

Urban ageing: technology, agency and community in smarter cities for older people

Valeria Righi

Interactive Technologies Group
Universitat Pompeu Fabra
Roc Boronat, 138, 08018,
Barcelona, Spain
valeria.righi@upf.edu

Sergio Sayago

Human-Computer Interaction and
Data Integration Group
Universitat de Lleida
Jaume II, 69, 25001 Lleida, Spain
sergio.sayago@diei.udl.cat

Josep Blat

Interactive Technologies Group
Universitat Pompeu Fabra
Roc Boronat, 138, 08018,
Barcelona, Spain
josep.blat@upf.edu

ABSTRACT

Despite the widespread popularity of smart cities in policy and research fields, and the ever-increasing ageing population in urban areas, ageing issues have seldom been addressed in depth in smart city programs. The main focus has hitherto been on making physical environments ‘older people friendly’. We review studies in environmental gerontology, policies and HCI that show the multifaceted relationship between ageing and cities. We discuss two case studies with scenarios of engagement of older people in urban areas we undertook in the past 4 years. By drawing upon the results, we propose a vision of smart city that conceives of older people as embedded in intergenerational urban communities and capable of creating new engagement situations by reconfiguring IT-driven scenarios to their interests and social practices. This paper aims at expanding the current visions of smart cities for older people by building along three main dimensions: technology, agency and community.

Categories and Subject Descriptors

H.5.m. Information interfaces and presentation (e.g., HCI):
Miscellaneous. <http://www.acm.org/class/1998/>

General Terms

Design, Human Factors.

Keywords

Ageing; Smart Communities; Smart cities; Older people; Age-friendly cities; Agency

1. INTRODUCTION

Despite the fact that urban population is ageing, there is a paucity of studies exploring how ICTs can support older people’s living in urban areas. Thus far, visions of smart cities for older people have focused on removing architectural barriers and making physical environments more age-friendly, by considering age-related

declines in functional abilities, especially mobility. However, a large number of social studies show how multiple facets of the everyday lives of older people are related to their living environment, such as belongingness, social engagement and community life.

In this paper, we aim to go beyond the current focus on age-related changes in functional abilities in ageing smart cities. The main contribution this paper seeks to make is to present a different portrayal of older people in smart cities research. Thus far, older people have been widely regarded as passive citizens. While we acknowledge that some seniors can take on this role, we argue that others might, and actually are, playing a more active role, which should also be examined if we aim to build better, more inclusive, smart cities. We present two case studies of age-friendly smart communities that explore scenarios of engagement of older people in urban contexts.

Over 100 active and independent people (aged 60-81) were involved in the case studies, which ranged from designing a mutual help service to co-creating routes of geo-located information about different topics. The participants were able to adapt the proposed initial concepts to their interests, which led to sustained outcomes other than being able to use the technology. We present ongoing work that seeks to scale up the two case studies to a neighborhood context.

By drawing upon the results of the case studies, we propose a set of recommendations for designing urban technologies to support older people’s engagement in cities. These recommendations are based on three main concepts:

- i) a revision of the central role assigned to technology in the smart city domain,
- ii) an emphasis on older people’s agency in creatively adapting ICTs to their *real* interests,
- iii) a community lens that promotes design scenarios across age boundaries in neighborhoods.

We discuss how the proposed dimensions can contribute to the governance of cities and whether and how they could be adapted to cater for more dependent older people in future research studies.

2. CURRENT VISIONS OF SMART CITIES FOR OLDER PEOPLE

“In the vision of smart cities, elderly people are supported by pervasive and smart environments in their daily mobility and activities” [22]. Special attention has been given to indoor environments. For instance, the IBM Smarter Cities team partnered with Bolzano (Italy) to equip a group of elderly residents’ homes with sensors capable of detecting dangerous

Paste the appropriate copyright/license statement here. ACM now supports three different publication options:

ACM copyright: ACM holds the copyright on the work. This is the historical approach.

License: The author(s) retain copyright, but ACM receives an exclusive publication license.

Open Access: The author(s) wish to pay for the work to be open access. The additional fee must be paid to ACM.

This text field is large enough to hold the appropriate release statement assuming it is single-spaced in Times New Roman 8 point font. Please do not change or modify the size of this text box.

Every submission will be assigned their own unique DOI string to be included here.

situations (e.g. CO₂ levels rise) and sending data back to a central database monitored by city officials, who could eventually dispatch a care worker to visit the elderly person at home [11]. INTEL proposed a community home-based platform that connects the elderly person to the network of people responsible for providing care. This platform allows the older person to receive integrated care while remaining fairly independent at home [12]. These visions are the hallmark of Ambient Assistive Living (AAL).

Studies exploring older people's interaction with urban outdoor environments are scarce, despite the fact that these environments represent another important element in the daily mobility and activities of a large number of active, fairly independent, older adults. A noteworthy exception is [19], where a geospatial service that maps barriers and facilities in urban environments was developed. It provided personalized paths for people with mobility needs by drawing upon open, sensor-gathered data and crowdsourcing. Another exception is [36], which explored mobile crowdsourcing of older people's opinions on good and bad aspects of their neighborhoods to support decision-making by local governments in planning urban environments.

Common to studies supporting the mobility of older people in indoor and outdoor environments is that they zero in on removing physical/architectural barriers. Achieving this goal is essential for older people to remain independent individuals. Yet, social studies show that older people's urban life also includes other important aspects, such as social engagement and civic life. To the best of our knowledge, there is a lack of studies addressing these aspects in the literature on smart cities and older people. We review in the section that follows key studies from policy and environmental gerontology that shed light on how concepts of place and community can contribute to expand the design possibilities for older people in smart cities.

