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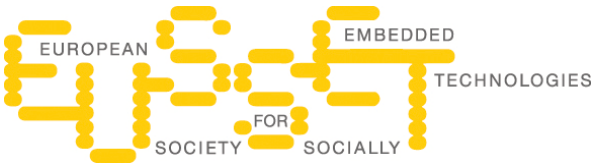

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Impressum

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Envisioning Futures of Practice-Centered Computing

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Abstract. In this panel, we will engage with the conference's membership and friends to consider directions for the *possible futures* of *practice-centered computing*. This panel is not targeting or aiming to result in a single, agreed "universal" vision, nor to ask for a shared vision among the panelists and the audience. Rather, we offer several and diverse vision statements by distinguished and innovative ECSCW scholars, being experts in their specific domain or context of research. These statements will be necessarily incomplete until the ECSCW membership has joined the discussion, offering their own, additional visions of the futures of the field. With this, the panel aims to engage in a discussion that foresees exciting future research directions for the field of ECSCW but likewise also unveils potential hurdles the community might face.

Introduction

Computer-Supported Cooperative Work (CSCW) is a well-established field of research, being beyond its third decade of existence. As part of its quarter century jubilee in 2013, scholars that have played a leading role in developing the field put together a jubilee issue in the CSCW Journal on "What has been achieved, and what issues remain as challenges for the field?" (Schmidt and Bannon, 2013). For instance, Blomberg and Karasti (2013) discuss the important role of ethnography to understand collaborative activity in past research, arguing that due to expanding temporal and spatial horizons of inquiry and new domains of collaborative activity, ethnography will continue to provide invaluable perspectives also in the future. Likewise, Fitzpatrick and Ellingsen (2013) reflect on healthcare, being a work context that CSCW was concerned with, since its early days. One key-challenge they identify is that in the context of understanding the work of healthcare, deeper research into the larger policy level is still lacking. Other papers in the jubilee addressed topics of awareness (Gross, 2013), coordination (Cabitza and Simone, 2013), knowledge management (Ackerman et al., 2013), infrastructures (Monteiro et al., 2013), and scientific collaborations (Jirotka et al., 2013). During the same year an analysis of participatory community engagement in computing futures appeared (Chamberlain et al., 2013). Thereby, the ECSCW community is particularly concerned with understanding and designing for *cooperative work practice*, as informed by the research domains listed above; also recently stepping outside the context of 'work' into other domains of *practice-centered computing*, as well as societal concerns such as marginalized groups and online collective political action.

No research discipline stands still. The concept of *work* is continually being redefined by organizations and by workers. Scholars bring new perspectives and methodologies to the study of work. Venues and publications for scholarly work in CSCW are undergoing rapid and complex reconfigurations. Schmidt and Bannon (2013) noted that CSCW was "peculiar" because it was "a remarkably heterogeneous research area, with a diverse array of research problems." We invite ECSCW members to join in a community discussion of that diversity, and of recent developments and potential futures.

This panel is specifically concerned with how highly distinguished and innovative ECSCW scholars *envision possible futures of practice-centered computing*, reflecting their own experiences and also their broader view of current and past ECSCW conferences and the journal of CSCW. Examining past research, reflecting on - and potentially also questioning - the status quo and our own assumptions, can help to unravel exciting future research directions, but likewise also may unveil potential challenges that the community might face. The panelists will represent current trends in practice-centered computing and by extrapolation, we hope to engage in a discussion that envisions future

developments with an attempt to be plausible (Blythe and Encinas, 2016). Speculative and fictional approaches have a long tradition in HCI and design related techniques, such as, scenarios, prototypes, forecasting, and envisionments (Wakkary et al. 2015). What all of these approaches unite is that they can aid research to *"peak into a possible future"* (Korsgaard, Nylandsted, and Bødker, 2016; p.71). As part of this panel we hope to provide a diverse set of different peeks into the future, composed of the following visions:

Ingrid Erickson: *Embracing Different Ways of Studying Practice*

We are ever more integrated with the machines and tools in our midst. We live alongside of them, in them, around them, through them. The boundaries are blurring constantly and are also ever changing. Against this backdrop, it is of continuing importance to study practice—aka, to study the verbs as well as the nouns. But this tight coupling sometimes makes it hard to differentiate practices, to separate the socio from the technical, the individual from the collective, the micro from the macro. This begs the question, do we need to embrace a different way(s) of studying practice that builds on our past, yet also challenges us with new questions and methods as we move into the future? If so, what does this look like and what does it mean for us as researchers?

Myriam Lewkowicz: *Transforming Workplaces*

I would like to emphasize that practice-centered research, and then computing or socio-informatics, are essential in a world facing a flood of digital technologies. Work practices are radically transformed, and practice-centered research is a way to deconstruct either too idealistic (open factories, with a production on demand, local production and circular economy, …) or too dramatic (the end of work, IA running the word, …) discourses on this transformation of the workplace.

Ann Light: *Enchanting Tools for a more Sustainable Culture*

What justifies the big energy footprint of innovating technology? One answer may be tools that enchant us with our world and connect us with the other living beings in it, particularly to support active and activist appreciation. I will consider networked technology for what it can offer to a more sustainable culture, drawing out some thoughts on how to design well for the rapidly changing times of the 21st century.

Luigina Ciolfi: *Reflecting on our Practice as Researchers*

I will argue how, as part of envisioning new frames, approaches and concerns towards practice-centred computing, we should include a more critical self-reflection on our practice as researchers: how we position ourselves towards our

research context, what is our own relationship (epistemological, ideological, cultural, political, or emotional) with the practices we study, what the impact of our research and of our way of doing it will be on those whom we study. At a time when, as a community, we are reflecting on the social impact of research and on how to decolonise subsets of HCI, such as participatory design scholarship, the concern of CSCW researchers should engage in self-critique of our own practices as researchers. I will illustrate these points with some short examples from my work in the field to highlight the tensions and challenges of being a self-reflective practice-centred researcher, and to propose a set of open questions for discussion by the panel and by the audience.

Methods

This panel will be composed of (1) *panelists* that are distinguished and innovative ECSCW scholars, being experts in their specific domain or context of research; and (2) *the ECSCW membership* as active participants in the discussion. With this panel composition, we aim to gather vision statements from the panelists from their specific research perspectives, framed with their broader understandings about the future of practice-centered computing. These statements may then be reflected upon, challenged, and questioned by the ECSCW membership, in order to open up the communities' thinking towards new future perspectives.

With this setup we are confident to ensure an engaging discussion and debate between the panelists and the plenum. In inviting distinguished scholars we anticipate the emergence of contrasting views, and therefore, also do not ask for a shared vision of the future as an outcome of this panel. We rather seek diverse, contrasting, divergent viewpoints about how the future of practice-centered computing may look like and ask the plenum to engage in this discussion.

We will begin the panel with a brief introduction to the panel by the moderators, followed by short vision statements from each panelist. After all of the panelists have provided their vision statements, a short discussion session among the panelists will follow. Afterwards, we hope to directly open the discussion to the entire plenum. If necessary, the moderators will also have provocative questions for the panelists and the audience to ensure a smooth transition from the panelist discussion to also involve the plenum into this conversation. By opening the discussion to the entire plenum, we hope to identify further, diverse viewpoints and perspectives that will complement and/or question the statements being made by the panelists. After this general discussion phase among the panel and the plenum, the moderators will then close the discussion by concluding with final remarks. As an outcome of this panel we aim to draw a kind of "landscape of practice-centered futures" that may help the community to foresee interesting research directions but also anticipate issues that we may need to tackle with in the future.

After the Panel

Having two moderators allows us to carefully document the discussions among the panelists, discussants, and the audience. These notes will provide the basis for an article for the next ECSCW conference in terms of an exploratory paper that more formally discusses potential future directions and challenges for practice-centered research initiatives from diverse but likewise contiguous perspectives. We can also envision continuing the discussion initiated during the panel, by for example, creating an online space that allows to further share, discuss, and question diverse futures of practice-centered computing. With this we hope to facilitate continuous engagement among researchers being interested in further shaping a research agenda for a practice-centered, socio-technical future; working towards a changed world where future technical possibilities help in resolving pressing societal, ethical, political, as well as sustainability concerns of the future.

