

5-15-2019

HEALTHY, ACTIVE AND CONNECTED: TOWARDS DESIGNING AN AGE-FRIENDLY DIGITAL NEIGHBORHOOD PLATFORM

Pascal Vogel

University of Hamburg, pascal.vogel@uni-hamburg.de

Natalija Jurcevic

University of Hamburg, natalija.jurcevic@uni-hamburg.de

Corvin Meyer-Blankart

University of Hamburg, corvin.meyer-blankart@uni-hamburg.de

Follow this and additional works at: https://aisel.aisnet.org/ecis2019_rip

Recommended Citation

Vogel, Pascal; Jurcevic, Natalija; and Meyer-Blankart, Corvin, (2019). "HEALTHY, ACTIVE AND CONNECTED: TOWARDS DESIGNING AN AGE-FRIENDLY DIGITAL NEIGHBORHOOD PLATFORM". In Proceedings of the 27th European Conference on Information Systems (ECIS), Stockholm & Uppsala, Sweden, June 8-14, 2019. ISBN 978-1-7336325-0-8 Research-in-Progress Papers.

https://aisel.aisnet.org/ecis2019_rip/5

HEALTHY, ACTIVE AND CONNECTED: TOWARDS DESIGNING AN AGE-FRIENDLY DIGITAL NEIGHBORHOOD PLATFORM

Research in Progress

Vogel, Pascal, University of Hamburg, Hamburg, Germany, pascal.vogel@uni-hamburg.de

Jurcevic, Natalija, University of Hamburg, Hamburg, Germany, natalija.jurcevic@uni-hamburg.de

Meyer-Blankart, Corvin, University of Hamburg, Hamburg, Germany, corvin.meyer-blankart@uni-hamburg.de

Abstract

Due to declining fertility rates and rising life expectancy, the world's population is ageing at an unprecedented pace. This demographic change is expected to exert pressure on social security as well as healthcare systems and poses the risk of social exclusion of the elderly. As urban areas are home to the majority of the global elderly population, they are disproportionately affected by this development. Cities have begun responding with strategies ranging from policy and regulation reform to investments in innovative healthcare technologies with the goal of becoming "age-friendly". Enabling the elderly to live a socially active, healthy and self-determined lifestyle past retirement are among the prime objectives for alleviating the challenges of an ageing society. With increasing urbanization, human, technological and infrastructural resources of urban contexts or neighborhoods have presented themselves as important determinants of elderly well-being. We propose that an age-friendly digital neighborhood platform can activate and leverage these resources to the benefit of the elderly population, contributing to the mitigation of the challenges of an ageing society. Following a design science research approach, we develop design principles for such an age-friendly digital neighborhood platform and evaluate a prototypical instantiation in two case neighborhoods in a German metropolitan area.

Keywords: digital neighborhood platforms, neighborhood social networks, age-friendly design, design principles, design science research

1 Introduction

The world's population is ageing. In 2017, the global population aged 60 years or older amounted to 962 million and is expected to double again by 2050 (Leeson, 2018). Already, the world's current population is the oldest it has ever been (UN, 2017). With more and more people leading longer lives, the age structure of countries in the rich developed world is undergoing a shift – from pyramids to columns – with the ratio of people above retirement age to those of working age rising, necessitating pension system reform (Turner, 2009). Besides putting increasing pressure on health and social security systems, population ageing brings about various cultural, economic, social and medical challenges (Sander et al., 2015). As people aged 70 or older spend around 80% of their time in their home or their immediate environment, their neighborhood plays an important role in determining their well-being (Wahl et al., 2012). In this regard, social isolation and loneliness, established as being comparable to risk factors for mortality such as obesity, alcohol consumption and smoking (Holt-Lunstad et al., 2010; Coyle and Dugan, 2012), are particularly common among older adults and negatively impact other health-related behaviors such as inactiveness and smoking (Shankar et al., 2011). Population ageing is more prevalent in urban than in rural areas, leading to high concentrations of the elderly in urban agglomerations (UN, 2017; EU, 2017). Therefore, cities see themselves as on the forefront of meeting the challenges of an ageing society and are increasingly implementing solutions such as neighborhood management services or innovative healthcare technology for ensuring a high quality of life for an increasing elderly population with the goal of becoming “age-friendly” cities (Buffel et al., 2012). According to Plouffe and Kalache (2010), age-friendly cities are characterized by features such as inclusiveness, service proximity, security and accessibility. Neighborhoods are rife with public and private actors, resources and infrastructure (Meyer-Blankart et al., 2013). For the elderly, being able to access these features has a significant influence on shaping the experience of inclusion and exclusion (Buffel et al., 2013).

In an ageing society, information technology such as ambient assisted living, wearable devices and telemedicine can help ensure that the elderly enjoy a self-determined and self-sufficient lifestyle (Koch, 2010) and using information technology and the internet has been shown to positively influence elderly social well-being (Hasan and Linger, 2016; Chopik, 2016). Usage of online social networks (OSNs) is rising among the elderly (Pew Research Center, 2018; Anderson and Perrin, 2018). OSNs can potentially support the elderly in overcoming loneliness, enhance feelings of self-efficacy and offer the opportunity for receiving and provisioning social support (Leist, 2013). Despite the organic formation of local social networks being evident on established OSNs in the form of groups or sub-communities (Ilena et al., 2011), research on community or neighborhood-level social networks is scarce. When implemented, neighborhood social networks can serve as a natural bridge between digital and local connectivity (Hampton, 2007). Meanwhile, commercial neighborhood social networks such as Nextdoor or nebenan.de are attracting large amounts of users who perceive them as more personal, private and relevant as opposed to public OSNs such as Facebook (López et al., 2015). However, existing OSNs do not consider the needs of elderly users and there is a lack of design knowledge for designing artifacts in the context of OSNs for the elderly (Boll et al., 2017; Goswami et al., 2010; Keijzer-Broers et al., 2014). As the elderly dislike the lack of privacy and the triviality of public exchanges on public OSNs, private communities could allow for more intimate and meaningful social interaction (Harley et al., 2014). This leads us to the following research question:

RQ: What are design principles for an age-friendly digital neighborhood platform?