3. URBAN AGEING FROM A GERONTOLOGICAL AND POLICY PERSPECTIVE

The literature on the interplay between ageing and living environments is vast. Environmental gerontology is especially devoted to it. In the early 1980s, environmental gerontology focused on micro-environments (e.g. private and nursing homes) and emphasized the role of personal competences in interacting within these environments [15]. There was a special focus on the physical aspects of the environment, and adaptations to accommodate the physical design of the environments to match the abilities of the older person were proposed. Design standards for housing, nursing homes and furniture are remarkable results of this approach. Over time, researchers progressively began to consider also the social components of these environments. Oswald et al. showed that both good accessibility at home and personal perceptions of meaning and value of one's own home are indicators of good autonomy in later life and better sense of well-being [21]. Following up on this line of thought, researchers have highlighted the relevance of transforming nursing homes into homelike places [29]. More recently, the focus has shifted towards macro-environments (i.e. neighborhoods, cities, rural areas) and their impact on older people's mobility, independence, opportunities for social interactions and quality of life. Macro-environments have been analyzed by considering two dimensions: the *physical* and the *social*. Within the former, accessible buildings, safe walking paths, adequate spatial distribution of benches and facilities, public transportation, among others, are

considered key parameters for supporting ageing in cities [18] [40]. The social dimension is concerned with other aspects of public spaces. For example, while exploring what the ideal place to grow old is for older people, Wiles [38] discovered that feeling attached to their neighborhood as "insiders", because of friendships, social clubs and familiarity with places, underpins the preferences of older people. These findings suggest that community environments are good promoters of well-being for older people, and, in fact, this vision has later been adopted by policy makers.

We have recently witnessed the launching of policy programs that promote the creation of age-friendly cities/communities¹ (e.g. [40]). These policies acknowledge both the physical and social dimensions of the communities, such as opportunities for participating in social events as well as their accessibility (e.g. adequate transportation to reach the location of an event). They also pay considerable attention to the governance processes in place to define and build age-friendly cities. Models of participatory and collaborative governance, which recognize older people's agency in constructing livable places and creating conditions for their own active aging, are considered key elements towards building age-friendly communities [16]. In this paper we focus and draw on the social and collaborative dimensions in two case studies of age-friendly smart communities.

4. TWO CASE STUDIES

Over the past 4 years, we have been exploring the design of services and technologies for older people in urban communities. We have conducted this research in Àgora (AG), an adult learning community located in La Verneda neighbourhood in Barcelona, Spain. The centre developed from a grassroots initiative in the late 70s. AG is deeply connected with the network of local associations in the local neighborhood. AG provides free educational activities on several subjects to meet different interests, expertise, and cultural backgrounds of its members. More than 1,000 people from different countries, Spanish regions, age groups and educational levels participate in these activities each month. AG stands out for its strong participatory orientation, since its members take on an active role in the center decision-making process and in their own formative processes. They call themselves participants, term which we use in the paper.

We adopted a qualitative research approach based on participant observation [7]. To establish a good and close relationship with AG participants, and develop a deep understanding of their everyday practices, the first author participated in several activities conducted in AG on a weekly basis over the course of 4 years. She enrolled in ongoing courses and ran new ones. The courses were about ICTs and during them the participants were learning to use several technologies, ranging from e-mail and smartphones to Social Networks Sites. She also participated in neighborhood events and hanged around with participants when they met up for coffee in the local bar. She conducted hands-on sessions in which participants were using the technology developed for the research projects, as well as focus groups, debriefing sessions and participatory design workshops to gather specific information for designing the urban platforms, which are described later. She took

¹ Different terminologies have been used to refer to the construction of a favorable environment for older people, such as age-friendly cities, livable community and lifetime neighborhood [16].

notes of her *in situ* observations and conversations with the participants during or immediately after these field activities.

Fieldnotes were periodically analysed by using inductive thematic analysis [5]. Emerging themes were used to elicit informal conversations with the participants throughout the study. As the research progressed, debriefing sessions were conducted to share, discuss and validate the results with the participants. We identified different themes for each case study. In this paper, we focus on those themes that we consider more related with the topic of ageing in urban cities, and we present them in the two case studies². In an additional iteration, we grouped these themes into three clusters, i.e. technology, agency, community, in order to draw more general conclusions. We discuss them in section 6.

4.1 Case study 1: older people as co-producers of community services

This case study was conducted within the context of Life2.0, a European funded project within the Smart City program in 2010. The project aimed at designing innovative services for supporting older people's independent life by enhancing social interaction among their neighbors. We describe the profile of participants involved in the project, the technology developed, and discuss the themes that emerged from our analysis.

4.1.1 Participants

We involved established local communities, the main one being AG, which participated in all the phases of the project, i.e. analysis, co-design, long-term evaluation and definition of the business model. We recruited an initial group of 20 people who had been active AG members for several years. Throughout the project, we invited new people to join the group and participate in the different activities organized, resulting in approximately 90 participants involved (aged 60-80). 95% of them were pensioners, the rest were about to retire. All participants were autonomous and independent (i.e. able to conduct daily living activities on their own). They engaged in social AG activities on a weekly basis. Most of them had completed primary education and used ICTs on a regular basis. While our participants cannot be regarded as 'vulnerable', there were bereavements and some long absences from people due to health problems during the project.

Meetings with 8 local associations were conducted to gather their feedback on the emerging service proposal and to invite them to join the project and use the community platform developed. Two interviews with district and regional government officials were conducted to understand their views of the intended service towards its eventual sustainability.