Panelists

Ingrid Erickson is an Assistant Professor at the School of Information Studies at Syracuse University. An ethnographer and organizational scholar by training, her research centers on the way that mobile devices, ubiquitous digital infrastructures, and artificial intelligence are influencing how we work and communicate with one another, navigate and inhabit spaces, and engage in new types of sociotechnical practices. Together with colleagues, she is responsible for overseeing the NSF-sponsored WAIM research collaboration network, which focuses on generating intellectual convergence amongst a wide range of disciplinary scholars on the broad topic of 'work in the age of intelligent machines.' She received her PhD from the Center for Work, Technology and Organization in the Department of Management Science & Engineering at Stanford University.

Ann Light is Professor of Design and Creative Technology, University of Sussex, UK, and Professor of Interaction Design, Social Change and Sustainability, Malmo University, Sweden. She is a qualitative researcher specializing in design for social wellbeing, the politics of participation and social innovation, with a particular interest in creative practice for transformations to sustainability and the social impact of networking. She also studies how grassroots organizations use design and technology. She has worked with arts and neighbourhood organizations and marginalized groups on five continents, in local, transnational and international development settings and run an international charity devoted to cultural exchange using digital media.

Myriam Lewkowicz is Professor of Informatics at Troyes University of Technology (France), where she heads the teaching program ‘‘Supporting the Digital Transformation”, and the pluridisciplinary research groupTech-CICO. Her interdisciplinary research involves defining digital technologies to support existing collective practices or to design new collective activities. Her main application domains are healthcare and Indutry 4.0. In 2017 she was elected next chair of the European Society for Socially Embedded Technologies (EUSSET).

Luigina Ciolfi is Professor of Human Centred Computing in the Faculty of Science, Technology and Arts at Sheffield Hallam University (UK). Luigina is a HCI and CSCW scholar researching practices around cultural heritage, collaborative work settings, and participation in design. She is concerned with the design of technologies to support human interaction within the physical world, based on an understanding of the relationship between people, activities and their locales. Luigina participated in national and international research projects on the topics of cultural heritage/museum technologies, interaction in public spaces, mobile and nomadic work, and she has published her work in HCI and CSCW conferences and journals, as well as social science, design and heritage studies venues. Her latest book (written with Eva Hornecker) is "Human-Computer Interactions in Museums".

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David Unbehaun, Konstantin Aal, Felix Carros, Rainer Wieching, Volker Wulf (2019): Creative and Cognitive Activities in Social assistive Robots and Older Adults: Results from an Exploratory Field Study with Pepper. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p07

Creative and Cognitive Activities in Social assistive Robots and Older Adults: Results from an Exploratory Field Study with Pepper

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Abstract. Medical progress and demographic changes will increase the future need of support and care in older adults. The use of robotic-based technologies may support older adults and relief the health system and caregivers. The authors provide results from two design case studies of applications that are designed for and with older adults and their caregivers to support both, their physical and cognitive activity. The authors conducted a pre-study, designed two applications, which were displayed and performed by the humanoid robot Pepper and evaluated them together with the participants in care-settings. The goal was to assess user experience and to explore effects of system usage on physical and socio-emotional conditions of older adults and their caregivers. Results indicate that the system seems to be able to initiate joyful interaction and that the Robot motivated and empowered participants to mimic movements that are embodied by the robot and displayed by the applications.

Introduction

Social and demographic change processes such as increasing life expectancy and constantly low birth rates are leading to an increase in the number of older adults in the populations around the world. ICT-based systems to support caregiving relatives and people with physical and/or cognitive diseases could help to train physical activity,

cognitive resources and promote individual and social well-being of these groups (Unbehaun et al. 2018; Vaziri et al. 2016). Robotic-based systems can be a helpful system to enhance the activity of older adults (Fasola and Mataric 2012). The presented work aims to discover possibilities of creative and physical interventions with robotic-based systems that are designed, developed and evaluated with older adults and their caregivers. The applications are displayed and mediated through the humanoid socially assistive robot Pepper[1] by using a hands-on interaction, including the use of speech and gestures to provide assistance and motivation in the particular healthcare context. The socially interactive robot-based functions were used to engage, to entertain, to empower and to motivate older adults. The primary research focus lied on Pepper's impact on social and physical aspects in the daily life in care homes. Therefore two design case studies are presented that have been moderated and guided by researchers that have been carried out over a period of 8 weeks with overall 22 older adults in need of care as well as 6 caregivers.

System Overview

The technical infrastructure includes the robot Pepper and its tablet to display the developed applications. Pepper is a humanoid robot launched by Aldebaran Robotics in 2014 and is able to communicate on a wide range of issues with humans through its autonomous behavior, speech, and emotional recognition function abilities as well as its smooth motion-generation technology (Tanaka et al. 2015). For the Pepper platform, we developed two applications that were designed for the stimulation of physical and cognitive capabilities in older adults. Over a period of 4 months, the study examined two different design applications: The first application aims to develop an interactive music system to empower and activate older adults to train and maintain their physical fitness by listening to music as well as following the embodied instructions given by Pepper. The second project focused on designing an interactive quiz game application to stimulate cognitive resources and build up on known games from the TV. The main goal of the **Music-based application** was to use established activities such as music and singing to motivate the participants to interact with Pepper and start imitating his movements. The exercise part is meant to be the main part of the developed application. In this part, the participants are stimulated to imitate movements that are embodied by Pepper. The final concept consisted out of three main parts – a preparation part where instruments are mounted on the robot, the music part, where Pepper plays the instruments and a randomly chosen song and the exercise part where the visitors are instructed to do some movements. In the **Quizmaster Application**, Pepper takes on the role of a charming quiz show host that asks questions, gives feedback to the answers, talks to the players, jokes around and uses typical gestures. Instead of playing

[1] https://www.softbankrobotics.com/us/pepper

alone, the participants should be able to answer the questions together as a team or compete against each other. However, we wanted to utilize other media besides text (e.g. audio and pictures) as question prompts to make the quiz more interactive and diverse. The content of the questions should span a variety of topics, of which some subjects should be especially targeted towards seniors.

Methods, Data and Research Questions

In general, the presented work is following the Design Case Study Approach by Wulf et al that consists of the phases: 1) pre-study, 2) the prototypical and participative IT design and 3) evaluation and appropriation (Wulf et al. 2011). Within this framework, we conducted a pre-study that analyzed existing social practices and tools already used in this context and identified technological, organizational and social perspectives of the field to be researched. During the design phase, the focus lied on the participatory development of the applications and their connection to the robot as well as the moderated sessions. We conducted **20 Interviews** with **22 older adults** and **5 PCG** who were later on also part of the study. Participants were allowed and required to elaborate freely on those topics. The development of the two applications has been applied in two steps. The first prototype was based on open interviews with the older adults and the caretakers. Further development of the application was based on two sets of data, first the interviews which have been conducted with the participants after the interaction with the robot and second from the observations that have been made by the researchers during the interaction. After designing the objectives of the evaluation, we included the exploration of (1) impacts with regard to the emotional behavior, (2) technology appropriation processes and (3) effects of applications on individuals.

