# Reflecting on a Smart City Project for Older Adults

Julian Fietkau
julian.fietkau@unibw.de
University of the Bundeswehr Munich
Neubiberg, Germany

Laura Stojko
laura.stojko@unibw.de
University of the Bundeswehr Munich
Neubiberg, Germany

## Abstract

Between 2015 and 2020 we participated in a joint research project to explore technological interventions fostering participation of older adults in urban spaces. *UrbanLife+* involved multi-year qualitative and quantitative empirical work on obstacles faced by people aged 65 and up living in cities. This brief retrospective does not recap the previously published results of the project, but summarizes methodological and organizational insights as well as pragmatic experiences gathered during its runtime that have not yet been discussed publicly. We focus on aspects relevant for future urban technology projects aiming for accessibility and inclusivity. These include issues navigating interdisciplinary design teams, conducting questionnaire studies with older adults, maintaining participatory design principles with geographically distributed teams, and conducting empirical evaluations during the COVID-19 pandemic.

## CCS Concepts

• **Human-centered computing** → *Empirical studies in ubiquitous and mobile computing*; • **Social and professional topics** → **Seniors**.

## Keywords

human-computer interaction, field studies, participatory design, urban spaces, activity support, accessibility, older adults, seniors

## 1 Introduction

This article looks back on the *UrbanLife+* project[1], a federally funded joint research project involving three German universities and a variety of industry partners from the city of Mönchengladbach and its surroundings, which served as the project's context for requirements analysis and field deployments [8, 9]. The goal of the project was to conduct research into technological interventions to allow and foster increased participation by older adults in the urban space and its social fabric. It culminated in a variety of design recommendations for smart urban objects and their deployment.

During its runtime from 2015 to 2020, UrbanLife+ conducted an extensive requirements analysis consisting of a panel study to gather subjective data from thousands of residents, as well as personal inspections of district streets, parks, and footpaths, enabling deep insight into perceived as well as physical barriers. This phase

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[1]https://www.urbanlifeplus.de/

was followed by ideation and prototyping work, in which a number of avenues were pursued to use interactive technology to solve or mitigate some of the issues experienced by older adults. Lastly, there was an evaluation phase in which ideas and prototypes were put to the test. The project's goal was not to single-handedly overhaul the realities of urban living in Mönchengladbach, or even to develop finished products, but instead to research and understand ways in which modern digital technology could be used to benefit older adults in the public urban space in innovative ways [10].

With a few years of distance and the benefit of hindsight, we use this venue to provide an overview of the project's approach, with a particular focus on areas where it stumbled or failed. While these problems themselves are not individually novel or even necessarily surprising, we believe that our experiences in aggregate may be helpful for future projects working on smart cities or other urban technology, particularly with accessibility and inclusivity in mind.

We intentionally avoid retreading prior published core results of the project for this contribution and instead reflect on aspects not previously discussed. To learn more about the panel study and its results [12, 13, 15, 16, 20], about the smart urban objects developed during the project [2, 4–6, 9, 17, 18, 22], or about the project's overall results and ensuing recommendations [1, 3, 7, 8, 10, 11, 21], please consult the earlier publications.

## 2 Interdisciplinary Team

The UrbanLife+ project committee consisted of researchers in software technology and human-computer interaction, elderly care and healthcare workers, as well as experts for urban planning and city development. This interdisciplinary approach sustained a productive atmosphere in which every project team member could enrich the work with their unique qualifications.

With an open-minded approach, this kind of team composition can enable sharing expertise far beyond anyone's personal competencies. Based on the concept of reciprocity, knowledge exchange becomes a personal enrichment. Considering other project colleagues as experts in their specific field fosters innovative ideas and methods, new perspectives, and different ways of thinking. Designing technology for vulnerable groups in urban areas requires a comprehensive understanding of the specific challenges they face. Therefore, we were dependent on the experts and participants showing us their perspectives in order to create something beneficial for the target group.

Still, communication was not always easy. As the quarterly committee meetings progressed and the team fell into a sort of routine, we observed a tendency of the different research groups to retreat into their own methods and goals. We had to make regular efforts to reinforce our shared goals through collaborative workshop days. Open and clear communication about expectations, resources, and objectives is key to understanding each other's work.

## 3   Panel Study

In 2017, UrbanLife+ conducted its comprehensive panel study. The written questionnaire consisted of 31 questions (some of which contained multiple items) in plain language. It covered people's living situations, their history with their local urban environment, the use of modern technology and media, social participation, mobility, and other everyday issues.

Through a cooperation with the relevant municipal governments, we were able to send this questionnaire to every person aged 65 and up living in the designated project areas at the time, totaling 6170 copies sent. Participants received a printed questionnaire and a return envelope as well as the option to fill out the questionnaire online instead.

The questionnaire had a 21 % return rate (1302 non-empty evaluable responses), which we judged as a major success. It may be attributable in part to our effort to meet people where they were, to give them opportunities to express their genuine concerns, and to make the questions straightforward but not patronizing.

An unintended consequence of the study was that a small number of respondents expressed powerlessness, frustration, and even anger in their answers. Going by their sentiments, we have come to understand that confronting older adults with a prompt to systematically reflect on age-related changes to their lives and health will leave some of them disillusioned and dissatisfied, which may be projected outward as anger towards the survey itself. As one committee member put it, "we underestimated how much of a mirror we were holding to their faces."

