering the shopping lists from the homes of the elderly, along with some means of payment, going shopping for five elderly people at a time, paying for the right groceries with the right wallet, carrying everything to their car, and driving back to the respective homes to deliver the groceries. Once home, they would open a key concealment where the key was hidden, go into the homes of the elderly, and put the groceries into the cabinets, freezer, and refrigerator, as needed.

The caregivers want to work with care, and they mostly dislike the task of grocery shopping on behalf of the elderly because, in addition to being time-consuming, the task leads to the burden of handling others’ money and associated errors and mistrust. Further, as the caregivers went shopping without the elderly, and then delivered the groceries to the elderly’s homes, the interaction and collaboration between the two practices was truly limited before.

4.2 The Co-design Process

Herein, we regard the elderly as one practice and the caregivers as another practice, as their tasks are not interrelated and the practices neither have interaction nor overlapping actions in the first phase. The analysis of the findings is structured according to the three design phases. Phase 1 involves separate practices. However, phase 2, the practices begin to be mix, which we regard as mixed practices. Finally, phase 3 involves mixed practices in an authentic setting.

4.2.1 Phase 1: Design Activities in Separate Groups

The digital artifact to be designed is intended to enable the elderly to shop for groceries from their respective homes, via a tablet. Traditionally, caregivers had to go grocery shopping for the elderly, which took up most of their designated time and resulted in the caregivers and the elderly spending very little time together. In addition to being time-consuming, the shopping solution included handling other people’s money with potential mistrust, mistakes, and a lack of freedom for the elderly to select groceries based on current supply.

In the early phases of this research initiative, the elderly were sceptical. One elderly said, ‘Well, I have been more or less opposed to the use of technology because you hear so much fuss about the use of it in the news’. Another agreed: ‘There are probably many people who are afraid because of the increased risk of fraud’. Others were more positive: ‘Using the Internet changes our lives. I started using technology early, and for a retiree, it will be amazing to be able to order home groceries’.

As an attempt to find common ground for the elderly and the caregivers where the elderly would not feel that they are at a risk of being cheated or fooled because they would now be connected to the Internet, the caregivers were interviewed in a group as well. In the initial phases, a caregiver stated, ‘You often hear that the elderly feel that there are too many caregivers who come and go. And that is important to remember. It’s really the most severe criticism you hear. But this does not necessarily affect this. Rather, that an initiative like this could reduce the running among the staff?’ Another caregiver stated, ‘It has been hard to maintain the grocery shopping routine. Today, there is a priority in the queue while shopping, but it’s still a big project to go grocery shopping for five [households]’. The caregivers did not share the worries of the elderly regarding the Internet; however, the caregivers emphasized the importance of building trust between the caregivers and the elderly.
The expectations and wants of the elderly group and the caregiver group differed. The elderly considered aspects from another angle, thinking about everyday life with technology, while the caregivers were concerned about their practice. Members of the two practices, the everyday practice of the elderly and the work practice of the caregivers, did not share the same concept regarding the function of the digital artifact. At this time, they were still working in separate groups, discussing the same artifact but with different views, worries, and expectations. The artifact evolved in the iterations from a paper prototype. These paper prototypes were similar to the ones presented in Figure 2. They were co-designed with the elderly, brought to the caregivers, who made some adjustments, and then brought back to the elderly. This process was inefficient, and the views of the two practices did not coincide.

![Figure 2: The paper prototypes from phase 1 of the design process](image)

The designer had the role of going back and forth between the two distinct groups of practices and negotiating between them, attempting to construct and negotiate consensus between the expectations for the artefacts’ impact on the groups’ practices. The design of the artifact was the focus, while the user experience for each practice group was also the focus.

### 4.2.2 Phase 2: Design Activities in Mixed Groups

During phase 2, the members of the two practices were brought together in an attempt to find common ground. The elderly and the caregivers sat together in workshops where prototypes were elaborated. For example, some group activities during this phase were held in a nursing home where the elderly did not live (they continued to live at home), but the setting was convenient because a larger meeting room was available. The elderly were picked up from their homes and driven there by bus, and the setting was not familiar. Designing the digital artifact in joint sessions generated further needs and desires. For example, the elderly expressed curiosity about what other groceries to buy; therefore, a function that presents the most popular choices among all buyers was developed. The initiative was brought to a design session and was sketched and prototyped. Then, the caregivers and the elderly interacted with a prototype together. The caregivers were slightly sceptical about the popular choice function, because the elderly might not understand that they would never see specifically what their neighbour was buying but only what most of the elderly were buying (i.e., the most popular choices). However, this was not a problem. Adopting this user-focused perspective generated
innovative user ideas, thereby making the design of the digital artifact richer and the artifact itself more focused and more suitable for the targeted groups.