Preliminary Findings

We observed different compelling reactions towards the robot in general. While some participants were careful with the interaction at the beginning, many of them "warmed up" and interacted freely. Many talked to Pepper and assumed he had human-like features: "*How is he doing today*?", "*This seems not to be his day"*, etc. For those who were already familiar with the robot, touching the head was already a natural gesture. Many also enjoyed it even if at the beginning they were cautious regarding the interaction: "*This was not as bad as I imagined it to be, it was nice*." All participants expressed satisfaction, were pleased with the game and its overall design, and would like to play again. There were expressions like: "*I had fun, I want to continue! Are there more questions*?" The explanations of the answers from the Quiz applications that Pepper tells after each answer especially seemed to appeal to all participants, who

commented on it as "*interesting*". This even affected the gameplay when individuals were still discussing one question when Pepper already read out the next answer. Playing in a group was highly preferred over playing alone. Overall, the participant's reactions were positive, while only some of them had reservations. Not only did most of the participants like the robot and its appearance and, singing was the most successful part of the concept. With regard to movement, the suggested exercises were doable for most of the participants. However, there were several issues with the functionality and design, e.g. the interaction with the tablet. The participants often pressed them either too long or too strong, so that the tablet did not give a reaction or zoomed in. Furthermore, interaction was hindered when Pepper was turning around in autonomous mode when hearing a sound or seeing a movement outside the group, or while being fixed on only one group member.

Conclusion and Outlook

Our study has shown that participants who were involved in the studies were motivated to move, sing along and interact in front of the robot and the applications while being guided by a moderator. The robot has proven itself a useful artefact to interact with the participants from the nursing home. Feedback from the participants itself was positive with regard to the activity, interaction and social dynamics. The results from this qualitative oriented study illustrate that robotic-based creative and cognitive activities seems to be able to initiate joyful interaction, individual and social well-being of the users and creates opportunities to be physically active. However, it is not fully clear if the high level of interaction between the robot and the participants is only based on the joyfulness of the applications on the robots. Future research should analyze further usage and acceptance indicators of robotic-based systems to support the daily life of people in need of care and their caregivers in longer terms.

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Livia Norström, Charlotte Arghavan Shahlaei, Lars-Olof Johansson, Anna Sigridur Islind, Ulrika Lundh Snis (2019): New Logics of Ethics in the Age of Digital Platforms: Design Fictions of Autonomous Cars. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p08

New Logics of Ethics in the Age of Digital Platforms: Design Fictions of Autonomous Cars

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Abstract. Autonomous cars are the first major examples of Artificial Intelligence (AI) in everyday life. When cars are transformed into platforms, new service relationships emerge between car companies and the car users. These relationships generate gains and catches for both parts related to how physical and non-physical resources are exchanged in the sharing economy; how integrity is negotiated; and how responsibility is delegated when AI enables the car to take over most of the driving. With a "car as a platform approach", in this paper, we present a design fiction on ethical implications for citizens' daily lives with autonomous cars.

Design fictions of autonomous cars

Our brief speculative design fiction about autonomous cars is a response to the call for engaging in socio-technical debates around disruptive technologies. Through putting future scenarios in perspective, we emphasize the importance of engaging in such debates prior to the actual design of these technologies. We believe that design needs to depict a world that is aligned with human desires and ideals rather than merely responding to increasingly outdated business models and value metrics. In that light, we hope that this short speculative design story is an

appropriate medium for triggering debates on human ideals and desires when it comes to designing smart cities.

The scenarios are a result of an ongoing design project so far consisting of 20 formal and many informal project meetings with actors, such as the automotive industry, municipality and university between June 2018 and March 2019. They are also inspired by an interview we conducted with a Swedish judge who had an extensive role in writing the proposal for the Swedish law on autonomous cars. As the development of autonomous cars is at its early stages, and since the employment of this technology is subject to extant political ruminations, it was important to know how the topic of autonomous cars is seen on a political and governmental level.

Speculative scenarios

Sharing economy. Autonomous cars are vivid examples of digitized products that can function as platforms (cf. Eaton et al. 2015; Ghazawneh and Henfridsson 2013; Islind et al. 2016) enabling car companies to sell flexible A-to-B transportation services to individuals. The core incentive in these services is the possibility for saving individuals' time and money. Our respondent judge, who has written the Swedish legal proposal for autonomous cars, emphasizes the importance of such possibilities

> *"…If you think about the Internet of Things, it's all about selling time in a way to make things easier for you, and that through making things talk to each other. So that's a huge shift from selling a product to selling time. You are selling the car each second."*

Once individuals' minds and hands are freed from having to think about driving, parking and managing the car, there will be opportunities for users to engage in other activities such as e.g. working or socializing during their travel time in autonomous cars. This is where the autonomous cars, as digital platforms (Islind 2018; Shahlaei et al. 2019), can also enable various firms even outside the automotive industry to develop services for users freed travel time. The question is what these firms will try to fill the users' time with and how users will accept and make use of these new offers. As our respondent judge continues to reason, once companies start to sell time, *"they want to lure humans into their vehicles*", and once they succeed to do so, they can "*sell other services to the person in the car*." Important considerations are thus raised about what are the "currency" or value metrics when exchanging resources in a shared economy (McAfee and Brynjolfsson (2017).

Negotiating integrity. Sharing data will lead to sharing resources and ever more innovation of services (Norström 2019). However, sharing data also implies increased transparency. The term "transparency", with its positive tune tends to connote trust and honesty. Yet, although it's only human to hope for the best, it's

smart to do so wisely. Take for instance, how our respondent judge points to "consenting" to sharing your "profile" in exchange for free transportation:

> *"You can, if you know the profile of the user, have commercials, adapted to that person's profile, in the car. So maybe you want them to stay there as long as possible and maybe if you agree to sit in his car and watch commercials, you'll have transportation for free. So that price of transportation would be almost nothing in the future in big cities."*

Such a consent can make the data, that was once considered personal and shared among limited people, available to any curious individual or corporation, and this can be the opening to both a Utopian or a Dystopian information society (Boyd and Crawdord, 2012). In an effort to "adapt" the commercial to one's personal taste, a picture of individuals is build based on as little real interaction with the individuals as possible. In this scenario, many things can go wrong concerning who has access to personal information. However, a more clandestine plot would be to asks whether individual's identity can be affected by the type of commercials that are fed to them in the car. Once individuals "consent" to share their profile for "adapted" commercials, the commercials are supposed to represent individuals. Upon repetition, one can eventually and unconsciously come to believe that they are interested in items and services constantly broadcasted to them, and thereby seeing a picture of their "self" as composed in the commercials. This scenario is close to what Zuboff (2015) recognizes as "reality" being a subject to commodification. The critical question would be, which one is the commodity in this context; the individual or the mobility services?

Delegating responsibility. Delegating responsibility to AI can not only be a relief for humans, but also an efficient way of running things fast enough in a system of connected artificial intelligence, as our judge respondent elaborates. By removing the human driver, she maintains, the human is moved from inside to the outside of the decision loop. But with initiatives from countries such as Germany, legislation should consider that, there is always a human who has programmed the digital driver and set the scene for things to transpire in a specific way. Therefore, even when humans are not directly in the decision loop, they are still completely present in their supervisory roles above the decision loop. However, our respondent judge also points out that humans cannot be considered responsible that easily:

> *"I think the human cannot be responsible for this. I can understand the emphasis on human responsibility when it comes to discussions around autonomous nuclear weapons. But in the case of autonomous cars, when each car is connected to the other cars, the human is not cognitively fast enough to respond and interact [in such an environment]. So, what's it going to be like? That you're sitting in the car, reading the paper, suddenly something goes wrong and now you have to put aside the paper, look around, understand the traffic situation?"*

It is not just the lack of required speed to interact with smart cars, that is the problem. As Thrift (2006) mentions, once information technologies turn into smart collaborative agents, human agents need to learn to work with them. This way, human agents will largely learn patterns of behavior that work when interacting with those smart agents. The smart agents in turn, function based on the logic of accumulation in which they are embedded and the conflicts inherent to that logic. Such logic of accumulation produces its own social relations and conceptions. In case of accidents or traffic complications, for example, instead of thinking how the other human (drivers) might think or act, the humans in the smart transportation system need to think how AI algorithms are logically programmed and what problems they might have inherited from their programmed logics. Humans will then need to develop different cognitive skills to be able to make sense of the new situation around them. The question then would be, is this scenario not implicating further responsibility for humans, only in a different disguise?