4.1.2 A community platform that promotes the co-production of help services

Drawing upon the results of the ethnography and co-design activities conducted in Life2.0 [13, 25], the project partners decided to develop a web-based community platform to offer three types of services related with mutual help, local events and local businesses. We focus on the first one, since it was the most discussed with the participants and technically operational.

The mutual help service aimed to encourage older people to ask and offer help to peers. It supported the idea of older people as co-producers and valid contributors of services, rather than merely consumers - a vision aligned with current paradigms of citizens' participation in public co-production [24]. The idea has already been explored in previous studies, with a particular focus on welfare innovation [20]. Our focus was on understanding the role that technologies play in promoting these scenarios, which seems a topic largely unexplored.

Through the platform, a user can make announcements by writing which kind of help s/he needs and her/his approximate location. Users can also reply to existing help requests by sending a direct message to the sender. The platform also provides typical elements of social networking sites, such as comments and user ratings for each help offer/request. This is aimed to increase trust among users.



Figure 2. The Life2.0 interface with a list of help offers and requests created by the participants. By clicking on one of them, the user can write a comment or send a direct message to the author of the announcement.

4.1.3 From care to social and learning scenarios

Contrary to our initial expectations, which assumed that older people would use the platform to ask and receive help for conducting (instrumental) activities of daily living, our participants regarded the platform as an opportunity for engaging in social interactions, requesting IT help or taking further their knowledge. Examples of the exchanges were help to solve doubts about their Facebook account or their smartphone, or to practice their Catalan with native speakers. The drive for social interactions often prevailed to the actual need in the help request. For instance, a group of women willing to improve their Catalan decided to meet every week in a cafeteria to chat in this language. A woman volunteered to show another one how to delete friends on Facebook in exchange for having some company during her weekly strolls.

The service goal thus shifted from sharing help, a scenario mostly related with care and assistance, to sharing knowledge, in which the social interactions and learning goals played a key role³.

² We have left out methodological details (available in previous papers and project reports of the authors [25, 27, 28, 31]) to discuss further the two case studies in terms of smart cities, which is the main focus of the paper.

³ The data analysis showed that the reasons for this shift are related to the kind of community involved which was not taken sufficiently on board in the designers' assumptions and conceptualizations of the older people category. We will discuss this issue in depth in a forthcoming paper.

4.1.4 Self-organization and sustained benefits beyond the platform use

Despite participants recognized the value and usefulness of the services offered by the platform, they did not access it or posted messages very frequently. This low use might be due to a number of technical reasons, such as: an effective notification system was not implemented, the platform was still a prototype or a critical mass of users was not reached. However, this low use did not prevent participants from exhibiting actual mutual help behaviors. In fact, by talking about the possible uses of the platform, and by reading the few announcements posted, participants became aware of needs and interests of other members and started to propose and organize group activities aimed at addressing these needs. The platform was not very important in these activities, though. For instance, new people joined the Catalan chat group without having created an account in the platform. This group, which established itself in 2013 while Life2.0 was running, is still in place at the time of writing this paper and no longer relies on the platform to, for instance, set up meetings or exchange messages. Yet, the co-design of the platform triggered this group. This result might be invisible if the success of a new technological development is only measured through its actual use.



Figure 1. Participants helping each other to use computers and the Internet face-to-face

4.1.5 The platform within the users' communication ecology

When a first prototype of the platform was delivered to users and they started to use it, we realized that participants' current IT-mediated communication practices influenced a lot the way in which they wanted to use our platform. 'Proper' notifications were key aspects of their IT-mediated communication. For example, they often access their Facebook accounts only when getting e-mail notifications of new messages received on Facebook. Thus, our participants asked us to include in the platform a notification system that would be aligned with their everyday IT practices, and made some suggestions. One was receiving a copy of the announcements posted in the platform in their e-mail accounts, given that they expected to be notified by e-mail when a user had replied to their posts. Those participants who were regular Facebook users missed an option that enabled them to share the platform announcements in their Facebook pages. Participants who owned a smartphone claimed that it would be easier for them if they could receive notifications directly on their phones.

Similar comments were received when interviewing local associations about their willingness to use the platform to promote their events. One of their main concerns was the perceived

duplicated effort they would have to make to publish an event in their current communication channels (typically a Facebook page, the association website and/or printed brochures) and the community platform.

These results highlight the relevance of integrating smoothly new community platforms with the users' and communities existing communication tools and strategies.

4.1.6 The role of the community to build trust and foster the service uptake

Over the course of the study, it became clear that it was important to build trust among participants in order to foster their uptake of the platform and share help / knowledge. Indeed, not all the participants knew each other when they joined the project and all reported that it was essential to first know the person with whom they were going to share knowledge and practices.

The weekly face-to-face meetings, organized as part of the project, allowed participants to know each other and build trust. Slowly, they started to identify themselves as a group: "*we created a very good group of friends*", a participant stated during the last debriefing session. The group progressively gained a sense of community and commitment to the project, as their active involvement in dissemination activities demonstrated: "*to make the platform a success we all have to commit!*"

These community-building activities turned out to be beneficial in several aspects: (a) promoting the use of the sharing service by fostering trust-building among potential service users, (b) creating a sense of project ownership by making participants feel part of something they were contributing to build. For example, participants voluntarily took on an active role in disseminating the project among their peers, discussed communication and dissemination strategies, set up interviews with possible stakeholders and wrote articles in a newspaper of a local association to promote the project. Moreover, the social interactions resulting from these community-building activities were considered by the participants a major outcome of the project. In fact, the core group of participants is still meeting weekly in AG and recently set up a self-organized group aimed at teaching each other how to use and personalize their smartphones.