In a design session, a cognitively impaired user (who also received home care) stated, ‘Good with different colours. Very good’. While this individual tested the prototype, he pressed the different icons and navigated in the digital artifact very quickly. He did not place any items in the shopping basket, but merely navigated and looked around. He smiled and seemed very happy with the colours. Thereafter, a caregiver said, ‘Those with mental disabilities, such as X and Y in the group, they are unable to read but were able to use clear icons, and the pictures were very important. Moreover, if you no longer read every day, we see that much of that ability disappears’. That last comment, regarding reading skills in general, is a highly relevant issue in the care for frail elderly because their reading skills may have deteriorated.

The mixed groups activity was an attempt to bring the needs of the two practices closer together, and the attempt was so successful that all future activities in the design process were arranged in mixed group. For example, in the mixed group activities, the elderly and the caregivers began to appreciate each other’s needs and acknowledged that both perspectives could co-exist. The co-design process continued to evolve, and when the mixed groups worked on the artifact’s design, they simultaneously developed a new way of handling the shopping task together. One caregiver stated:

‘We want to encourage the dialog between us and the elderly. In a perfect world, the caregivers and the elderly can talk, and that is what we want to accomplish, an easy discussion without it having to be too personal. Today, we function more as assistants, and we want to have a more caring role.’

During this period, the caregivers and the elderly sat together but did not share consensus at all levels. The caregivers had one view in mind regarding how the artifact would facilitate different needs: ‘The elderly patients regain the control of their own decision making regarding choice of eatables, as well as control over their payments. For the staff, it is the relief of not having to shop and being able to focus on care’. During this design session, the caregivers began facilitating the needs of the elderly in a more structured manner. They understood that the caregivers also wanted to spend time with them and help them regain control of their own decision making. During this phase, the option of mobile payments was further developed. The prototype from this phase is illustrated in Figure 3.
In this phase, the designer’s role no longer involved negotiating and bringing the other group to the table, but became more of an advisory role to facilitate the needs of both practices and translate the needs into a design.

Although the two practices had begun to find consensus, the elderly did not speak much during these joint sessions, when there were a few elderly and a couple of caregivers present. To turn that challenge into an attempt to empower the elderly to speak much more, the next design phase was moved to the homes of the elderly.

4.2.3 Phase 3: Design Activities in Mixed Groups in Authentic Setting

During phase 3, the design activities were performed in the homes of the elderly as an attempt to include them more in the design process. The desire to eat became a part of the design process. A caregiver stated:

‘What we need to remember is the desire to eat. The appetite is something that needs to be promoted. Writing words on a piece of paper does not make one desire to eat. They should get the chance to desire chips on a Friday or a new tasty type of soup. Many elderly need to think of their food consumption because of their physical state so the importance of appetite is even higher for those who seldom eat.’

An elderly person said, ‘I have not been to the store for eight years. I would like to see what the local grocery store has to offer. I always write [on the list] the same products, week after week, year after year’. Being able to see the products and sort through the assortment was an empowering factor in the design process. The elderly liked sorting through the products and looking for an item, but scrolling easily tired them.

During this phase, rapid prototyping became a sharp development. The first version of the application is depicted in Figure 4.

The close collaboration and the spontaneous reaction to the way the digital artifact evolved throughout the design process led to a range of design decisions, including the decision to prioritize high-resolution images for the products presented in the digital artifact, in order to make these products as aesthetically pleasing as possible. It was a challenge to promote the appetite of the elderly and enrich their experience through images.

Although this mobile app could have been sufficient, the desire to have a small social media function was one of the reasons the design process continued, and the application was rebuilt on the digital platform. In addition, the interaction design was improved. Figure 5 illustrates the full-scale application built with a modular architecture on the digital platform and as part of a digital ecosystem.
After a few iterations and testing of the images, they were finally sufficient in size and clarity. An elderly person stated:

‘The images are so clear! It is wonderful! It would be nice if the photos in the shopping cart on the right side would be bigger. Oh, it is so neat that the price is adjusted immediately when I select the bananas I want to buy. The text needs to be clearer though. I have such bad eyesight.’