In this research project, we propose that an age-friendly digital neighborhood platform can contribute towards mitigating the challenges of an ageing society. With this digital platform, we aim to go beyond a mere online social network. Akin to the concepts of resource liquefaction and resource density (Lusch and Nambisan, 2015), we aim to use our digital platform to make the available actors and resources of a neighborhood such as its inhabitants, institutions and service providers, available and accessible in an age-friendly manner. As an intermediary, our platform provides the preconditions for self-organization (Hamari et al., 2016) of these actors. Therefore, we consider the term *platform* as more descriptive in the context of our design principles and instantiated artifact. Based on recommendations by Gregor and Hevner (2013), we structure the remainder of this paper as follows. In Section 2 we outline related work

on the relationship of the elderly towards OSNs and neighborhood social networks. In Section 3 we present our research approach including completed and planned activities. Our initial design principles as well as their instantiation as a website and mobile application are presented in Section 4. First results of our evaluation in two case neighborhoods are presented in Section 5. We conclude with a summary and expected contribution of our research project.

2 Related Work

2.1 Online Social Networks and the Elderly

The term elderly is somewhat ambiguous, often used synonymously with other terms such as seniors, senior citizens or older people (Rockmann et al., 2018) and varies widely between different viewpoints such as biology, employment and retirement, demography or sociology (Encyclopedia Britannica, 2018). An age of 65 and above is considered a widely accepted definition for the term elderly, as this age coincides with the occupational retirement age in most developed countries (WHO, 2015). The post-retirement age is characterized by significant changes concerning factors such as one's social network, income and daily life in general which in turn may have effects on health (Coe and Zamarro, 2011; Behncke, 2012) and is therefore chosen as a working definition in this research project. Online social networks, "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (boyd and Ellison, 2007), are becoming increasingly popular among the elderly (Anderson and Perrin, 2018). In the United States, 41% of people aged 65 years or more use Facebook, representing 4% of Facebook's total U.S. audience (Pew Research Center, 2018). Among the elderly, adoption of OSNs is often driven by utilitarian as opposed to hedonic outcomes while non-adoption can often be traced back to fear of technology (Maier et al., 2011). A lack of consideration of age-related changes such as declining vision, coordination skills or memory further contribute towards non-adoption, necessitating a more age-friendly design of OSNs (Boll and Brune, 2016; Boll et al., 2017).

Regarding adoption of OSNs and internet use, elderly people in the same age group cannot be considered a homogenous group as they exhibit varying behavior depending on factors such as education or income (Niehaves and Plattfaut, 2014; Hunsaker and Hargittai, 2018), leading to a digital divide (Rockmann et al., 2018). Just like their younger counterparts, the elderly can derive feelings of social connectedness from OSNs (Sinclair and Grieve, 2017). OSNs afford people which lack an opportunity to make face-to-face contact with others the possibility of gaining social connectedness (Grieve et al., 2013). According to Leist (2013, p. 382), OSNs enable the elderly "to provide and receive social support, overcome loneliness as well as to enhance feelings of control and self-efficacy". Goswami et al. (2010) propose using OSNs as a means of increasing social connectedness and social support of the elderly. Active participation in online communities for seniors which promote leisure activities and expand their social network are suggested to improve overall well-being (Nimrod, 2010). In this context, Keijzer-Broers et al. (2014) develop requirements for an online platform which, under the overall goal of facilitating "ageing in place", supports the elderly in matchmaking with healthy and smart living products and services.

2.2 Neighborhood Social Networks

The term *neighborhood*, often used synonymously with *community*, can be defined from a variety of perspectives based on criteria such as an area's history, administrative boundaries, people's perceptions or characteristics of its inhabitants, with the boundaries of each criterium not necessarily overlapping (Diez Roux, 2001). In this paper, we assume a spatial definition of a neighborhood as "a collection of people and institutions occupying a subsection of a larger community" (Sampson et al., 1997), as it applies both of our case neighborhoods, one being defined by municipal boundaries and the other being defined by being serviced by a specific neighborhood management institution. With the rise of social network sites, cumulative and segmentive network effects have resulted in the organic formation of city

and neighborhood-level social networks on traditional OSNs such as Facebook (Ilena et al., 2011). However, literature on OSNs or other artifacts with a specific neighborhood scope is scarce. Early research reports on the implementation of a neighborhood email list as well as discussion board and demonstrates effects such as an increase in volume and range of neighborly relationships, more recognition of neighbors, increased online and offline communication as well as participation in common activities (Hampton and Wellman, 2000; Hampton and Wellman, 2003). These artifacts were able to overcome spatial, temporal and social barriers to communication. At the same time, the internet did not substitute but complement offline communication in-person or via phone. In a different research project, Hampton (2007) expand on this concept and implement a neighborhood website with features such as a neighbor directory, private messages, community calendar, classified ads and polls. In a non-research context, a new breed of OSNs, best described as local, private or neighborhood social networks is on the rise. Since its launch, San Francisco-based neighborhood social network Nextdoor has expanded to every fourth neighborhood in the United States (Popper, 2014). Berlin-based nebenan.de registers 800,000 neighbors in 6,500 neighborhoods across Germany and recently launched derivatives in France, Spain and Italy (Tönnemann, 2018). These neighborhood social networks share a number of common traits. They are generally free-to-use and require users to verify their real name and address. They delineate neighborhoods into individual sub-communities with their content being visible exclusively for verified neighbors. Per default, each user is identifiable by his or her full name and address. However, these platforms put little weight on the needs of elderly users, lack integration with local service providers as well as institutions and are not linked to existing efforts in the context of age-friendliness.