These positive results suggest that community-building activities should be considered an integral part of the service, which in turn should not be targeted at single (needed) users. Instead, the service relied heavily on a community that acted as the offline reference point of the online platform.



Figure 2. Participants in a get-together celebrating the start of the Christmas season.

4.2 Case study 2: Older people co-creating engaging scenarios in urban areas

The second study explored the co-creation of geo-located content for informal learning scenarios. Two main activities were conducted, one in 2012, and the other, in 2013. These activities were not directly focused on smart cities aspects (although learning is an important part of novel concepts of city). Yet, the results reveal interesting ideas related to how ICTs can be used to engage communities in co-creating content related to their urban areas.

4.2.1 Participants

28 people (age 60-81) took part in the case study, 20 in both activities. They were enrolled in a book-reading club in AG, where they read and discuss classical literary books. Most participants had little or almost no experience with ICTs and did not show a big interest in learning how to use them either. Only 5 of them owned smartphones and were regular computer users.

4.2.2 Co-creating literature routes with smartphones

In the first activity the group of participants created routes through geo-located closed-ended questions about the book they were reading, which had a lot of references to a specific neighborhood in Barcelona (Gràcia), and answered them a few days later in the real locations referenced in the book using a mobile application. The participants were divided into two groups so that each created questions to be answered by the other. There were 4 sessions: 2 for the creation of the questions, 1 *in-situ* activity in which participants explored the route with smartphones and answered the questions that popped up on their smartphone when they were close to the location, and 1 debriefing session in which the results were discussed by the participants. A detailed description of the activity and some its learning related results was reported in [31]. We highlight here some aspects, which, over time, pointed at new urban scenarios and possibilities.

4.2.3 Good for physical exercise and an ice breaker for getting familiar with technologies

At the beginning, participants were reluctant to participate in an ICT-based activity. Yet, after the activity, 80% of the participants showed a big interest in carrying the smartphone during the *in-situ* session if the activity were conducted again. Participants' engagement in the activity was also evident by their reactions (e.g. jumps) every time they answered a question correctly. The activity also turned out to be a good physical exercise, as this participant's comment confirms: "We walked for 2 hours and we did not complain about it!"

4.2.4 Co-creation adds value to the activity

The *in-situ* activity was important but the overall process of creating the route too, as one participant vigorously pointed out during the debriefing session: "we should not forget about the whole process we followed to create the route! We worked very hard and the results have been wonderful. We all now talk about the activity on the street and the smartphones...but that was just one part of the whole experience, don't forget it!" Indeed, when defining the contents of the route, the participants engaged in a lot of conversations and debates about the book and the locations of the questions. Our observations and conversations with the participants suggest that their strong engagement in the creation process contributed substantially to the success of the activity.



Figure 3. Participants co-creating a route

4.2.5 Exploring and adapting to new scenarios

The second activity took place one year later at the participants' request. They wanted to create a new route based on a new book they were reading. The book stories were set in a prison, which was a challenge for creating geo-localized content. However, the participants suggested creating a route on the biography of the author, which contains numerous references to the historic center of Barcelona. Participants used books, notes and printouts containing information about the author's life to create the route. Each of them had voluntarily collected this material by searching on the Internet, libraries and encyclopedias. During the *in situ* activity, participants did not limit themselves to answering questions. Instead, they discussed with each other about what they knew about the places they were visiting. For example, when reaching St. Agatha chapel, a participant commented: "did you know Agatha is the patron saint of breasts? (...) "the stairs leading to the square were built by Juan I...the character of the book we are reading!!"



Figure 4. Participants during the *in-situ* activity

4.2.6 Incorporating routes as a community practice

Since then, members of the book-reading club have organized three routes. We were invited to one of them, which was about unknown buildings of the historic centre of Barcelona. The activity was quite different than the previous one we organised. The route was created by two members of the club, who picked a topic, the locations, and gathered information about them. They acted as *hosts* during the *in situ* activity. There were no

questions/answers and no technologies were used. Yet, it is worth noting that the participants incorporated the activity into their practices and adapted it. They claimed they would like to repeat the routes with smartphones. Yet, to do so, they considered that they would need our help. This shows that handing the technology over to the community and assuming that this technology will effectively be used is an actual challenge, which is a matter of concern being increasingly discussed within the HCI field targeted at communities [34].

5. TOWARDS REACHING THE CITY SCALE: FROM SINGLE TO INTER-COMMUNITIES

The case studies presented above were both conducted with a specific community. Working towards providing a wider vision of smart cities for older people, it is valuable to expand the context by, for example, moving from scenarios targeted at single communities to other ones that explore interaction within the network of communities that make up a neighborhood or an entire city. We have recently started to work on a scenario that aims at scaling up to a neighborhood context. There has been an initial consultation phase with interviews with public actors and local communities to explore the feasibility of the scenario discussed below. We are currently meeting local communities to set up an initial pool of participants.

5.1 Neighborhood cohesion through co-creation of urban leisure

The scenario is situated in the district of Sant Andreu in Barcelona. The area is characterized by high population density, a quarter over 65 years old, low income and a strong associative network. Recently, the city council promoted two new initiatives intended to attract people of the Creative Industries. These initiatives have been bringing into the neighbourhood new “visitors” who do not know much about the local area or people living in there. The city council aims to make the neighbors more visible in these new initiatives. A strategy could be to involve them, particularly the older segment of the population, in creative activities based on ICTs.