During the planning stages, we had intended to conduct a comparative survey at the end, but with the *General Data Protection Regulation* (GDPR) going into effect in Europe in 2018, the approach was deemed infeasible to repeat. Comparable questionnaires would now need to rely on a much smaller pool of opt-in volunteers instead of approaching residents in writing en masse.

The results of the panel study provided a very good basis for understanding the needs of older adults. Based on these insights, we proceeded to work on beneficial technical interventions in the form of smart urban objects [9].

## 4   Participatory Design

The intention for the design and prototyping phase was to involve the target user group in a participatory fashion. The biggest measure we took towards that end was to establish the "Technik-Café," a regular social meet-up in a local retirement home, where project committee members would test, examine, and discuss current interactive technology from inside and outside the project with care home residents and older adults from the surrounding area in a round table format. During early parts of the design phase, this worked well and served as a solid source of formative feedback.

Regrettably, this approach fizzled out in an unplanned fashion when a team member who worked for our university in Munich, but lived near the UrbanLife+ testing and evaluation area of Mönchengladbach, left the project. Without a direct personal presence in the local context, organizing meet-ups became a much lengthier process involving prior scheduling, a minimum of two weeks advance notice for train bookings, and costly hotel stays.

The methodology of participatory design [14] states that users should be directly involved in the process as continuously as possible. With our design and development team working in Munich, and the project committee's partners for elderly care and connections to the target audience being situated in Mönchengladbach, meetings with users became infrequent and design progress slowed down. We were still able to move forward and maintain some user involvement (particularly for the evaluation phase), but it was plain to see that the geographic circumstances hampered the project.

One idea to overcome this difficulty would be to select participants for empirical studies closer to the research group. However, such changes are not necessarily easy to implement. In UrbanLife+, the idea of doing evaluations in Munich conflicted with the focus on Mönchengladbach to which the project had made an explicit commitment, as well as with responsibilities agreed on by the committee. Approval processes for empirical work added to the organizational inertia. We observed a need to make the approval processes of institutions and ethics committees more straightforward and more transparent. This would help researchers see these requirements more as complementary quality guards than as hindrances.

## 5   Evaluation

The final evaluation phase, which would have seen prototypical deployments and field evaluations of multiple of the project's smart urban objects in public spaces, was slated for the summer of 2020. This time coincided with the worldwide emergence of COVID-19, which made it impossible to conduct interactive evaluations with older adults, particularly in groups. Because infection vectors were initially uncertain, the UrbanLife+ project decided not to invite older adults for studies with public interactive touch devices.

While we were eventually able to conduct a small-scale outdoor evaluation with one participant at a time in a highly access-controlled area [5], the scope of the experimental evaluations sadly remained far removed from the initial project plans. Even though the 2020 pandemic could not reasonably have been predicted, it is still regrettable that most of the planned evaluations were not conducted. The pandemic has also resulted in a societal shift in the role of interactive digital technology. In lieu of evaluations with groups of older adults in public spaces, UrbanLife+ was able to repurpose some of its technology to instead establish and foster remote connections (e.g. video calls) between elderly care residents and their families while visitation was not possible [19].

Rescaling our evaluation plans, it was necessary to rethink our methods to make the best out of this situation, especially as our target group was severely affected by COVID-19. Due to the circumstances, it was only possible to conduct qualitative evaluations within a limited scope, mainly with experts for elderly care and a very small number of older volunteer participants, and within a tightly controlled area. We set up our smart urban devices [4, 18] within an enclosed area owned by one of the project member institutions and performed interviews as well as observational studies.

The qualitative evaluations emphasized how important it is to show patience and empathy towards vulnerable target groups. Even if not all of their comments are relevant to the experiment, they still strengthen the overall understanding of their experience and highlight issues and needs that may be unnoticeable to younger

people. A positive aspect of this more controlled evaluation environment was the ability to create the perfect "smart city" context: having WiFi across the whole area, being able to manipulate devices through remote signals, and making use of existing electric infrastructure. The area turned into a sort of hybrid field/"outdoor laboratory" setting, skipping infrastructure concerns that would have been relevant for actual long-term in-the-wild deployments. The support of our local project colleagues, who enabled our work in the first place, was crucial to our success.

Finally, some of our researchers' careers were even affected by the diminished evaluation possibilities, as one doctoral thesis had planned to rely on the evaluation phase. The lacking quantitative results were ultimately substituted with additional footpath simulations of people moving randomly through a virtual urban area outfitted with smart urban objects for activity support, but the cohesion of the results suffered somewhat [2].

## 6 Conclusion

Overall, we learned a lot from being part of such a project, both personally and professionally. We observed that successful projects in urban areas with vulnerable groups require commitment from all disciplines, especially social sciences, that are close to the vulnerable groups, and the openness of other disciplines for interdisciplinary work by showing empathy and interest in the needs and issues experienced by others. Regarding participatory design it is especially important to connect to participants on a personal level as it increases the quality of design outcomes and evaluations.

Working with highly diverse disciplines in such a long-term project requires open communication at all levels. It is important to clarify terms and create a common understanding, as well as report expectations and employee resources. This may sound obvious, maybe even too obvious to state. But in our experience, if these assumptions are not made explicit, misunderstandings will arise.

Furthermore, adaptability towards new challenges is required, especially rethinking evaluation methods when necessary. In addition, a controlled outdoor area for prototype evaluation purposes helps to gain insight into what actually is worth deploying in the long term and to clearly identify the requirements for field deployments before significant funds are invested.

## Acknowledgments

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