3 Research Design

Our research project follows the design science research methodology (DSRM) as proposed by Kuechler and Vaishnavi (2008). Figure 1 presents our overall research approach consisting of two consecutive design cycles, including completed, ongoing and planned activities. To ensure practical relevance of our design principles for an age-friendly digital neighborhood platform, we interact with two case neighborhoods situated in a large metropolitan area in Germany which serve as a source of issues and opportunities as well as a proving ground for our evaluation throughout the design process. One case neighborhood, defined by the municipal boundaries of a city quarter, featured an elderly population of 19.4% at the end of 2017 (Statistik Nord, 2017). As the other neighborhood is not defined by municipal boundaries but by being serviced by a specific neighborhood management institution, there is as of yet no precise age-related data available. Both neighborhoods are already undertaking steps towards becoming more age-friendly. These include but are not limited to social workers and neighborhood management personnel which engage neighbors by organizing a variety of leisure, health and educational events, infrastructure and housing improvements towards accessibility including ambient assisted living technology and partnerships with health service providers such as elderly care services, physicians or nutritionists. During the *awareness of the problem* phase, we conducted a literature review on neighborhood social networks and the relationship of the elderly towards social networks. Based on the results of the literature review as well two workshops, one with 3 representatives of neighborhood management of one case neighborhood and one with 12 inhabitants of this neighborhood aged between 55 and 85, we defined design principles for an age-friendly neighborhood platform in the *suggestion* phase of the DSRM process (see Table 1). Design principles pursue the goal of informing designers on how to effectively design artifacts of a certain type (Niehaves and Ortbach, 2016). In consequence, the evaluation of design principles must assess their suitability for being instantiated into a concrete artifact and this artifact's ability "to proffer the action described by the design principle" (Chandra et al., 2015, p. 4046). In the *development* step, we therefore instantiated these design principles into a prototypical age-friendly digital neighborhood platform (see Figure 2). We draw on techniques inspired by human-centered design (ISO, 2010) and design thinking (Brown, 2009) to iteratively develop prototypes with increasing functionality. As part of this process, we defined user personas and stories to identify problems and to develop suitable solutions. We began with low-fidelity, paper-based prototypes and culminated the first design cycle with a website and mobile application based on the open source technology ReactJS (Facebook, 2018).

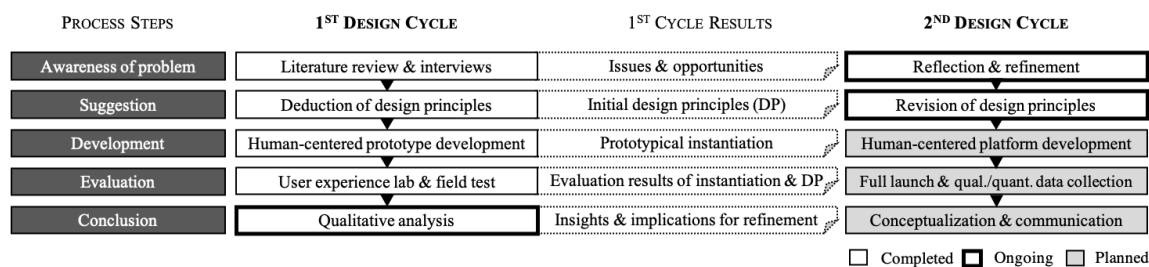


Figure 1. Research approach and activities (based on Kuechler and Vaishnavi (2008))

We conduct several *evaluation* episodes throughout the DSR cycle, both artificial and naturalistic (Venable et al., 2016). First, we conducted a user experience lab, a workshop focused on assessing how our prospective users perceive the system’s utility, ease of use and efficiency (Pannafino and McNeil, 2017). During this workshop, 20 prospective users of our platform aged between 53 and 85 were able to gain hands-on experience with our prototype and had the opportunity to provide feedback. Upon implementation of these first suggestions for improvement, we launched a field test of the mobile application in our two case neighborhoods. In the course of our field test, 35 inhabitants of our two case neighborhoods were given access to the mobile application for a limited period of three months. Their feedback was collected via several channels. Weekly on-site consultation hours were offered in both neighborhoods to provide in-person support and to collect improvement suggestions. Further support was provided via e-mail and phone. Each participant of the field test was also provided with an evaluation diary which served as a cultural probe, “designed to provoke inspirational responses from elderly people in diverse communities” (Gaver et al., 1999, p. 22; Maaß et al., 2016). Using these diaries neighbors were prompted to provide both quantitative and qualitative data such as age, living situation, technology proficiency, involvement in neighborhood life as well as degree of physical and social activity. Neighbors were also afforded the opportunity to chronicle experiences with our platform and could provide textual and graphical feedback on platform design and functionality using wireframes. Having concluded our first evaluation episodes, we are in the process of analyzing the collected qualitative data as well as revising and extending our proposed design principles which will in turn inform the design of our final digital neighborhood platform. With the full public launch of the platform in our case neighborhoods during the second design cycle, we plan to conduct a mixed-methods evaluation (Venkatesh et al., 2013), combining several further qualitative evaluation episodes in the form of workshops and interviews, quantitative analysis of platform usage and the distribution of digital surveys directly via our neighborhood platform to assess its effects.