Within this context, the pilot develops the concept of local communities creating a geo-localized game about their neighbourhood as a means of promoting the sharing of information between the visitors and the locals. The dynamics of the game would be similar to that followed in the geo-located literature routes presented above. According to initial discussions with local associations, the topic of the gamified activity would be about memories and stories of the neighbourhood, aiming at creating a gamified collective heritage of the local area. The participants will select the most salient memories of, and information about, the local area and transform them into questions localized in specific places. Members of local associations, schools, libraries, and the “visitors” will be invited to play the game and add new content.

Within this scenario, we aim to explore a number of aspects and related challenges, which we discuss next.

5.1.1 Facing challenges in scaling up to a neighborhood context

Conducting the study in a neighborhood invites us to consider the different groups of people that independently or jointly act in it. Thus, although our focus is primary on older people, we need to see them within a much wider daily life context. In addition to

involving associations of older people, we aim to reach cultural centres, associations of parents of school-aged children and libraries, independently of the chronological age of their members. Our approach has been supported by the coordinator of a senior centre, “*it is important to foster older people to go out from the senior centres and interact from time to time in other contexts, with people of all ages*”.

Working across communities presents a number of challenges too, since the practices of each community can be disjoint and lead to organizational issues. For instance, the group of older people already involved reported that the time slot available in their busy agenda is on Monday morning, which is incompatible with most job and school timetables. The negotiation of a place among the different associations to host the co-creation activities we are carrying out involves subtleties too. We are addressing these issues in different ways by, for instance, making the collaboration scenario more flexible and involving additional groups.

5.1.2 Exploring civic agency of older people through creative activities

We consider the creation of a neighborhood game as an example of civic action: the game becomes a neighborhood common good, which should aid in increasing the social cohesion among visitors and locals. By involving older people as primary creators of the game, we aim at taking forward our understanding of older people as civic agents (presented in case study 1 and 2), which includes exploring their role in collaborative IT-based civic actions. In order to do so, we consider they should take on two main roles: *informants* (e.g. they provide information to young people who generate the digital outputs) and *makers* (e.g. they actively select information and produce the digital output). Within this scenario, it is important to understand which technical/social skills, knowledge and motivations foster civic engagement among older people.

6. AN ENLARGED VISION OF SMART CITIES FOR OLDER PEOPLE: TECHNOLOGY, AGENCY, COMMUNITY

Through the analysis of our case studies, we have identified a number of factors that are not fully covered in the usual vision of smart cities for older people. We group them into three main clusters: technology, agency and community. Our goal is to outline a set of key aspects to consider when designing scenarios of ICT for older people in urban contexts; there is no aim of completeness, which might be useful to benchmark age-friendliness of cities, for instance.

6.1 Technology

Technologies are key components and drivers of visions of smart cities. Technologies are widely considered *enablers* and *facilitators* of predefined scenarios based on fixed goals, which include, amongst others, monitoring traffic, enabling participatory governance, facilitating communication between older people and public care workers. New platforms and apps are often proposed and developed to achieve these goals, leading to a proliferation of new digital tools. By contrast, in our study, urban technologies were both *triggers* of new community behaviors and dynamically integrated within the *ecosystem* of existing technologies and communication practices. These two aspects emphasize the importance of looking at *creative use* when pursuing innovation in smart cities.

6.1.1 *Urban technologies as triggers of new community behaviors*

Our results show that the benefits and outcomes of the research activities went beyond the use of the specific technology introduced in the community. The (prototype) technologies did trigger new behaviors, which did not disappear upon project completion. These new behaviors persisted using or not the technologies developed. The members of Catalan mutual help group still meet up and the book-reading club has included routes as a regular activity. The prototype technologies do not play a special role in sustaining these new practices (which could be or not supported by technology), though.

This urges us to reconsider what positive outcomes in IT- and community- based studies are. Rather than measuring impacts on the basis of patterns of technology use (e.g. number of accesses or messages sent), sustained offline behaviors could be considered too. This might also challenge current revenue models of business-driven visions of smart cities, which are based on sales or improved services against payments relying on massive use of the developed technology [1].

Our vision calls for shifting the focus from conceptualizing urban technologies solely as solving tools to widening our view by looking into how local communities creatively use the opportunities offered by ICTs to trigger new social behaviors (and overcome problems, of course).

6.1.2 *Urban technologies within the ecosystem of communication tools and practices*

Through a technological lens, urban environments are often framed in smart cities discussions as “a source of problems to be resolved” [39]. This vision has driven the development of an increasing number of prototypes which fail to understand the fit of these new developments in current cultural contexts, communication practices and everyday activities of cities dwellers [14]. Furthermore, when these systems are targeted at older people, it is often assumed that they are not regular ICTs users and special and dedicated technologies need to be built for them.

Contrary to these assumptions, our first case study showed that not only were our participants regular users of mainstream technologies, such as e-mail, Facebook and smartphones, but also promoters of integrating them into the platform we were developing. Similarly, local associations were using a number of different technologies and showed concerns about adding a new one without a clear understanding of how it would integrate with the rest of tools. These results show that a new technology should not be considered in a vacuum. Instead, understanding how it evolves within an ecosystem of established (technology mediated) communication practices in a given community is worth the effort.

This has two main implications for designers of smart cities. The first one is that new platforms / apps should easily communicate with other mainstream technologies, especially social media. The second is that designers should consider whether the tasks (needs) allowed (met) by the new technology can actually be performed (addressed) through an effective, perhaps modified use [8] of existing technologies, rather than introducing a new one. Thus, a future challenge for researchers and designers could be to understand how to foster the development of strategies for achieving creative use and appropriation of existing ICTs to accomplish individuals’ and communities’ purposes.

