HCI Research for Responsible Innovation: A Living-Lab Approach to Designing an Automated Transport System for Last Mile Logistics

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ABSTRACT

We are currently working on a responsible innovation for last-mile urban delivery. We will be testing an automated electric freight vehicle in a new urban quarter that is being built as part of the German Federal Gardening Show 2019 in Heilbronn. Different scenarios are co-designed with users from the new neighborhood and an interdisciplinary team of researchers and developers. We are using a living lab framework and methods from HCI to contribute to making our project a good practice of responsible innovation

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KEYWORDS

Automated transport systems; urban logistics; autonomous vehicles; living lab research; transdisciplinary research; responsible innovations; last-mile delivery; sustainability

Figure 1: Electric, automated vehicle for last-mile urban deliveries in the BUGA:log living lab

Figure 2: Methodological space: Iterative phases

1 A CASE STUDY OF FUTURE URBAN DELIVERY

Trends like re-urbanization, the rise of e-commerce, a heightened focus on sustainability and technological and digital advancement have increased the importance and relevance of urban logistics [8]. The balance of supply and demands of goods within urban areas is a challenge for scientists, companies and cities alike [1]. We are currently working on a responsible innovation for future urban delivery: Researchers from logistics, engineering, social studies and HCI are involved, using different methods and working at an interdisciplinary level to generate an automatic transport system for urban areas.

The context for this exploration is the Federal German Garden Show 2019 (BUGA 2019) in Heilbronn, Germany. As part of the exhibition, a new housing quarter will be built, which is part of an integrated urban development plan for sustainable city development. Within this context, the research project BUGA:log is an open and integrative environment to develop solutions for the rising logistical challenges in urban spaces in a participatory process. Many of the supply processes in new housing quarter are exemplary for logistical challenges of last-mile delivery in urban areas and pedestrian zones. Inhabitants of the new quarter will interact directly with the electric, automated vehicle (Fig. 1) by using a progressive web app.

2 LIVING LAB RESEARCH

We have established a living lab, thus taking a holistic approach to the design of the new technology for last-mile delivery, following a co-design philosophy and involving the relevant stakeholders. Living labs have emerged as an approach to support transitional processes at the interface of science and society in sustainability research and in HCI [11]. In recent years, living labs have increasingly been initiated in cross-organizational collaboration between individuals from an academic setting and from government, industry, and citizenry, with the aim of fostering transformational change processes towards greater sustainability [5, 3].

Living Labs may have several benefits: they have the potential to contribute to societal change and transformation. At the same time, they are a space for scientific and societal learning and create transformation knowledge that can be transferred to other contexts [9].

3 RESEARCH FRAMEWORK

Our approach to the BUGA:log living life lab encompasses four dimensions [6, 4]: stakeholder/user space, methodological space, creative space, management space. The research takes an iterative approach and follows living life lab frameworks that take a transformatory research approach in line with participatory action research [6, 7]. Our research activities follow four iterative phases. We are using a mixed-method approach to gain empirical insight for diagnosis and evaluation (Fig. 2). Throughout the different phases, implicit assumptions are reflected to ensure that the process is inclusive. We use the Gender Extended Research and Development (GERD) model to identify

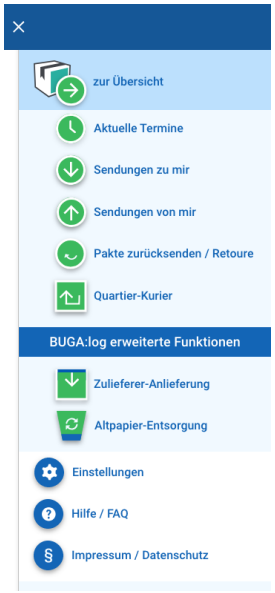

Figure 3: Screenshot of the scenarios presented in the menu of the progressive web app for the interaction with the vehicle in the BUGA:log living lab

gendered practices throughout the process and support the degendering of artefacts through reflections in all phases [2].

4 SCENARIOS

The fully automated freight vehicle that we are using for last-mile delivery is based on a battery-electric golf cart. It will go in use when the Federal Gardening Show opens in April 2019. Parcel delivery will be the first scenario coming to life in the living lab: Parcel service providers will deliver parcels to a parcel box integrated in the vehicle. A progressive web app will allow inhabitants to set the date, time, and place for their parcels delivery (Fig. 2). Over the six-month period, we will work with the relevant stakeholders (parcel service providers, inhabitants, city officials, pedestrians, etc.) to appropriate, co-evaluate and expand the possibilities in iterations. After the parcel-delivery scenario we will implement more scenarios in short iterations: Selected users (e.g. a coffee shop run by staff with disabilities in the new quarter) will be able to have their suppliers call the vehicle to the gate of the Federal Gardening Show to send them goods. In the iterations to follow, we plan on implementing new scenarios like disposal of paper waste, parcel return, and sending articles that inhabitants want to give or lend to someone in the neighborhood.

5 CONTRIBUTION TO THE WORKSHOP

Based on the research project BUGA:log we would like to contribute our experience and knowledge from a living lab setting. We are using the living lab framework and methods from HCI to contribute to making BUGA:log a good practice of responsible innovation: Through a participatory process with the stakeholders we are exploring how the social, environment, and economic impact of new technologies can be strengthened, how the process can be managed and how the results can be evaluated. We are looking forward to sharing our experiences and getting impulses and critique for our project.

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