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André Sekulla, Jiannis Giatagantzidis, Julian Dax, Volkmar Pipek (2019): A Lightweight Tool for Measuring the Impact of IT Security Controls in Critical Infrastructures. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p03

A Lightweight Tool for Measuring the Impact of IT Security Controls in Critical Infrastructures

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Abstract. IT security is a cost-intensive aspect of SMEs. Critical infrastructures, in particular, are increasingly dependent on good IT security. Increasing security, however, can limit the usability of existing applications and work processes. Based on empirical studies inclusive workshops in the field, we designed a lightweight tool and integrated it into an inter-organizational knowledge exchange platform. With the tool, we want to offer an opportunity to get experience and feedback directly from those employees, who are directly affected by IT security controls. So, the IT security officer can react to it and gain more insight into the impact of IT security controls. They are in the position to administrate the tool's backend company-internally, while chosen data can be exported and discussed on the inter-organizational platform. Hence, this tool supports a community building effect on organizational and inter-organizational level.

Introduction

Due to the legal situation in Germany, critical infrastructures are obliged to introduce an Information Security Management System (ISMS). This raises possible problems, especially for small and medium-sized enterprises. The problems of SMEs caused by the advancing digitalization and Industry 4.0 are already a topic of the CSCW Community (Ludwig et al. 2018). With the use of an

ISMS, IT security controls are introduced in the respective company, which can have a direct influence on the (work-) processes of the company. Restrictions resulting from IT security potentially reduce usability and user experience. Furthermore, many SMEs lack the capacities to guarantee IT security in the best possible way. With the demonstrator presented in this paper, we would like to present a lightweight tool that measures the influences of IT security on employees and (work-) processes and additionally supports an exchange of knowledge and experience between SMEs.

Description, Requirements, and Concept

In the following part of the paper, we want to give a brief description of the lightweight feedback tool. Furthermore, through our research, we could define requirements and develop a concept for integrating this tool into an already created inter-organizational knowledge exchange platform, the core of our research project (Dax et al. 2016, Schmitz et al. 2018).

Description. With the demonstrator presented here, the IT security manager or administrator of the ISMS should be able to receive feedback on the IT security controls introduced in the organization. In this context, there are two views within the lightweight tool. One for the administrator, for the introduction of new controls (including a detailed description) and matching surveys (pre-defined questions and individual questions possible). Employees of the company or end users of the tool can view the controls, give direct feedback with the help of a comment function or have discussions with other users and the administrator or give feedback by completing the listed survey(s). In particular, the comment function is intended to support an exchange of experience between employees, but also to improve IT security throughout the company. An example scenario is that an employee could give direct feedback on a security control through a browser to access the web-based tool on his or her computer or smartphone.

Requirements. Before the development of the demonstrator, an empirical study was carried out. Among other things, workshops with four different energy supply network operators and two large-scale surveys between approx. 900 SME energy supply network operators in Germany could be carried out (Dax et al. 2017, Pape et al. 2018). These requirements can be derived from the findings:

(1) May not disturb the daily work of employees: Easy and simple usability.
(2) Dealing with sensitive data: No automated data exchange beyond the company's network.
(3) Exchange of experiences: Between employees, as well as an inter-organizational exchange between the respective IT security officers.

Concept. Based on the requirements we designed a concept for integrating the lightweight usability feedback tool into the core platform of our research project. The resulting concept is shown in figure 1 and figure 2.

For providing a solution to the first requirement, the lightweight feedback tool should be available through a mobile device but also on a personal computer by the employees or end-users (see figure 1).

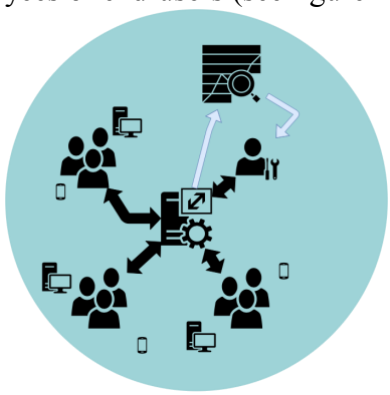

Figure 1. Concept of the feedback tool in one company. Accessible through smartphone and personal computer. Self-hosted web-platform controlled by the IT security officer.

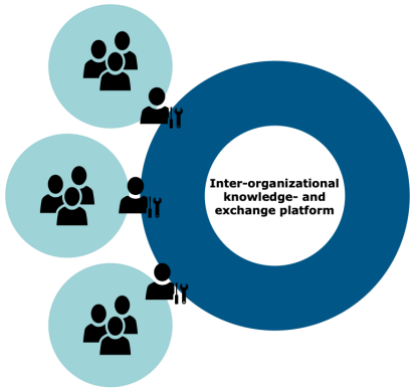

Figure 2. Concept of the feedback tool included in the inter-organizational knowledge exchange platform. IT security officers can choose and exchange specific feedback data.

The second and third requirement can be provided by the integration of the lightweight feedback tool into the already developed inter-organizational web-based platform of our research project. As it can be seen in figure 2, the platform can be accessed on the internet, while the lightweight feedback tool has its own structure based on a self-hosted service internally at the company's private network and server. Hence, the generated feedback data and sensitive data is secure. The IT security officer can provide chosen data from it, through a csv-/json-export function, onto the inter-organizational platform and discuss it with other company's IT security officers or administrators.

Lightweight Feedback Tool & Community Building

Based on the requirements and concept, we designed a lightweight tool for feedback on IT security controls introduced in a company. To provide access via a mobile device and personal computer, we developed a standalone responsive web-application with the React.js framework. The resulting tool has two views with different functionalities as described in table 1.

Table 1. Table of functions, functions are separated by user role.

Function Views	Adding new control entry	Create a survey	Start/Close survey	View results	Export results	Create a comment	Answering a survey
IT security officer	X	X	X	X	X	X	X
Employee	-	-	-	X	-	X	X

The admin can choose from many existing IT security controls, with a detailed description, or define an individual control to generate a new entry. Furthermore, a predefined survey is automatically added to this control. The admin can also add new and individual questions to the survey. For supporting an experience exchange and discussion on this platform of the feedback tool, it is possible to create comments under a control entry or another comment – this should open the opportunity to discuss different topics related to one IT security control. Hence, a community building effect between the end-users and the admin is supported. While IT security is expensive and, as already said, SMEs in most cases do not have enough capacities, an organizational community with awareness for IT security can create added value for the whole company. Furthermore, the admins can export their experiences and share them on the inter-organizational exchange platform, for an inter-organizational community building effect. This community consists of IT security experts and managers from different critical infrastructures or SMEs. So, the experience and knowledge can be spread and discussed, resulting in an improvement of the security on an organizational level.

Acknowledgment

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Frâncila Weidt Neiva and Marcos R.S. Borges (2019): Towards Expertise-based Intuition Sharing. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p11

Towards Expertise-based Intuition Sharing

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Abstract. Expertise-based intuition is a form of 'knowing' where experience is translated into action through non-deliberative solutions. This cognitive process provides opportunities for sharing and learning in the social context of communities of practice. To address this opportunity, we suggested computational artifacts and promoted a discussion about the implications of expertise-based intuition sharing. This study concludes that the subconscious patterns where intuition relies on are charged with social-cultural context generating both potentials and barriers to encourage the sharing practice. For one side, it can contribute to positive transformations in the communities. For the other side, it can reinforce the *status quo* and aggravates social inequalities being imperative the commitment with a design imbued with sensitivity to social aspects.

Introduction

The role of information in organizational settings has been one of the significant streams within CSCW (Ackerman et al., 2013). Based on the information, organizations and their experts can make decisions, and these decisions are heavily based on intuition (Akinci and Sadler-Smith, 2018; Okoli et al., 2018). In this way, it is reasonable to consider the role of intuition in organizations through a CSCW perspective. Intuition is fast and requires unconscious processing of information (minimal mental effort) and while the outcomes are accessible to conscious thinking (and hence are articulable), how one arrives at them is usually challenging to describe (Akinci and Sadler-Smith, 2018). The outcome is holistic, and information is processed based on the analysis of previously unconnected elements (Okoli et al., 2018). In the case of experts, they developed a deep and

rich information base from extensive experience within a domain. These primarily unconnected elements that are abundant in experts can be related to the patterns discussed in Ross et al. (2004), they state that experts can identify and access subconscious patterns very quickly. Some examples of specific situations of expertise-based intuition use can be found in (Akinci and Sadler-Smith, 2018) about police organizations, in (Okoli et al., 2018) about firefighters and in (Ross et al., 2004) about the army.