6.2 Agency

Recently, the smart city debate has increasingly moved from a vision based on automation and sensors to one where citizens play a key role in “building” the smartness of their city through collective actions. Concepts such as human smart cities [17], smart citizenships [30], among others, are gaining ground and are challenging the IT-driven approach that builds on technologies the smartness of the city. Contrary to these scenarios of citizens’ engagement and empowerment, the widespread vision on the older population still sees them as passive users of (assistive) technologies, thus overlooking their active role as citizens and IT-users. We consider that it is timely and important to bridge some gaps between the visions of smart cities targeted at older people and the one addressing the “rest” of the population. In this section we claim that in order to bridge this gap, an age-friendly smart city should support a notion of agency by older people.

6.2.1 *From “above” to the culture of agency*

A thread that cuts across the cases studies is the active role played by older people: they offer their knowledge to other peers, create the contents of the routes or identify key aspects of their neighborhood. Furthermore, their intervention went beyond playing an active role within the scenarios proposed by researchers. They adopted and adapted those scenarios to their needs and interests. We witnessed this adoption and adaptation in how they turned the mutual help service into a knowledge sharing service, or when they incorporated routes in their class practices. This ability to make decisions and alter pre-defined scenarios is often overlooked. It is also worth noting that the results of their actions did not simply affect the design of the product or service (e.g. choosing one feature rather than another one), but they actually had significant impact on modifying their own practices.

These results have implications for the design of age-friendly smart cities. Designers could reflect on how older people are involved in defining smart city scenarios targeted at them. Researchers are increasingly acknowledging that the design of technologies for the older population needs to move from discursive constructions of the older people’s needs [23,26]. Similar critiques have also been raised with respect to the specific domain of smart cities, where researchers claim that the vision of smart cities has often been constructed and driven by corporate interests [33]. This approach runs the risk of ignoring the gap between the discursively constructed needs and interests of citizens and the real ones – not to mention the corporate interests. In order to overcome this drawback, empirical research on what constitutes a livable smart city from the perspective of older people is needed.

Drawing upon our results, this research needs to go beyond a consultation process where insights and feedback from older people about pre-defined scenarios are gathered. Designers and researchers should look into how older people appropriate and adapt the technologies proposed to them to their needs, social interests and practices. In other words, conceptualize an older person as someone who counts in the design process and, more importantly someone with agency in his/her living context – including in the use and design of ICTs. The notion of agency bears some relationship to a notion of power (governance): being able to achieve something for themselves rather than being bestowed “from above” [2]. Thus, we claim that a smart city for older people vision should move away from the current vision in which policies and technological experts define the ageing problem and set the goals, towards developing a culture where the

ability of (older) people and local communities to solve problems and create new scenarios of living is considered, fostered and supported.

Agency also means that neither older people nor local communities become an instance of reification within the technological development. This seems particularly challenging since it requires transferring key responsibilities of the project/research to the community and the community willingness to take them. Our experience indicates that research should be driven by community interests rather than by seeing communities as a research setting. How to balance this community-driven approach with research objectives, or overall policies deserves careful research consideration.

6.3 Communities

Researchers have recently started to explore how local communities of neighbors, craftsmen, artists, or hackers organize themselves to solve issues of daily living (e.g. [9]). Engaging established communities of older people and looking at their everyday practices only recently emerges in design research, with rare examples such as [3,4]. How does a community lens influence the vision on design for ageing in urban contexts? Our results suggest that seeing older people as community members rather than individuals homogenized through an age-based approach can foster interests-based and cross-age design.

6.3.1 Communities, interests and cross-age interactions

When building dedicated systems or services targeted at the ageing population, there is an implicit assumption that older people share similar interests, needs and life experiences, because of their chronological age. This approach is aligned with the concept of “chronologization” of life, for which the age of an individual can determine what type of activities s/he will engage [37], which has been criticized for being too simplistic, overlooking self-identities and creating stereotypes (e.g. [6]).

Our results invite us to think of older people as members of different communities, thus as people who have varying interests and goals according to the specific community with which they identify. For example, in case study 1, participants were interested in learning ICTs, while those involved in the second were more into sharing opinions about literature. Although both case studies were conducted within the same (AG) community, each sub-group had its own practices, interests and goals impacting on potential designs. Community-based thinking led us to consider a wider pool of interests, needs and practices and propose solutions community-focused, rather than age-focused. It also drove us from a personhood to a citizenship perspective [2] on ageing; i.e. from conceptualizing older people within their immediate micro-environments (e.g. interaction in the home-context with mainly family members) to considering them within wider socio-cultural and political contexts (e.g. interaction in neighborhoods, which include a varied ecosystem of actors, cultures, forces).

This shift in focus may promote design themes across different age groups, age-integrated⁴ scenarios, that benefit an entire neighborhood (i.e. designing neighborhoods for all ages [35]). However, reaching age-integration models may be a matter of

degree, and requires detailed consideration of different age group communities, as we indicated in our ongoing work.

7. CONCLUSIONS

The aim of this paper has been to analyse and expand the current vision of smart cities targeted at older people.

We have discussed that the current (IT-driven) visions of smart cities for older people could and should be widened by considering social aspects of ageing in urban environments and participatory governance processes.

We have presented two case studies that, by drawing on concepts of co-creation and social engagement in community contexts, contribute towards outlining new scenarios of active urban ageing. The results have shown that the urban technologies developed, and most importantly, the process of adaptation and appropriation undergone, empowered older people – at least, our participants - to engage in topics of their interests, such as sharing knowledge and organizing literary strolls, and resulted in sustained outcomes which were not delimited by continued (prototype) technology use.