These particular comments led to design decisions of enlarging the size of the photos of the products placed in the shopping cart. The total price increases immediately when a product is placed in the cart, an option tested with the functional prototype, as it was too difficult for the elderly to imagine these changes without a visual prototype. The text size was adjusted accordingly, and the colour changed to completely black. In addition, the font was tested among the elderly and carefully selected according to their wishes. The elderly thereby chose the picture size, colours and fonts alongside their caregivers. The menus and buttons were also placed to fit both target groups, in accordance to how they placed their hands on the tablet during testing, which separates this artifact from other grocery shopping apps. The process of grocery shopping also changed. When using the digital artifact, the groceries in the mobile app were chosen and put in a virtual shopping basket, which was always visible. When the shopping basket was full, the elderly paid for the groceries themselves using mobile payments, which was carried out with a credit card transaction built-in in the app. The credit card information was stored in a token, so that neither the elderly nor the caregivers could access the information. This was both to move the responsibility of the transaction from the caregivers to the elderly, i.e. the caregivers no longer handled money or payment cards at all and due to the notion that some elderly had a relative responsible for their economy.

The grocery store received the orders from the elderly via another app, which was a backend app, i.e. a grocery store app, which was also designed as a part of this project (but not the study object for this article), and the grocery store personnel would pick and pack the groceries directly from the inventory room before the store opens the morning after the order. The caregivers retrieved the grocery bags at the store, and went to the elderly’s homes where they unloaded the groceries into the freezer and pantry.

In the early design phases, the elderly perceived their thoughts as invalid, as they felt they were too old and had too little experience with technology to make a difference. However, as the process progressed, they felt differently since they realized and saw (during the rapid prototyping) the value of their contribution. An elderly person
said, ‘I have been scared of technology, but this is not so terrible. Even we, old people, can use this, probably because it is partly designed by old people’.

The close collaboration and their spontaneous reaction to the way in which the digital artifact evolved throughout the design process led to more design considerations. For example, comments from the elderly regarding how the pictures triggered more active decision making for more varied grocery shopping habits resulted in prioritizing high-resolution images to make the products as aesthetically pleasing as possible to trigger the lack of appetite the caregivers had indicated. In addition, larger pictures of the products were integrated into the interface because some of the elderly had mentioned bad eyesight.

The elderly and the caregivers discussed the digital artifact and its design while discussing the impact of the artifact on their joint task of shopping together. In that dialogue, the designer’s role also evolved into being a facilitator of communication. The designer became detached, and the newly formed boundary practice was a fact and owned the situation collaboratively.

5 Discussion

When a new or transformed artifact is created out of a design process, and a new practice emerges as a use practice, as a consequence of the design process (Goldkuhl, 2012, 2015) it can be discussed from the practice lens. Involving the relevant users (who later would become the end-users of the digital artefact) early on is crucial in co-design (S. G. Joshi & T. Bratteteig, 2016; Kensing & Greenbaum, 2013). One reason to this early involvement of elderly, is so that they can identify themselves as the future users (Malmborg, Binder and Brandt, 2010). The findings show how participation in the co-design process over time led to the app functioning as a boundary object, which facilitated the crossing of boundaries between the practices of elderly and caregivers. Boundaries arose due to differences related to roles (professional role versus private person), power (caregiver versus care recipient, i.e., the provider vs. the needy), context (being in someone else’s home versus one’s own home), age differences, and differences in technology experience and competence, to mention a few. Hence, the elderly and the caregivers created a new collaborative practice, a boundary practice, which we refer to as co-care. The co-care practice now owned both the needs and the values of the boundary practice activities. Many subtle boundaries were bridged due to the particular situation in which the elderly and their caregivers collaborated on designing a common artifact that supported the needs and desires of both groups. Thus, during the design process, there were several apparent shifts with respect to boundaries; we discuss these in the following sections.

5.1 From Co-design to Co-care

Our findings indicate that the organisation of the design process must be collaboratively set into both separate and mixed-group design activities that can bridge preconceived understandings and taking the point of departure from the different practices, first separately and then together. This facilitated negotiation to take place and encouraged the creation of an own, new boundary practice (Wenger, 1998). The mobile app was regarded as a boundary object that changed continuously, into various representations of the digital artifact (see Figure 6) throughout the design process (Dalsgaard, Halskov, & Basballe, 2014; [blinded for review process]).
It can be critically reflected whether the involvement in the design process over time, increased the maturity of the elderly and the caregivers as they got acquainted with the design activities and technology challenges that were discussed, leading to increased confidence during the following phases in the design process. However, during the early phases when the design activities were performed in separate groups, the focus was on their own practice, their own needs and not on the collaboration between the two practices. In phase 1 (separate group activities), only one practice’s point of view was brought forward to the designer at the time, leaving the designer with the difficult task of negotiating often contradictory needs and desires on behalf of one practice to the other practice and combining different visions from both practices into one holistic design vision. Proceed the design process in separate groups could thereby have fostered consolidation of self-contained routines, as the members of the practices had not collaborated before when the grocery shopping mainly consisted of divided tasks where the elderly planned the task of grocery shopping and the caregivers executed it.