Once expertise-based intuition involves a kind of knowledge that is usually mystified, it is essential to state that we agree with (Schmidt, 2012) about the need to explore methodologies for making intuition explicit as well, how to describe, understand and learn it, both through a knowledge sharing perspective and expertise sharing perspective. We present a description of artifacts that a system for supporting expert based intuition needs to consider aiming to address opportunities of sharing and learning in the social context of communities of practice. Concomitantly, we promote a discussion about the implications of expertise-based intuition sharing enhanced through these artifacts.

Expertise-based Intuition Sharing

Regarding CSCW, we are also interested in the social practices involved in expertise-based intuition sharing, as well as the system that could support it.

To understand these social practices, we observed and interviewed four decision-makers experts from a public company with more than 500 thousand students that have dozens of courses in Higher Education.

Based on this study, we identified that patterns could not be separated from the social-cultural context that generated them and which they are inserted. Pattern recognition enables the expertise-based intuition to emerge (Ross et al., 2004). In a simplified way, we can say that experts have a repertoire of patterns stored in mind, and pattern recognition is a cognitive process that matches information received with a stored pattern retrieved. Once these patterns are social-cultural related, they influence and are influenced by personal beliefs. Moreover, considering the collectivity of personal beliefs, it can influence and be influenced by the beliefs of a community of practice. For example, imagine a decision maker selecting a candidate for a high position in an engineering company. Regarding social-cultural aspects, the patterns of the decision maker were likely influenced by a society with gender gaps that even without deliberation has crystallized the recurrence of men as successful leaders which can lead to a gut feeling that is biased to hire a man.

Although intuition arises without consciously processing, the decision makers are frequently able to think after and deliberate about the patterns used. In analogy, think about a pianist that may find difficult to pay attention to the music and the movements of his fingers at the same time, but it does not exclude that the

pianist, at another time, can give an account of how he was using his fingers (Schmidt, 2012, apud Harré, 1977). However, once social-cultural aspects influence these patterns, the decision maker experts can feel threatening to expose them. We analyzed this context and proposed its understanding through the dynamics we represented in Figure 1. We consider it relevant when designing a system to support the expertise-based sharing. Ollinger and von Muller (2017) stated that intuition influence insights, which corroborates with our representation (Figure 1). While intuition arises from the recognition of patterns, insights arise from a restructured pattern. That means that intuition evaluates the coherence of the given information, whereas insight evaluates the result of restructuring. It is essential to consider the potential to expertise-based intuition to trigger insights to disrupt organizations and to change patterns that will also affect personal and community beliefs. By blindly sharing expertise-based intuition without questioning it, it can contribute to reinforcing the *status quo* and aggravates social inequalities. By conscientious sharing it, it can contribute to positive transformations.

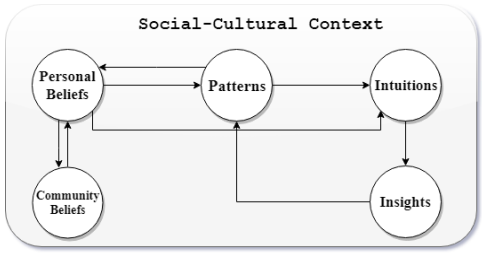

Figure 1. Expertise-based Intuition and Social-Cultural Context. The arrows indicate the influence direction between elements.

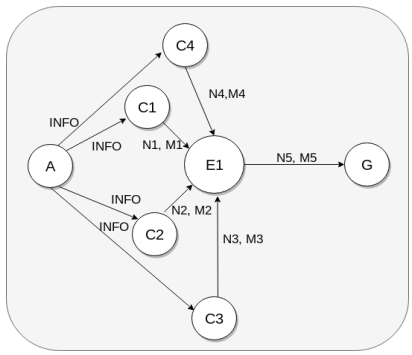

Figure 2. Decision-making support graph.

After we proposed the representation and interpretation of the dynamics of the context related to expertise-based intuition, one of the things needed to share it, is to define how to represent it, especially in terms of computational artifacts. Patterns are relationships between the most important cues that in conjugation generate an expectancy linked to a goal, which suggests a particular action (Ross et al., 2004). For instance, a firefighter heard the noise of the fire and felt the temperature of the walls, and these cues related triggered a pattern that generated an expectancy that the building would collapse.

Based on what we assessed in our interviews and literature review, we suggest representing this situation as a graph (Figure 2) targeting the further development of a system that supports expert-intuition knowledge sharing. In this graph that we proposed, the nodes represent the important cues (C1, C2 ...) for a given expectancy be satisfied (E1). As observed during the conducted study, cues do not have the same weight to address an expectancy. In other words, some cues are

more important than others. We can have cues that are associated with more than one expectancy, with edge weights to each relation. We can have more cues merging in a more significant cue transforming itself in a new expectancy. The cues can be compared with filters that receive information from the environment and let only the chunks of information related to a particular cue passing. Information flows through the proposed artifact as resources flowing through pipes, each pipe with its capacity, from a source to a sink (destination). In Figure 2, the node A represents the environment from which all the information is retrieved and the (N, M) pairs at the edges that connect the nodes, respectively representing the maximum flow rate and the incoming flow. The incoming flow is how much a cue was perceived concerning the weight (maximum flow) of this cue regarding an expectancy.

Conclusion

This study creates possibilities for the sharing of expertise-based intuition research within a CSCW perspective. Once we treat expert-based intuition as a form of knowledge, the graph-based solution is a possible path to support the management of the complexity presented in sharing it, and also, enables the translation of unstructured data into a structured form of actionable knowledge for decision support. The discussion presented in this paper generated a broader understanding of the sharing of expertise-based intuition and its social-cultural implications. As further work, we will improve and implement the proposed artifacts in a system designed with sensitivity to social aspects.

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Automatic for the People: Implementing Robotic Process Automation in Social Work

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Abstract. This short paper reports exploratory results from an ongoing longitudinal study on the introduction of robotic process automation (RPA) of financial support in a Swedish municipality. The study combines interviews, observations and surveys with a focus on the employee experience. Preliminary results show positive expectations yet there are concerns relating to the long-term effects of increased automation.

Background

IT systems for social work have been the subject of criticism (Gillingham, 2015). Yearly surveys from a Swedish union have identified social workers as the group having the most negative impact of IT on their working conditions (Lindström, 2016). It was therefore a surprising success when Robotic Process Automation (RPA) was introduced in the Swedish municipality of Trelleborg, and social workers were freed from many routine administrative tasks and could focus on their clients. Since then, there has been a rapid introduction of RPA in municipalities all over Sweden. However, media reports from other municipalities show that success

is not always guaranteed, and there are reports of social workers resigning in protest to the changes.

Robotic Process Automation has evolved over almost a decade (Slaby, 2012) and is currently receiving strong attention from both private and public organisations as a cost-effective solution to automate processes. Though rule-based it is a first step towards more advanced automation in e-Government and with it issues of fairness, accountability and transparency (Brown et al., 2019. Yet, there is still very limited research on RPA, and to our knowledge none that takes an employee perspective.

Social Work is a field that has received limited attention in the CSCW community, with the exception of the work by Boulus-Rødje (2018). Social Work can be defined as "a practice-based profession and an academic discipline that promotes social change and development" (Truell, 2014). There is a long debate over the pros and cons of IT in social work (Fuller, 1970). However, most of these discussion focuses on client interventions rather than administrative tasks (Reamer, 2013). There are some exceptions to this rule. Gillingham has written extensively on the subject, with a focus on best practices (e.g. 2015, 2019). Boulus-Rødje (2018) looked at Danish caseworkers' IT use from a knowledge management perspective. Svensson & Larsson (2018) studied digitalisation in social care in Helsingborg, and noted a focus on technology and less on user involvement. Ranerup (2018) analysed values related to implementation of RPA in Trelleborg. Lagesten & Andersson (2018) formulated a research agenda for social work and information systems, focusing on IT governance and usability issues. Recently Devlieghere & Roose (2019) and Gillingham (2019) investigated issues of transparency and algorithmic accountability in the intersection of ICT and social work, thus introducing some of the issues related to RPA.