4 Initial Design Principles and Instantiation

In the following, we define an initial set of seven design principles for an age-friendly digital neighborhood platform (Table 1) and present their corresponding design elements in the current version of our prototypical instantiation (Figure 2). Maintaining social relationships is regarded as one of the key elements of ageing well (Leist, 2013). Also, increasing social ties and civic participation in their neighborhood contributes to senior’s feeling of security (De Donder et al., 2012), increases their quality of life and minimizes the risk of social isolation (OECD, 2015). An age-friendly digital neighborhood platform should therefore afford its users the ability to form and maintain social relationships (**DP1**). Our prototypical instantiation identifies neighbors with a profile image and their full name and a detailed profile page introduces neighbors with further information such as their address (depending on individual privacy settings) or their interests. A searchable neighborhood directory lists all registered neighbors. To enable communication among neighbors, we implement a private messaging system. Access to timely, relevant and local information to manage life and meet personal needs is a vital component for active ageing (WHO, 2007). Besides providing social support, information sharing has been identified as an important enabler of social trust in online communities (Choi et al., 2014). As a perceived lack of meaningful occupation and loss of social context post retirement has been shown to negatively impact seniors’ well-being and can even cause depression (Lee and Smith, 2009), an age-friendly digital neighborhood

platform should afford its users the ability to access and share information that allows them to remain active in neighborhood life at an old age (**DP2**). Our prototype allows users to share information via “contributions” of various categories which are then displayed for consumption in a neighborhood news stream. This includes information such as asking for and making recommendations or organizing and being invited to events. Search and filter functionality allow users to find relevant content. Contributions with a related location such as an event venue are also presented on a neighborhood map. Users can engage with these contributions via likes and comments. A dedicated neighborhood calendar provides an overview of events in the neighborhood.

| | |
|-----|--|
| DP1 | Provide the age-friendly digital neighborhood platform with functionality for discovery and engagement of neighbors in order to enable social interaction among the elderly. |
| DP2 | Provide the age-friendly digital neighborhood platform with functionality for information sharing and retrieval in order for the elderly to remain engaged with neighborhood life. |
| DP3 | Provide the age-friendly digital neighborhood platform with functionality for requesting and provisioning voluntary support services in order to establish a local peer-support network. |
| DP4 | Provide the age-friendly digital neighborhood platform with motivational mechanisms in order to encourage continued usage. |
| DP5 | Provide the age-friendly digital neighborhood platform with security and privacy mechanisms in order to ensure trust towards the platform and between platform users. |
| DP6 | Provide the age-friendly digital neighborhood platform with functionality for integrating organizations in order to improve elderly access to local organizations. |
| DP7 | Provide the age-friendly digital neighborhood platform with a user interface that allows for age diversity in order to attract an all-age user base while remaining age-friendly. |

Table 1. *Initial design principles for an age-friendly digital neighborhood platform*

Encouraging the elderly to engage in volunteer work can support them in maintaining an active lifestyle and strengthen cross-generational linkages in neighborhoods (OECD, 2015). Maintaining a supportive social network enables older adults to lead an independent as well as self-sufficient life and improves overall well-being of the elderly (Avlund et al., 2004). Improving social support among the elderly can also increase physical activity and in turn contribute to the prevention of all-cause mortality and chronic illnesses (Lindsay Smith et al., 2017). As neighborhood connectedness is a predictor for older adults’ willingness to volunteer (Dury et al., 2014), an age-friendly digital neighborhood platform should contribute to connectedness and facilitate requesting and provisioning peer-support (**DP3**) with the goal of providing “social support in areas with definable close geographical boundaries” (Meyer-Blankart et al., 2013, p. 2). Our prototype implements this design principle via a request and offer contribution type. Users can request assistance, e.g. for assembling furniture, or make an unsolicited offer, e.g. offering free tutoring. Besides functionality such as affording neighbors the formation of social relationships or offering access to relevant information which are in themselves motivating for the elderly (Jung and Sundar, 2016), an age-friendly digital neighborhood platform must possess motivational mechanisms to ensure continued usage (**DP4**). Divulgence of personal information on a user profile can be motivating for other users (Antikainen et al., 2010; Leimeister et al., 2009; Porter et al., 2011). On our platform neighbor profiles present full name, picture, interests and an “About me” text for each neighbor. We further enable neighbors to “Like” contributions of other neighbors visualized via a thumbs-up symbol and to comment on contributions (Koh et al., 2007; Bretschneider et al., 2015). Web and mobile notifications are implemented to inform users of private messages and comments on their contributions. Research on sensitivity for information privacy among the elderly remains inconclusive with some studies describing the elderly as exhibiting less concern for privacy than other age groups (Lorenzen-Huber et al., 2011; Kwasny et al., 2008) and others describing them as particularly sensitive (Maaß, 2011). AS illustrated by recent irresponsible behavior concerning data privacy on public OSNs such as Facebook and with pressure of legislation such as GDPR (Kurtz et al., 2019), any OSN has a duty to emphasize privacy mechanisms to realize trust in the platform itself and between platform users (**DP5**). Our platform is exclusively available for inhabitants of a case neighborhood and cannot be accessed without registration. Neighborhoods are strictly separated from each other. Users have to sign up with their real name and address but can customize if their real name and address or only a part thereof are visible to other neighbors. Furthermore, users can disable notifications and choose not to add a profile picture.

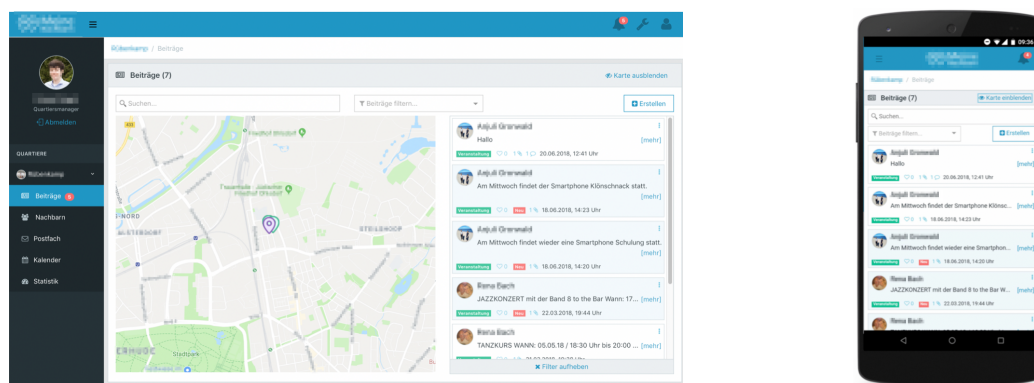


Figure 2. Prototypical instantiation of DPs as age-friendly digital neighborhood platform