The role of the designer in traditional design processes, is generally to negotiate between user groups. Making participation happen over the boundaries in the design process requires coordination and negotiation (see Figure 6, phase 1). Consequently, the designer has the main responsibility as negotiator who is to interpret, negotiate, and combine conflicting ideas into one cohesive design vision.

The two practices, that on beforehand did not share consensus, started to form a working relationship (Kimble, Grenier, & Goglio-Primard, 2010; Kimbler, 2010; Star, 2010; Star & Griesemer, 1989; Wenger, 2000) during phase 2 (see ‘formation of boundary practice’ in figure 7). The digital artifact functioned as a boundary object between the two practices during the prototyping as a device for transformation, translation, and
negotiation at the boundaries (Bartel & Garud, 2003; Bechky, 2003; Boland & Tenkasi, 1995; Carlile, 2002, 2004; Natalia Levinga & Vaast, 2005; Nicolini et al., 2012; Pawlowski & Robey, 2004; Star & Griesemer, 1989), particularly due to the mixed group activities in phases 2 and 3. Its function was to strengthen the cohesion between the two practices and facilitate the two to work together in a new manner in order to reach consensus (Akkerman & Bakker, 2011; Carlile, 2002, 2004). Moreover, the caregivers and the elderly crossed the boundaries of their separate practices and created a new boundary practice characterized by increased cohesion when using the boundary object as a facilitator of communication and collaboration (Fischer, 2001; Kimble et al., 2010; Star, 2010; Star & Griesemer, 1989; Wenger, 2000).

Almost all design activities that were significant (i.e. design ideas that were realized in the digital artifact) arose and evolved during phases 2 and 3 (the mixed group activities), in which the caregivers and the elderly directly discussed their respective perspectives and negotiated different ideas with each other and came up with common ideas.

The designers’ role during the mixed group activities in phase 2, shifted from being a negotiator to a facilitator, as much of the negotiation was left to the two practices to discuss new meaning between them. Therefore, the co-design process slowly changed from being primarily about design of the digital artifact to primarily being about the boundary practice of co-care.

The authentic setting played a crucial role in phase 3, enabling more insightful design decisions, which benefitted both practices (the elderly and the caregiver) to support the task that they were to be collaborating on. This enabled the formation of a new collaborative care practice, the co-care practice. The aim of co-care was to support the re-designed task of grocery shopping where the elderly and the caregivers would sit together and select the groceries. The grocery shopping changed dramatically through the design process, from a service executed solely by caregivers to the passive elderly, to a mutually engaging and negotiating activity. This closeness and interaction during phase 3 was completely new, a new way of collaborating in the elderly’s homes. What also was changed was that the caregivers no longer had to spend time in the grocery store, neither selecting groceries nor standing in queue as the grocery store personnel did the picking and packing activity. By re-allocating and restructuring the caregivers’ time, there was now an opportunity for the caregivers and the elderly to sit down and use the digital artifact in collaboration while socialising and spending time together. Hence, the shift in responsibility was manifested and embedded in the co-care practice that included the added aspect of social closeness for the elderly.

Consequently, there was an increased focus on user empowerment and democracy as both practices began taking each other’s arguments into account to a larger extent when they were brought together and were in the same room during the design activities in phase 3. Having the two groups negotiating their design visions and focusing on finding shared goals influenced the quality of the digital artifact. Furthermore, the caregiver’s role changed from sole service-provider and evolved into the role of an advisory co-shopper, who could discuss the nutritional aspects of health and care. In addition, the power relation also changed and became much more equal, as the elderly had the opportunity to select available groceries, be aware and in control of the expenses during grocery selection, and participate in selecting other popular choices made by other el-
The role of the designer in phase 3, shifted even more, where the designer went from being the facilitator to being an advisor who was asked for advice on certain issues that the fully formed boundary practice had designed and prepared. Consequently, the designer was able to take a step back as the co-care boundary practice grew stronger. This boundary practice was found to be closely linked to developing a shared boundary object together, and allowed the two groups to represent their own expertise and merge that expertise within the joint practice (Carlile, 2002, 2004).