This ongoing study answers to the call for more research from Boulus-Rødje (2018) and it contributes to the emerging literature on RPA. At this stage the study is informed by the two overarching research questions: what are (1) the benefits and (2) the challenges of robotic process automation for caseworkers?

Case Study

The implementation of RPA is studied at the division of financial support in the municipality of Uppsala, with a focus on caseworkers. The case study has a qualitative, longitudinal approach, combining interviews, observations and surveys, informed by the theory of technological frames (Orlikowski & Gash, 1994). The first data collection aimed at creating a baseline, whereas the second (at the end of 2019) will focus on the experience of automation. The first data collection consisted of interviews with caseworkers, line managers and project leaders, some from other municipalities (N=14), two days of observation in situ

and a survey to the caseworkers at the division (N≈150, response rate ca. 60%). Below are the preliminary observations.

The short-term goal of the RPA project is to reduce the administrative burden on caseworkers, and to give clients faster responses to applications. In the longer term, more resources can be allocated to social work. During the interviews the respondents reflected upon their work, the current IT and the upcoming implementation. The respondents mainly focused on the prospect of increased effectiveness but also on legal certainty. Overall, the respondents described a sense of trust in the ongoing developments. The survey supported the findings from the interviews. There was a positive attitude towards the RPA solution (87% thought RPA would make their work more effective). The possibility of having more time to work with clients was seen as positive, but respondents also cautioned that increased digitalization might leave some clients more vulnerable and that caseworkers' insights into their clients' situation might be reduced when more of the process was automated. One respondent summarised the challenge in the following words (translated):

> If we don't trust the robot we will not increase effectiveness as we will be double checking everything. If we trust the robot too much we may blur our own judgement instead.

The participatory observations provided insights into the traditional bureaucracy that the caseworkers were operating in. The hierarchical structure was noticeable (during meetings, in the physical layout of the workplace, in reporting). The dependence on paper was also tangible, with case files being carried around, security lockers in the caseworkers' rooms, and classic in- and out-boxes on their desks. Much of the communication with clients was also still based on paper mail. What was most striking during the participatory observations was however the interaction with the case management system. It had numerous usability issues ranging from the overall interface design to half implemented features, that required the caseworkers to find workarounds (such as a secure messaging channel with no support for attachments). Furthermore, the work process as such resulted in double documentation, parallel handling of paper and digital information etc. Hardware was up to date with mobile phones and laptops but security restrictions (and usability issues) led to the laptops being stationary. The planned RPA implementation will address some of these issues, more specifically the cut-and-paste manoeuvres and calculations that are time consuming. As most of the issues were related to the case management system a legitimate question is why this could not be solved by updating the system, rather than adding a new software layer. According to the project managers this was in part due to the fact that software providers so far had not responded to such requests. The introduction of RPA did seem to stir the market, and the attitude from the system providers seemed to be changing. In summary, there is a potential to improve work through RPA but there a number of challenges, ranging from user involvement over to the subtler aspects of algorithmic decision making.

Discussion

Besides the obvious limitation of being an ongoing study this is still only one case and there is a need for more research on both first line workers in social care in general and in relation to RPA in particular.

It would seem that the preconditions for reaping the benefits of RPA are in place. Thanks to the self-service portal most client data is received in digital form, a prerequisite for RPA. The legacy system requires a large amount of repetitive procedures to compensate for various technology gaps. The caseworkers believe that the RPA can indeed increase effectiveness, and to some extent also legal correctness. The challenges are subtler and will perhaps be more visible at the end of the case study. Process development and task-technology fit seems critical but the actors seem aware of this. User involvement seems to have been an issue in other cases, it remains to be seen if that will be a factor here as well. On a longer term there are other challenges that perhaps are the most interesting and that call for more research. These relate to the impact of automation, automated decision making and even artificial intelligence on the caseworkers and ultimately on their clients.

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David Struzek, Claudia Müller, Alexander Boden (2019): Development of an Everyday Persuasive App for Movement Motivation for Older Adults. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_d04

Development of an Everyday Persuasive App for Movement Motivation for Older Adults

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Abstract. This paper intends to give a short overview on the development of a persuasive widget system to increase the level of physical activity in the context of participatory IT research for and with older adults. The complete work was embedded in the three-year research project Cognitive Village.

Introduction

Older adults are increasingly shaping the image of society and thus the everyday lives of all citizens. Accordingly, every fourth German is over 60, every fifth over 65, which in 2014 accounted for 21% of the population (Statistisches Bundesamt, 2016). Industry as well as the research sector are trying to accommodate this and to support older adults or people in need of care with modern technology, e.g. Ambient Assisted Living (AAL) systems. Applications in the field of prevention, e.g. in the fields of nutrition and exercise, are increasingly receiving attention as a

contribution to a longer and pain-free life (Statistik Austria, 2016). In this context, the focus is on adaptive persuasive systems that adapt contents based on persuasive communication to the behaviour, experiences or environment of the users and encourage changes in behaviour. But it is clearly noticeable that many AAL projects in the field of persuasive systems have little (qualitative) empirical approach, and that the conceptual and design work is therefore based more on existing literature or available statistics. The approach is comprehensible, but the often lacking practice can be criticized, because many concepts only prove their effectiveness in the real everyday context. Authors therefore call for an intensive involvement of stakeholders in the design process, for example using participatory design methods (Hirschheim/Klein, 1994; Chatterjee/Price, 2009). Works such as by de Oliveira et al. (2010) and Kumahara and Mori (2014) show how many projects in the development of persuasive systems are far removed from potential users and real usage contexts. For the design of persuasive systems to work in practice and have sustainable success, it is particularly important to understand and co-explore concrete needs together with the users in order to carefully embed motivational strategies for behavioural change in everyday practices and conceptions (Patrick et al., 2009). The paper describes a sensor-based flower-shaped widget that was developed and implemented to increase movement for seniors within the three-year BMBF-funded research project "Cognitive Village" on the basis of the participatory design approach.

Requirement analysis

In order to identify the usage requirements, ten participants aged 67 to 82 years participated, who received various digital devices in the process of the research project. Different qualitative methods such as focus group sessions, interviews and technology probes (Müller et al., 2017) were used. Requirements for the persuasive system could be derived and prioritized from the needs. These included the presentation and personalization of the system, autonomy awareness, key figures such as current steps, the absence of warnings and low usage hurdles.

Design idea and description of functions

Based on the requirements, potential design ideas were conceptualised by the author, outlined and extended with functions. The selected idea flower widget featured nine elements, which were adopted in modified form until the final prototype.

Window glass. At the window, the current local weather is always indicated on the ZIP code, which also changes the window glass. For special days, such as the user's

birthday or Christmas, special matching elements are placed in the background or on the windowsill to personalise the overall scene.

Plant in a pot. The plant is the primary element of the widget. The flower grows in the initial phase in 20% steps and always symbolizes the steps taken on the last day. The size of the growth depends on the filling state of the water can. There are different flowers and colours. At 100%, the flower should appear relatively large and powerful so that the user feels a positive user experience and is happy to have reached his daily goal the day before.

Water can. The water can shows the current number of steps in 20% stages, which was set individually beforehand. The More water collected with the walked steps, the more the flower blossoms the next day. The pot is emptied in the morning. In addition, the water can should encourage the user to drink and show in a simple way how much steps the user had moved.

Sticker (Achievements). Sticker, are small encouraging messages for the user and show pictorially reached daily goals of the whole week. These stick to the window glass in the background. Since there are several sticker variants and these appear in random order. If the user has collected three stickers nevertheless, he has the possibility to collect cups.