The elderly prefer to age in place, meaning that they prefer to remain living independently within their community and not in residential care (Wiles et al., 2012; Gitlin, 2003). Access to local services is a key enabler of this independence (Phillipson, 2011; Lui et al., 2009). These services entail necessities such as health service providers but also institutions such as church, police, community management or non-profit organizations and clubs. Organizations seek to come into contact with neighbors to promote their offerings and events or to find members and volunteers, similarly to what they already do on public OSNs (Waters et al., 2009; Lovejoy et al., 2012). To facilitate access to local services, an age-friendly digital neighborhood platform should therefore be able to integrate local service providers (DP6). Our prototypical instantiation implements access for organizations which can use contributions to promote events in the neighborhood and allows them to create organizational profiles with information such as their location or opening hours. While the user interface of an age-friendly digital neighborhood platform must consider the particular needs of older OSN users (Boll et al., 2017), it must also be designed in a way not to alienate younger neighbors or neighbors who do explicitly not perceive themselves as members of the elderly population. Similar to an age-friendly city, which is not a city exclusively inhabited by the elderly but one that strives to offer a high quality of life to everyone, including the elderly (Buffel et al., 2012), an age-friendly digital neighborhood platform should aim for an all-age audience (DP7). Like the elderly, non-elderly neighbors can also profit from a digital neighborhood platform, e.g. a single parent finding a babysitter in an elderly neighbor or a retired piano teacher giving free lessons to children next door. In case of our platform, we do not advertise it as being age-friendly but as a general neighborhood platform while at the same time considering factors such as accessibility (Leitner et al., 2009) and support multiple access paths via web and mobile apps. We consider this a necessity as our envisioned peer-support network relies on the participation of users of various ages and as our fieldwork has shown that the elderly do not want to be separated into a platform exclusively for old people.

5 Discussion and Initial Evaluation

Based on the evaluation results from our workshops and field test, we present and reflect on some of our initial findings. In general, neighbors reacted positively to the idea of our age-inclusive digital neighborhood platform and highlighted several functionalities as useful. They appreciated the ability to keep in touch with neighborhood events and having a feeling of not “missing out” (Jung and Sundar, 2016, p. 29) on any important occurrences. In line with previous research, they further valued the ability to discover and engage with neighbors with similar interests (Goswami et al., 2010). Contrary to our expectations, neighbors requested almost no support services from their peers, despite stating that they welcome the idea of a peer-support network and stating their willingness to participate. The reasons for this could be both cultural and age-related and as previous research has shown, particularly the elderly are hesitant to request support services as they are reluctant to surrender responsibility and in fear of giving up independence (Dunér and Nordström, 2005). We also face a causality dilemma: the willingness to participate in the peer-support network may very well be genuine but without any open support requests, there is no opportunity for neighbors to volunteer help. Some stimulation, potentially in the form of contributions and events by neighborhood management, may be needed to initialize the peer-

support network. Vast differences regarding technology proficiency of different neighbors, even between those inside the same age group were evident, emphasizing a digital divide (Rockmann et al., 2018). Some elderly users were quickly frustrated with using the mobile app and required close support to use the platform. We have therefore begun to offer training sessions on basic smartphone usage to improve proficiency among potential elderly platform users. Neighbors also had varying expectations regarding technical support and usage advice. While younger users mainly chose email as a support channel, elderly neighbors expected to be able to receive in-person or at least phone support. We therefore plan to expand our offline support structures in cooperation with neighborhood management in both case neighborhoods to offer on-site consultation hours for onboarding and platform usage. Concerning our implemented motivational mechanisms, neighbors reported that relevant content and the chance to form new relationships inside the neighborhood were main drivers for their usage of the platform. Profile pages with detailed information about other neighbors and knowing that this information is verified were described as enablers of trust. We are currently considering the implementation of gamification elements as additional motivational mechanics as previous research has shown promising results in using gamification to engage seniors (Altmeyer et al., 2018; Minge et al., 2014). Privacy and security concerns presented themselves as some of the most vocal feedback during our evaluation sessions as neighbors wanted to be ensured that the information they share on the platform can only be accessed by actual neighbors. The full public launch of the digital neighborhood platform will necessitate a registration process which ensures the neighborhood platform remains private. We plan to ensure this by initially mailing all inhabitants of our case neighborhoods a personal sign-up code which will confirm their address inside their neighborhood at sign-up. Neighbors registering at a later time via website or app will also be mailed a personalized sign-up code before being able to use the neighborhood platform.

Overall, our research project highlights the multilevel nature of IS (Bélanger et al., 2014; Grotherr et al., 2018) and the need for an ensemble view of technology which considers the IS artifact as being embedded in a constantly evolving social and environmental context (Orlikowski and Iacono, 2001). Therefore, while the design of our artifact may be age-friendly, it is of equal importance to consider the way it is integrated into the specific usage context of our case neighborhoods via measures such as training, support by neighborhood management and integration with age-friendly initiatives. Organizations situated in our case neighborhoods have expressed great interest in participating on our neighborhood platform. Discussions with institutional actors such as a local church and community police officers revealed an appreciation for features such as the planned address and real name verification and the ability to specifically target a local audience in the neighborhood. They further considered a local not-for-profit platform such as our age-friendly digital neighborhood platform as more appropriate for use by institutional actors than anonymous, for-profit social network sites such as Facebook.

6 Conclusion and Expected Contribution

With our research project we aim to contribute nascent design theory (Gregor and Hevner, 2013) in the form of design principles for age-friendly digital neighborhood platforms and the situated implementation of our prototypical artifact. Our research is motivated by the challenges of the ageing society and based on extant literature on the relationship of the elderly with OSNs and neighborhood social networks. Based on a literature review, we define an initial set of design principles and interviews in two case neighborhoods. In a human-centered development approach, we instantiate these design principles into a prototypical website and mobile app which we evaluate during several evaluation episodes. In this paper, we report on our ongoing DSR project and present initial findings from this evaluation. We determine a distinct interest for the platform by neighbors as well as organizations active in the context of our case neighborhoods and highlight security and privacy as well as integration of organizations as priorities for future development. Further research may aim to evaluate, expand or customize our design principles for different application contexts.