We have drawn upon the lessons learned in these case studies in order to propose a different conceptualization of smart cities for older people that leverages on specific approaches along three main dimensions: technologies, agency and community. The first dimension suggests that smart cities researchers and practitioners could harness local communities’ creative use of ICTs (existing or proposed) to trigger new social behaviors. By re-positioning the primacy of technology, we can re-think what positive outcomes in smart cities research and innovation are, such as opening up possibilities, beyond designing new problem-solving tools. The second dimension puts forward agency as a key component of smart cities scenarios in order to tap into the capabilities of (older) people and local communities to create new scenarios of living, aligned with concepts of citizen’s self-organization [10], effective use [8], civic intelligence [32], among others. Finally, the community dimension invites us to consider the older population within the larger context of their neighborhoods, communities of interests, and encourages cross-age design scenarios for building cities for all ages.

8. LIMITATION AND FUTURE WORK

The case studies presented, and the implications drawn from them, address only some of the numerous factors that characterize the ageing process and the smart city phenomenon. This may limit the applicability of our findings and, at the same time, opens up future research opportunities.

As far as ageing is concerned, the case studies were carried out with active and independent older people. Other important challenges of the ageing population, such as risk of loneliness and cognitive disabilities have not been addressed in this paper, although they remain an important societal challenge in urban cities. Whether and how our scenarios and visions can be adapted and benefit frail older people warrants further research.

With respect to smart cities, the case studies have emphasized the role of older people as active citizens. We have barely considered other actors who might also be involved in ageing urban cities, such as social workers and institutions. Further research is needed to understand, for instance, how the proposed scenarios apply to and can contribute to the governance of cities, and which technical and human resources are needed to scale them up (e.g. from a

⁴ According to Uhlenberg an “age-integrated structure may be defined as one that does not use chronological age as a criterion for entrance, exit, or participation.”[37]

community to a single neighborhood, and to the entire city). Our ongoing work is geared towards this direction.

9. ACKNOWLEDGMENTS

We cannot thank Àgora participants enough. We thank P. Santos and M. Balestrini for their key roles in case study 2, A. Rosales, S. M. Ferreira and J. Tirado for their contributions throughout our research activities, and the programming team in WorthPlay and Life2.0. We also thank C. Giovannella, coordinator of the Master in Design of People Centered Smart Cities, for inviting us to present our research and prompting us to write this paper. This work has been partially funded by the Spanish Ministry of Science and Innovation (TIN2011-28308-C03-03), the EU through Life2.0 (CIP ICT PSP-2009-4-270965), FGSIC and OSC through WorthPlay and supported by the A-C-T (Ageing-Communication-Technology) network funded by the Canadian SSHRC.

10. REFERENCES

- [1] Alcatel-Lucent. Getting Smart About Cities. Understanding the market opportunity in the cities of tomorrow. 2012. Retrieved from: http://www2.alcatel-lucent.com/knowledge-center/admin/mci-files-1a2c3f/ma/Smart_Cities_Market_opportunity_MarketAnalysiss.pdf.
- [2] Bartlett, R. and O'Connor, D. From personhood to citizenship: Broadening the lens for dementia practice and research. *Journal of Aging Studies* 21, 2 (2007), 107–118.
- [3] Botero, A. and Hyysalo, S. Ageing together: Steps towards evolutionary co-design in everyday practices. *CoDesign* 9, 1 (2013), 37–54.
- [4] Brandt, E., Binder, T., Malmberg, L., and Sokoler, T. Communities of everyday practice and situated elderliness as an approach to co-design for senior interaction. *Proceedings of the 22nd Conference of the Computer-Human Interaction Special Interest Group of Australia on Computer-Human Interaction - OZCHI '10*, ACM (2010), 400–403.
- [5] Braun, V. and Clarke, V. Using thematic analysis in psychology. *Qualitative research in psychology* 3, 2 (2006), 77–101.
- [6] Bytheway, B. *Ageism*. Open university Press, Buckingham, 1997.
- [7] DeWalt, K. M. and DeWalt, B.R. *Participant observation: A guide for fieldworkers*. Rowman Altamira, 2010.
- [8] Gurstein, M. Effective use: A community informatics strategy beyond the digital divide. *First Monday* 8, 12 (2003), 1–13.
- [9] Horelli, L. and Sadoway D. Community Informatics in Cities: New Catalysts for Urban Change. *The Journal of Community Informatics* 10, 3 (2014).
- [10] Horelli, L. *New Approaches to Urban Planning. Insights from Participatory Communities*. Aalto University Publication series, Helsinki, 2013.
- [11] IBM. IBM Human Centric Solutions Center is making a difference for Italian seniors aging at home in Bolzano. http://www-03.ibm.com/able/news/bolzano_video.html.
- [12] Intel. Building a Smart, Age-Friendly Community. Community, Home Based Elder Care Information Platform. 2013. Retrieved from: <http://www.intel.com/content/dam/www/public/us/en/documents/case-studies/building-smart-age-friendly-community-exec-summary.pdf>.
- [13] Kalviainen, M. Elderly as content providers in their everyday life supporting services'. Presented at Cumulus Conference (Helsinki, Finland, 2012). Available at: <http://cumulushelsinki2012.org/cumulushelsinki2012.org/wp-content/uploads/2012/05/Elderly-as-content-providers-in-their-everyday-life-supporting-services.pdf>
- [14] Kukka, H., Ylipulli, J., Luusua, A., and Dey, A.K. Urban Computing in Theory and Practice : Towards a Transdisciplinary Approach. *Proceedings of the 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational*, ACM (2014), 658–667.
- [15] Lawton, M.P. Environment and other determinants of well-being in older people. *The Gerontologist* 23, 4 (1983), 349–357.
- [16] Lui, C.-W., Everingham, J.-A., Warburton, J., Cuthill, M., and Bartlett, H. What makes a community age-friendly: A review of international literature. *Australasian journal on ageing* 28, 3 (2009), 116–21.
- [17] Marsh, J. and et al. The Peripharia Cookbook, Peripharia project. (2013).
- [18] Michael, Y.L., Green, M.K., and Farquhar, S. a. Neighborhood design and active aging. *Health and Place* 12, (2006), 734–740.
- [19] Mirri, S., Prandi, C., Salomoni, P., Callegati, F., and Campi, A. On Combining Crowdsourcing, Sensing and Open Data for an Accessible Smart City. *International Conference on Next Generation Mobile Apps, Services and Technologies*, (2014), 294–299.
- [20] Munoz, S.-A., Farmer, J., Warburton, J., and Hall, J. Involving rural older people in service co-production: Is there an untapped pool of potential participants? *Journal of Rural Studies* 34, (2014), 212–222.
- [21] Oswald, F. and Wahl, H.W. Creating and Sustaining Homelike Places. In *Environmental gerontology: Making meaningful places in old age*. Springer Publishing Company, 2013, 53.
- [22] Palumbo, F., Rosa, D. La, and Chessa, S. GP-m: Mobile Middleware Infrastructure for Ambient Assisted Living. *In Computers and Communication (ISCC), 2014 IEEE Symposium on*, IEEE (2014), 1–6.
- [23] Peine, A., Rollwagen, I., and Neven, L. The rise of the “innosumer”—Rethinking older technology users. *Technological Forecasting and Social Change* 82, (2014), 199–214.
- [24] Pestoff, V., Brandsen, T., and Verschuere, B. *New public governance, the third sector, and co-production*. Routledge, 2013.
- [25] Righi, V., Malón, G., Ferreira, S., Sayago, S., Blat, J. Preliminary Findings of an Ethnographical Research on Designing Accessible Geolocated Services with Older People. In C. Stephanidis (Ed.): *Universal Access in HCI, Part II, HCII 2011, LNCS 6766*, 205–213. Springer-Verlag Berlin Heidelberg 2011.
- [26] Rogers, Y. and Marsden, G. Does He Take Sugar ? Moving Beyond the Rhetoric of Compassion. *interactions*, 2013, 48–57.