Calendar. The calendar shows the current date to the user. It is mainly about the last synchronized status.

Notebook. The notebook shows the current and if desired also the personal maximum steps.

Settings. In the settings the user can enter a personal title, his name, his target steps and his Zip code so that the local weather can be called up. In addition, the user can also find a selection of flowers.

Different modes. In addition to the planned interactive elements, various modes are used to make the widget content look more realistic. Accordingly, a distinction is made between five different modes, between which the widget changes depending on location, time and date.

Hardware implementation and software architecture

For the use of the app the sensors of a Smartwatch (Huawei Watch and Nokia Go) are used to generate data (steps), which can be viewed at the end of an iterative data processing process in the form of a changed flower widget, which is integrated within the Cognitive Village Dashboard open.Dash[1]. Open.Dash is an open source visualization framework written mainly in Javascript. It offers users a dashboard connected to existing data sources, a user administration and other http/websocket

1 open.Dash: Vordefinierte Visualisierungselemente zum einfachen Erstellen von Smart Home Ansichten und der Möglichkeiten zur Exploration von Daten und freien Gestaltung individueller Visualisierungselemente. (2016). https:// opendash.de/. – (June 2017)

sources. The dashboard and widget were used via a web browser, in the case of Cognitive Village with a Samsung tablet. If the user moves so that the watch detects a change, the generated user data will be sent to a middleware by an automated process. For synchronization, storage and forwarding of the data, a smartphone was used. The middleware receives the data, processes it and assigns it to the respective functions. The devices synchronize every 10 seconds and store the data on the smartphone, even if the Internet connection fails.

Summary

All individual design ideas and iterations were explored, developed and finally used over several weeks in intensive cooperation with the older adults. With the strong participative and everyday approach, not only the visual elements were designed and selected, but also successfully led to technology adoption and long-term usage motivation.

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Gernot Rottermanner, Volker Settgast, Peter Judmaier, Kurt Eschbacher and Carl-Herbert Rokitansky (2019): VAST: A High-Fidelity Prototype for Future Air Traffic Control Scenarios. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_d02

VAST: A High-Fidelity Prototype for Future Air Traffic Control Scenarios

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Abstract. Significant changes in air traffic control (ATC) are planned within the Single European Sky ATM Research (SESAR) initiative. Some of the goals are an increase in air traffic, reduction in delays and an improvement of safety. Further, 4D trajectories should ensure flights on the most direct route to the destination airport. The team in the research project "Virtual Airspace & Tower" (VAST) wants to explore the design space and give ideas for future ATC interfaces to meet the ambitious SESAR goals. This paper and demo present the high-fidelity prototype developed. The air space can be displayed three-dimensionally. Separation minima - the minimum space needed between airplanes - and planned routes can be shown as well.

Introduction

Within the research project "Virtual Airspace and Tower" (VAST), the team explored new concepts for visualising and sonifying complex air traffic scenes in two and three dimensions. The team followed a user-centred design process (Bowles, 2013) and developed three low-fidelity prototypes (Rottermanner et al., 2018) as well as one high-fidelity prototype. Background of this work is planned innovations in the next years in air traffic management. Next to an increase in air traffic, reduction in delays and improvement of safety, 4D trajectories will ensure flights on the most direct route to the destination airport (SESAR, 2015). Instead

of using flight levels, the implementation of 4D trajectories will ensure flights on a “practically unrestricted, optimum trajectory for as long as possible [...] to meet very accurately an arrival time over a designated point” (SKYbrary, 2017). To be able to handle these innovations, Air Traffic Control Officers (ATCOs) need appropriate tools, especially for the visualisation of 4D trajectories.

Related Work

From the very beginning, air traffic control (ATC) has been an important field of CSCW research. Ethnographic studies have shown the importance of seamless communication between operators and of awareness in coordinating air traffic (e.g. Bentley et al., 1992; Schmidt, 2002). The air traffic has increased dramatically since then (SESAR, 2015) and the computer is an integral part in communication and controlling. The challenge is, as in many CSCW projects, to improve situation awareness and problem detection.

Regarding related work in 3D visualization, Bourgois et al. (2005) describe a stereoscopic representation which includes concepts for navigation, weather information, positional audio and presentation of conflicts. They compared it with a 2D representation. Objective measurements in a study with former ATCOs indicated that “controllers were quicker in identifying the target in the 3D stereoscopic than in the 2D condition”. Also, subjective data showed that the controllers estimated that their performance was better with the 3D stereoscopic interface. Baier and Zimmer (2016) reveal that “an adequate 3D airspace representation for air traffic control allows an immediate perception of danger and urgency in a given situation”.

Related work also reveals a bunch of challenges regarding prototyping and evaluating for the ATC domain. Compared to other disciplines, ATCOs must have a clear picture not only of the static interface elements itself, but also how it is changing and reacting in case of events over time (Rottermanner et al., 2017). Also, to make testing as real as possible, one way is to integrate existing tools and visualisations, already used by ATCOs into a simulation. But often they are proprietary, inaccessible or costly, and cannot be adapted to the required research functionality (Prevot et al., 2018). Prototyping is essential to test the most important usage scenarios as early as possible. Therefore, it is necessary to simulate air traffic realistically to make profound decisions about the quality of the concepts. As a result, the project team decided to develop a fully-interactive high-fidelity prototype using a simulator, which provides the prototype with real air traffic movements.

High-Fidelity Prototype Development

The developed high-fidelity prototype is a result of preliminary work (e.g. interviews and focus group discussion with ATCOs, on-site visits of approach and terminal control centres, development and evaluation of three low-fidelity prototypes) within the project (Rottermanner et al., 2018, 2017). The high-fidelity prototype will be described in this section in more detail.

Flight Data Interface (NAVSIM)

NAVSIM is an air traffic simulator, developed and continuously enhanced by University of Salzburg in close cooperation with Rokitansky et al. (2018) and the Mobile Communications R&D ForschungsGmbH. It can simulate realistic actual and future worldwide gate-to-gate air traffic. Various datalink and voice interfaces like the ATCO or pilot interface allow for full interaction in system performance testing and human in-the-loop exercises. The prototype uses the speech recognition feature of NAVSIM to let ATCOs give realistic commandos to the "pilots". Also, Non-ATCOs can give instructions by clicking on the airplane label and entering new values. NAVSIM runs in parallel to the prototype on separated PCs. NAVSIM has a persistent network connection to the prototype. It is possible to route an aircraft to a specific waypoint or to use radar vectoring and instruct a new heading. Also speed and height changes as well as clearances for instrumented landing system approaches & landing can be instructed this way.

High-Fidelity Prototype: User Interface and Interaction

The prototype was developed with Unity. It can display 4D trajectories of air planes without the need of flight levels. The orthographic top down view can be rotated to a perspective 3D view (see Figure 1).