ACKNOWLEDGEMENTS This research was funded in part by the European Regional Development Fund and the City of Hamburg as part of the research project AGQua (<https://www.agqua.de>).

References

- Altmeyer M, Lessel P and Krüger A. (2018) Investigating Gamification for Seniors Aged 75+. *Proceedings of the 2018 Designing Interactive Systems Conference*. Hong Kong, China: ACM, 453-458.
- Anderson M and Perrin A. (2018) *Technology use among seniors*. Available at: <http://www.pewinternet.org/2017/05/17/technology-use-among-seniors/>.
- Antikainen M, Ahonen M and Mäkipää M. (2010) Motivating and supporting collaboration in open innovation. *European Journal of Innovation Management* 13(1): 100-119.
- Avlund K, Lund R, Holstein BE, Due P, Sakari-Rantala R and Heikkinen RL. (2004) The impact of structural and functional characteristics of social relations as determinants of functional decline. *J Gerontol B Psychol Sci Soc Sci* 59(1): S44-51.
- Behncke S. (2012) Does retirement trigger ill health? *Health Economics* 21(3): 282-300.
- Bélanger F, Cefaratti M, Carte T and Markham SE. (2014) Multilevel Research in Information Systems: Concepts, Strategies, Problems, and Pitfalls. *Journal of the Association for Information Systems* 15(9).
- Boll F and Brune P. (2016) Online Support for the Elderly – Why Service and Social Network Platforms should be Integrated. *Procedia Computer Science* 98: 395-400.
- Boll F, Brune P and Gewald H. (2017) Towards Your Parents' Social Network Platform – A User Interface For the Age of Retirement. *Proceedings of the 50th Hawaii International Conference on System Sciences (HICSS)*. Waikaloa Village, HI, United States.
- boyd dm and Ellison NB. (2007) Social Network Sites: Definition, History, and Scholarship. *Journal of Computer-Mediated Communication* 13(1): 210-230.
- Bretschneider U, Leimeister JM and Mathiassen L. (2015) IT-enabled product innovation : customer motivation for participating in virtual idea communities. *International Journal of Product Development* 20(2): 126-141.
- Brown T. (2009) *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*: HarperCollins.
- Buffel T, Phillipson C and scharf T. (2012) Ageing in urban environments: Developing ‘age-friendly’ cities. *Critical Social Policy* 32(4): 597-617.
- Buffel T, Phillipson C and Scharf T. (2013) Experiences of neighbourhood exclusion and inclusion among older people living in deprived inner-city areas in Belgium and England. *Ageing and Society* 33(1): 89-109.
- Chandra L, Seidel S and Gregor S. (2015) Prescriptive Knowledge in IS Research: Conceptualizing Design Principles in Terms of Materiality, Action, and Boundary Conditions. *Proceedings of the 48th Hawaii International Conference on System Sciences (HICSS)*. Waikoloa Village, HI, USA, 4039-4048.
- Choi JH, Kim S, Moon JY, Kang J, Lee I and Kim J. (2014) Seek or Provide: Comparative Effects of Online Information Sharing on Seniors' Quality of Life. *Communications of the Association for Information Systems* 34(28): 513-530.
- Chopik WJ. (2016) The Benefits of Social Technology Use Among Older Adults Are Mediated by Reduced Loneliness. *Cyberpsychology, behavior and social networking* 19(9): 551-556.
- Coe NB and Zamarro G. (2011) Retirement effects on health in Europe. *Journal of Health Economics* 30(1): 77-86.
- Coyle CE and Dugan E. (2012) Social Isolation, Loneliness and Health Among Older Adults. *Journal of Aging and Health* 24(8): 1346-1363.
- De Donder L, De Witte N, Buffel T, Dury S and Verté D. (2012) Social Capital and Feelings of Unsafety in Later Life:A Study on the Influence of Social Networks, Place Attachment, and Civic Participation on Perceived Safety in Belgium. *Research on Aging* 34(4): 425-448.
- Diez Roux AV. (2001) Investigating neighborhood and area effects on health. *Am J Public Health* 91(11): 1783-1789.
- Dunér A and Nordström M. (2005) Intentions and strategies among elderly people: Coping in everyday life. *Journal of Aging Studies* 19(4): 437-451.