5.2 Design Considerations

The findings indicate that by applying a co-design approach with a practice lens led to the formation of a boundary practice. In our study this was contextualised in co-care practice, where the elderly and the caregivers collaborated with the digital artefact and created a new boundary practice. Our conceptualisation of the co-design process will contribute to the practice-oriented literature by providing design consideration as important aspects to take care of in co-design processes where the goal is to facilitate the formation of new types of collaboration across boundaries. Based on the findings the following three design considerations can be identified:

i) Co-designing with boundary objects for two different practices
The co-design approach is applicable when designing mobile apps for practices, especially when two or more disparate practices are involved, which have not been collaborating before. Bridging boundaries through the co-design of a boundary object implies that the design situation is designed to resemble the future practice where the app is to be incorporated and used collaboratively. In line with the changes in the digital landscape, where many users and practices are disregarded during the design process, we argue for a collaborative and participative design process in which users as members of different practices can be co-producers, co-users, and co-creators of service delivery through the co-design of mobile apps. Due to these changes, there is a need to broaden the practice lens and taking in not only work practices but also use practices as customers and co-creators of a particular service.

ii) Co-designing in an authentic setting for empowerment
Bridging boundaries by conducting the design activities in the authentic setting close to the experience of the service delivery means that the process is designed to resemble the future practice where the app is to be incorporated and used collaboratively. Doing this in the authentic setting empowers the two practices involved and facilitates the formation of a boundary practice. Design decisions inspired and expressed in the authentic situation are more relaxed, insightful and feasible for the digital artefact as they are inspired directly from the actual surrounding setting. Members acting in its own authentic setting shared designated and relevant ideas upon several design decisions.

iii) Attaching the agency of co-design to the boundary practice itself
The designer’s role changed from being a negotiator between the two separate practices to being an advisor to one boundary practice. The intimate relationship the designer needed in the beginning was not necessary when the co-care boundary practice was in
place. Instead the designer was able to take a step back and delegate the discussions to the boundary practice itself. The role of the designer therefore changes from an intimate negotiator to an advisory role characterized as an arm’s-length relationship (Levina & Vaast, 2006) as the designer successively left the negotiation to the boundary practice and adopted a more passive role. Much of the literature favours designers and developers in an arm’s-length relationship. However, in a co-design process, the designer needs to go from intimate to arm’s-length over time. The opposite was true for the practices. The relationship there can go from being a distant, arm’s-length relationship between the two distinct practices to an intimate co-care relationship over time, fostered in a new boundary practice.

6 Conclusion and Further Research

The research questions for this study were: How can the design process be organised in order to foster the formation of a prospective collaborative care practice? What aspects are important to consider when designing with a boundary practice perspective? We have shown how the creation of a boundary practice can evolve provided that the design process is organized in a manner where the different practices take an active part in designing the artifact together on equal grounds, in ways that their respective perspectives and needs are discussed and negotiated in an authentic setting. We argue that when designing mobile apps, a co-design approach can bridge boundaries between practices to facilitate a new boundary practice to form through engagement. Creating design with practices and users, who have different backgrounds and domains of interest, raises what we define as boundary issues.

Our contribution is a practice-oriented design approach combining co-design principles with boundary theories formulated as three design considerations concerning: i) Co-designing with boundary objects for two different practices; ii) Co-designing in an authentic setting for empowerment issues; and iii) Attaching the agency of co-design to the boundary practice itself.

The contribution from this study will extend existing knowledge on practice-oriented approaches and in particular, how a boundary practice can emerge when two or more different practices collaborate in a design process. This study was contextualized in a care context aimed at developing a mobile app for two different practices; the elderly’s everyday activities of selecting groceries and the caregivers practice of helping with the grocery shopping. Creative digital solutions, such as mobile apps, offer new means of communication between caregivers and the elderly and can be one way of meeting the challenges of higher productivity and efficiency while simultaneously enhancing the quality of care. Taking these design considerations to be explored for other settings might be of relevance, especially if the setting is to be developed into a co-creation manner, where several beneficiaries meet the services and values delivered from a professional practice of any kind. Thus, we suggest a broadened view of a practice into a multiple view where not only work practices are regarded, but also everyday practices in which users/customers/individuals take part.

Future work could include exploring larger design processes, such as the design of platforms, and how heterogeneous practices collaborate in the design process of larger, more complex efforts. That is, a higher level of abstraction where the focus is on a larger platform ecosystem. These types of efforts have the potential to facilitate the formation of boundary practices and explore if there are different characteristics of
boundary practices, depending on the type or level of collaboration. Further work could also include exploring the active use of different types of boundary objects in a co-design process, as a more strategic way of forwarding the design process. Moreover, future research could include testing the design considerations in another setting, either within care or within other settings, where heterogeneous practices with different user goals are engaging in a co-design process, where the aim is to facilitate the formation of a new boundary practice, which resembles the use situation of the digital artifact that is being incorporated in the heterogeneous users’ interaction.

References


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