- [27] Rosales, A., Righi, V., Ferreira, S., Tirado, J., Sayago, S., and Blat, J. D8.1 Second report on experiences of digital game play. Proyecto Cero Worthplay (WorthPlaying Digital Games for Active and Positive Ageing). 2014. Available at: <http://worthplay.upf.edu/node/181>.
- [28] Rosales, A., Righi, V., Sayago, S., and Blat, J. Ethnographic techniques with older people at intermediate stages of product development. Presented at *Workshop on How to Design Touch Interfaces for and with Older at NordiCHI2012*, (Copenhagen, Denmark, 2012), 1–4.
- [29] Rowles, G.D. and Bernard, M. The meaning and significance of place in old age. In *Environmental Gerontology: Making Meaningful Places in Old Age*. Springer Publishing Company, 2013, 3.
- [30] Sadoway, D., Shekhar, S. (Re)Prioritizing Citizens in Smart Cities Governance: Examples of Smart Citizenship from Urban India. *The Journal of Community Informatics* 10, 3 (2014).
- [31] Santos, P., Balestrini, M., Righi, V., Blat, J., and Hernández-Leo, D. Not interested in ICT? A case study to explore how a meaningful m-learning activity fosters engagement among older users. *Proceedings of the 8th European Conference on Technology Enhanced Learning*, Springer Berlin Heidelberg (2013), 328–342.
- [32] Schuler, D. Cultivating society’s civic intelligence: Patterns for a new “World Brain.” *Information, Communication & Society* 4, 2 (2001), 157–181.
- [33] Söderström, O., Paasche, T., and Klauser, F. Smart cities as corporate storytelling Smart cities as corporate storytelling Abstract. *City* 18, 3 (2014), 307–320.
- [34] Taylor, N., Cheverst, K., Wright, P., and Olivier, P. Leaving the wild. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems - CHI '13*, (2013), 1549.
- [35] The Annie E. Casey Foundation. *Communities for All Ages: Planning Across Generations. Elders as Resources Intergenerational Strategies Series*. Baltimore: The Annie E. Casey Foundation, 2005. Retrieved from: <http://www.aecf.org/resources/communities-for-all-ages-planning-across-generations/>
- [36] Thorne, J., Li, A., Sivaraman, V., and Bridge, C. Mobile Crowdsourcing Older People’s Opinions to Enhance Liveability in Regional City Centres. In *Intelligent Sensors, Sensor Networks and Information Processing (ISSNIP), 2014 IEEE Ninth International Conference on*, IEEE (2014), 1–7.
- [37] Uhlenberg, P. Introduction: Why Study Age Integration? *The Gerontologist* 40, 3 (2000), 261–266.
- [38] Wiles, J.L., Leibing, A., Guberman, N., Reeve, J., and Allen, R.E.S. The meaning of “aging in place” to older people. *The Gerontologist* 52, 3 (2012), 357–66.
- [39] Williams, A., Robles, E., and Dourish, P. Urbane-ing the city: Examining and refining the assumptions behind urban informatics. In *Handbook of Research on Urban Informatics: The Practice and Promise of the Real-Time City*. Information Science Reference, IGI Global., Hershey, PA, 2008, 1–20.
- [40] World Health Organization. *Global age-friendly cities: A guide*. World Health Organization, 2007.