- Dury S, Willems J, De Witte N, De Donder L, Buffel T and Verté D. (2014) Municipality and Neighborhood Influences on Volunteering in Later Life. *Journal of Applied Gerontology* 35(6): 601-626.
- Encyclopedia Britannica. (2018) *Old age*. Available at: <https://www.britannica.com/science/old-age>.
- EU. (2017) The 2018 Ageing Report. Brussels: European Union Economic and Financial Affairs.
- Facebook. (2018) *React - A JavaScript library for building user interfaces*. Available at: <https://reactjs.org>.
- Gaver B, Dunne T and Pacenti E. (1999) Design: Cultural Probes. *Interactions* 6(1): 21-29.
- Gitlin LN. (2003) Conducting research on home environments: lessons learned and new directions. *Gerontologist* 43(5): 628-637.
- Goswami S, Köbler F, Leimeister JM and Krcmar H. (2010) Using Online Social Networking to Enhance Social Connectedness and Social Support for the Elderly. *Proceedings of the 31st International Conference on Information Systems (ICIS)*. St. Louis, United States.
- Gregor S and Hevner AR. (2013) Positioning and presenting design science research for maximum impact. *Management Information Systems Quarterly (MISQ)* 37(2): 337-356.
- Grieve R, Indian M, Witteveen K, Anne Tolan G and Marrington J. (2013) Face-to-face or Facebook: Can social connectedness be derived online? *Computers in Human Behavior* 29(3): 604-609.
- Grotherr C, Semmann M and Böhm T. (2018) Using Microfoundations of Value Co-Creation to Guide Service Systems Design – A Multilevel Design Framework. *International Conference on Information Systems (ICIS)*. San Francisco, USA.
- Hamari J, Sjöklint M and Ukkonen A. (2016) The sharing economy: Why people participate in collaborative consumption. *Journal of the Association for Information Science and Technology* 67(9): 2047-2059.
- Hampton K and Wellman B. (2003) Neighboring in Netville: How the Internet Supports Community and Social Capital in a Wired Suburb. *City & Community* 2(4): 277-311.
- Hampton KN. (2007) Neighborhoods in the Network Society the e-Neighbors study. *Information, Communication & Society* 10(5): 714-748.
- Hampton KN and Wellman B. (2000) Examining Community in the Digital Neighborhood: Early Results from Canada's Wired Suburb. *Digital Cities*. Berlin, Heidelberg: Springer Berlin Heidelberg, 194-208.
- Harley D, Howland K, Harris E and Redlich C. (2014) Online communities for older users: what can we learn from local community interactions to create social sites that work for older people. *Proceedings of the 28th International BCS Human Computer Interaction Conference on HCI 2014 - Sand, Sea and Sky - Holiday HCI*. Southport, UK: BCS, 42-51.
- Hasan H and Linger H. (2016) Enhancing the wellbeing of the elderly: Social use of digital technologies in aged care. *Educational Gerontology* 42(11): 749-757.
- Holt-Lunstad J, Smith TB and Layton JB. (2010) Social Relationships and Mortality Risk: A Meta-analytic Review. *PLOS Medicine* 7(7): e1000316.
- Hunsaker A and Hargittai E. (2018) A review of Internet use among older adults. *New Media & Society* 20(10): 3937-3954.
- Ilena M, Ard H and Wim B. (2011) ON THE DEVELOPMENT OF ONLINE CITIES AND NEIGHBORHOODS: AN EXPLORATION OF CUMULATIVE AND SEGMENTIVE NETWORK EFFECTS IN SOCIAL MEDIA. *Proceedings of the 19th European Conference on Information Systems (ECIS)*. Barcelona, Spain.
- ISO. (2010) Ergonomics of human-system interaction -- Part 210: Human-centred design for interactive systems. *International Organization for Standardization*.
- Jung EH and Sundar SS. (2016) Senior citizens on Facebook: How do they interact and why? *Computers in Human Behavior* 61: 27-35.
- Keijzer-Broers W, Nikayin F and de Reuver M. (2014) Main requirements of a Health and Wellbeing Platform: findings from four focus group discussions. *Proceedings of the 25th Australasian Conference on Information Systems*. Auckland, New Zealand.
- Koch S. (2010) Healthy ageing supported by technology – a cross-disciplinary research challenge. *Informatics for Health and Social Care* 35(3-4): 81-91.

- Koh J, Kim Y-G, Butler B and Bock G-W. (2007) Encouraging participation in virtual communities %J Commun. ACM. *Communications of the ACM* 50(2): 68-73.
- Kuechler B and Vaishnavi V. (2008) On theory development in design science research: anatomy of a research project. *European Journal of Information Systems* 17(5): 489-504.
- Kurtz C, Wittner F, Semmann M, Schulz W and Böhm T. (2019) The Unlikely Siblings in the GDPR Family: A Techno-Legal Analysis of Major Platforms in the Diffusion of Personal Data in Service Ecosystems. *Proceedings of the 52nd Hawaii International Conference on System Sciences (HICSS)*. Wailea, HI, USA.
- Kwasny MN, Caine KE, Rogers WA and Fisk AD. (2008) Privacy and Technology: Folk Definitions and Perspectives. *Proceedings of the SIGCHI conference on human factors in computing systems. CHI Conference 2008*: 3291-3296.
- Lee J and Smith JP. (2009) Work, Retirement, and Depression. *Journal of Population Ageing* 2(1): 57-71.
- Leeson GW. (2018) The Growth, Ageing and Urbanisation of our World. *Journal of Population Ageing* 11(2): 107-115.
- Leimeister JM, Bretschneider U, Huber M and Krcmar H. (2009) Leveraging Crowdsourcing: Activation-Supporting Components for IT-Based Ideas Competition. *Journal of Management Information Systems* 26(1): 197-224.
- Leist AK. (2013) Social Media Use of Older Adults: A Mini-Review. *Gerontology* 59(4): 378-384.
- Leitner M, Subasi Ö, Höller N, Geven A and Tscheligi M. (2009) User requirement analysis for a railway ticketing portal with emphasis on semantic accessibility for older users. *Proceedings of the 2009 International Cross-Disciplinary Conference on Web Accessibility (W4A)*. Madrid, Spain: ACM, 114-122.
- Lindsay Smith G, Banting L, Eime R, O’Sullivan G and van Uffelen JGZ. (2017) The association between social support and physical activity in older adults: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity* 14(1): 56.
- López C, Lin Y and Farzan R. (2015) What Makes Hyper-local Online Discussion Forums Sustainable? *2015 48th Hawaii International Conference on System Sciences*. 2445-2454.
- Lorenzen-Huber L, Boutain M, Camp LJ, Shankar K and Connelly KH. (2011) Privacy, Technology, and Aging: A Proposed Framework. *Ageing International* 36(2): 232-252.
- Lovejoy K, Waters RD and Saxton GD. (2012) Engaging stakeholders through Twitter: How nonprofit organizations are getting more out of 140 characters or less. *Public Relations Review* 38(2): 313-318.
- Lui C-W, Everingham J-A, Warburton J, Cuthill M and Bartlett H. (2009) What makes a community age-friendly: A review of international literature. *Australasian Journal on Ageing* 28(3): 116-121.
- Lusch RF and Nambisan S. (2015) SERVICE INNOVATION: A SERVICE-DOMINANT LOGIC PERSPECTIVE. *MIS Quarterly* 39(1): 155-176.
- Maaß S, Schirmer C, Bötcher A, Buchmüller S, Koch D and Schumacher R. (2016) Partizipative Entwicklung von Technologien für und mit ältere/n Menschen.
- Maaß W. (2011) The Elderly and the Internet: How Senior Citizens Deal with Online Privacy. In: Trepte S and Reinecke L (eds) *Privacy Online: Perspectives on Privacy and Self-Disclosure in the Social Web*. Berlin, Heidelberg: Springer Berlin Heidelberg, 235-249.
- Maier C, Laumer S and Eckhardt A. (2011) Technology Adoption by Elderly People – An Empirical Analysis of Adopters and Non-Adopters of Social Networking Sites. *Proceedings of the International Conference on Wirtschaftsinformatik (WI)*. Zurich, Switzerland.
- Meyer-Blankart C, Parchmann J and Böhm T. (2013) Design Goals for IT-Enabled Local-Social Service. *SIGSVC Pre-ICIS Workshop*. Milano, Italy.
- Minge M, Bürglen J and Cymek DH. (2014) Exploring the Potential of Gameful Interaction Design of ICT for the Elderly. *Proceedings of the 16th International Conference on Human-Computer Interaction (HCI)*. Creta Maris, Greece: Springer International Publishing, 304-309.
- Niehaves B and Ortbach K. (2016) The inner and the outer model in explanatory design theory: the case of designing electronic feedback systems. *European Journal of Information Systems* 25(4): 303-316.

- Niehaves B and Plattfaut R. (2014) Internet adoption by the elderly: employing IS technology acceptance theories for understanding the age-related digital divide. *European Journal of Information Systems* 23(6): 708-726.
- Nimrod G. (2010) Seniors' Online Communities: A Quantitative Content Analysis. *The Gerontologist* 50(3): 382-392.
- OECD. (2015) Ageing in Cities. OECD Publishing, Paris.
- Orlikowski WJ and Iacono CS. (2001) Research Commentary: Desperately Seeking the "IT" in IT Research—A Call to Theorizing the IT Artifact. *Information Systems Research* 12(2): 121-134.
- Pannafino J and McNeil P. (2017) *UX Methods: A Quick Guide to User Experience Research Methods*: CDUXP LLC.
- Pew Research Center. (2018) *Social Media Factsheet*.
- Phillipson C. (2011) Developing Age-Friendly Communities: New Approaches to Growing Old in Urban Environments. In: Settersten RA and Angel JL (eds) *Handbook of Sociology of Aging*. New York, NY: Springer New York, 279-293.
- Plouffe L and Kalache A. (2010) Towards Global Age-Friendly Cities: Determining Urban Features that Promote Active Aging. *International Journal of Urban Health* 87(5): 733-739.
- Popper B. (2014) *The anti-Facebook: one in four American neighborhoods are now using this private social network*. Available at: <https://www.theverge.com/2014/8/18/6030393/nextdoor-private-social-network-40000-neighborhoods>.
- Porter CE, Donthu N, MacElroy WH and Wydra D. (2011) How to Foster and Sustain Engagement in Virtual Communities. *California Management Review* 53(4): 80-110.
- Rockmann R, Gewalt H and Haug M. (2018) EQUAL ACCESS FOR EVERYONE? A DIGITAL DIVIDE CASCADE FOR RETIRED SENIOR CITIZENS. *Proceedings of the 26th European Conference on Information Systems (ECIS)*. Portsmouth, United Kingdom.
- Sampson RJ, Raudenbush SW and Earls F. (1997) Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy. *Science* 277(5328): 918.
- Sander M, Oxlund B, Jespersen A, Krasnik A, Mortensen EL, Westendorp RGJ and Rasmussen LJ. (2015) The challenges of human population ageing. *Age and ageing* 44(2): 185-187.
- Shankar A, McMunn A, Banks J and Steptoe A. (2011) Loneliness, social isolation, and behavioral and biological health indicators in older adults. *Health Psychology* 30(4): 377-385.
- Sinclair TJ and Grieve R. (2017) Facebook as a source of social connectedness in older adults. *Computers in Human Behavior* 66: 363-369.
- Statistik Nord. (2017) *Bevölkerung in Hamburg am 31.12.2017*. Available at: <https://www.statistik-nord.de/zahlen-fakten/hamburger-melderegister/bevoelkerungsstand/>.
- Tönnemann J. (2018) *In guter Nachbarschaft*. Available at: <https://www.zeit.de/2018/16/soziale-netzwerke-facebook-konkurrenz-datenschutz>.
- Turner A. (2009) Population ageing: what should we worry about? *Philosophical transactions of the Royal Society of London. Series B, Biological sciences* 364(1532): 3009-3021.
- UN. (2017) World Population Ageing Report 2017. United Nations Department of Economic and Social Affairs Population Division.
- Venable J, Pries-Heje J and Baskerville R. (2016) FEDS: a Framework for Evaluation in Design Science Research. *European Journal of Information Systems* 25(1): 77-89.
- Venkatesh V, Brown SA and Bala H. (2013) Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. *Management Information Systems Quarterly (MISQ)* 37(1).
- Wahl H-W, Iwarsson S and Oswald F. (2012) Aging Well and the Environment: Toward an Integrative Model and Research Agenda for the Future. *The Gerontologist* 52(3): 306-316.
- Waters RD, Burnett E, Lamm A and Lucas J. (2009) Engaging stakeholders through social networking: How nonprofit organizations are using Facebook. *Public Relations Review* 35(2): 102-106.
- WHO. (2007) Global Age-Friendly Cities: A Guide. World Health Organization.
- WHO. (2015) World Report on Ageing and Health. Luxemburg: World Health Organization.
- Wiles JL, Leibing A, Guberman N, Reeve J and Allen RES. (2012) The Meaning of "Aging in Place" to Older People. *The Gerontologist* 52(3): 357-366.