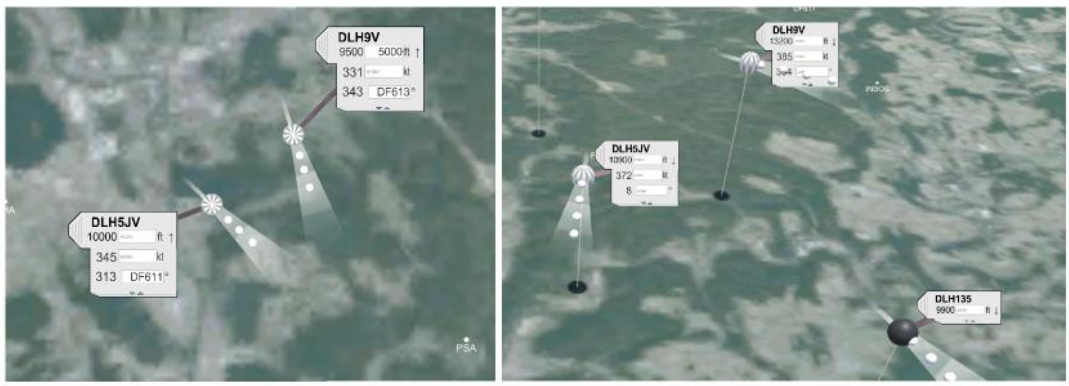

Figure 1: Conventional orthographic 2D view (left) and 3D perspective view (right)

A normal PC mouse is used for all interactions: By pressing the left mouse button it is possible to rotate the view. Further tilting triggers a transition from an orthographic top down to a perspective 3D view. The user can pan the view by pressing the right mouse button and moving the mouse. Zooming is done by using the mouse wheel. Flight labels show only the call sign and altitude by default. The user can double click the label to reveal more information, in this prototype the speed and heading of the air plane. Labels are movable by left mouse click and drag. For conflict warning, both flight labels will be highlighted in red. To increase situation awareness and to decrease the response time in case of critical events, the team implemented an auditory display as an additional perceptual channel, based on continuous sonification intermittent auditory alerts (Watson, 2006). A video of the prototype can be found here: https://youtu.be/u7SU3rjNkUI

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A Tactical Urbanist Approach to Facilitate Exploratory HRI Research in Public Spaces

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Abstract. Human-Robot Interaction (HRI) research in public spaces often encounters delays and restrictions due to the need for sophisticated technology, regulatory approvals, and public or community support. To remedy these concerns, we suggest HRI can apply the core philosophy of Tactical Urbanism, a concept from urban planning, to catalyze HRI in public spaces, gather community feedback and information on the feasibility of future implementations of robots in the public, and create social impact and forge connections with the community while spreading awareness about robots as a public resource. As a case study, we share tactics used, and strategies followed in conducting a pop-up style study of 'A robotic mailbox to raise awareness about homelessness.' We discuss benefits of the approach that could enable the social studies of HRI not only to match but to precede, the fast-paced technological advancement and deployment of robots in public spaces.

Introduction

Despite technical advances, supportive laws, and increased deployment in public spaces, the success of human-robot interaction (HRI) in public spaces has been limited and often disappointing: Bascelli (2018), due to lack of research in the public space and from the need for sophisticated technology to support dynamic public interactions. For public space studies, researchers often need to obtain additional approvals from the municipal government, whose bureaucracy can result

in long-lasting delays. Besides, a lack of participation from the general public and support from the target user communities is common due to their unfamiliarity with or disbelief towards the usefulness of novel robotic technologies. With such common impediments, how can we facilitate research in public spaces, find community participation, or test the feasibility of future robots for public and community use?

To overcome such hurdles, urban planners use Tactical or Pop-up Urbanism - an action-based approach to bringing urban change using budgeted, scoped, small-scale interventions, in a system curbed by outdated policies and voids in leadership: Lydon and Garcia (2015). The success of the approach lies in its public promotion and visibility of new solutions, which often leads to acceptance of novel ideas as best practices by the authorities. HRI research could follow a similar approach and use 'tactics' or short-term actions to test ideas in public by making use of available opportunities and finding creative solutions to policy and regulatory restrictions while staying within the 'strategies' or plans laid by law. We share our experience of conducting a pop-up HRI study 'deploying a 'robotic mailbox in public space to support the homeless.' We describe our use of the Tactical Urbanism-like approach to cope with challenges faced during the research ethics board approval process, lack of community support, and technical limitations. We discuss how using tactics, and following strategies facilitated our study, benefited us with research data, created social impact, and indicated the potential for future real-world implementation of our project.

Case Study - 'A robotic mailbox to raise awareness about homelessness'

We designed a stationary robotic mailbox, to address the lack of awareness about homelessness in the city by providing the public with information about homeless people and share their requests and stories, or receive advice and encouraging messages from the public for the homeless. The robot could detect passers-by, rotate its body seeming to look around, wave its 'red flag' to invite and greet, and move a sheet of paper/flyer back and forth to interact. The flyer contained stories and messages about homeless individuals and information on how passersby could support the homeless. To test the real-world effectiveness of our robotic mailbox, we aimed to install it in a few public spaces and have participation from a homeless shelter for recruiting homeless individuals who would provide us with their stories.

The community organizations we hoped to work with, however, were mostly uninterested in our approach, lacked time to participate, and did not believe in the potential for using robots to address issues relating to homelessness. Furthermore, reaching out to city officials for approvals for researching in a public space turned out to be a tedious and time-consuming process, as it involved several layers of bureaucratic oversight from officials in different departments and long response times to our queries. Besides, approvals from the homeless shelter and the city

were required to obtain institutional research board clearance. To counter these hurdles, that meant delays and non-participation, we changed our approach and followed a pop-up format, resonating with Tactical Urbanism principles, as described below.

Use of Tactics and Strategies in an HRI study

We followed tactics and strategies to speed up our approvals. For example, to address the issues of navigating several layers of bureaucracy for permissions to conduct a study in the public space, we used the blurred boundaries of public, semi-public, and private spaces to our benefit and researched spaces adjacent to the public spaces, open to all. To receive expedited institutional review board approval for our study, we ensured that specific departments or officials regulated our chosen semi-public spots, within a library or farmers market, thus had fewer layers of bureaucracy and were mostly open to the public. Finally, within the selected spaces, where possible, we used authorized public performance and street event spots to conduct our research, allowing us to follow established procedures for booking a spot and speeding up approvals.

Further, to address the lack of initial community participation, we carefully chose locations such as places where community events were held, or places with facilities attractive to a broad section of the public, used by a diverse group of people, from different socio-economic backgrounds and ages.

After we began our study, several times through the data collection, participant interviews indicated the need for design iterations to make our robotic mailbox more noticeable, inviting, and effective for public interaction. One way to achieve this could have been through significant technological changes, requiring considerable efforts, skills, and time such as by adding speech for the robot to attract and talk to passersby. Instead to avoid delays, we made use of a 'lighter, quicker, and cheaper' approach, akin to tactical urbanism, such as by posting stickers and signs to make the robotic mailbox more inviting and by Wizard-of-Oz'ing (WOZ) the robot to allow for quick control on the robot's behavior without requiring sophisticated technology.

Benefits of Tactical Urbanism Approach

Our study was reasonably successful in spreading awareness about the homeless in the city. Passersby mentioned that the robot made them aware of the sensitive issue of homelessness, without requiring awkward encounters with the homeless. In doing so, the robot exposed the public to the possible use of robotic technology for non-commercial, social purposes of delivering some social good.

The pop-up style research format also provided us demographic data from observation, and feedback from passers-by on the robot's features, sociality, appropriateness of interactions and purpose, suggestions on improvements and

alternative uses, and feasibility for future implementation of the project, through short interviews conducted in the public space.

Also, conducting research using a pop-up approach resulted in attracting people who did not generally attend traditional community engagement events for supporting the homeless. Passers-by mentioned that their interactions with the robot provided them with awareness beyond their preconceived ideas about the homeless community and thought that having a permanent robot in the city would encourage sharing of resources and communication with the homeless.

In sum, the robotic mailbox was successful in gaining attention from passers-by to convey the message about homelessness and pointed to the significance of studies in public space, especially for early stages of the research and robot design.

Conclusion

Following a pop-up format meant going a bit back from the initial involvement of homeless and the shelter authorities, limiting it to testing out the effectiveness of our robotic mailbox and understand if that was of interest to the community. We experienced several benefits of using the pop-up approach, for example, on design and interaction aspects of the robot, its purpose, and its effectiveness to raise awareness about homelessness. We got our initial feedback in context, rather than starting in the lab. Despite limitations from the dynamics of public space and research approval processes. We learned that the approach could provide necessary information on the true choke points in designing and developing useful robots for public spaces, and collecting user attitudes for public implementation of the project.

The pop-up robotics approach empowered our inter-disciplinary research team with limited technical capabilities and access to resources, to conduct valuable research using quick action, short-term, and scoped solutions. By placing equal value on 'strategies,' i.e., regulations and plans laid by critical legalities, and 'tactics' short-term actions to bring change, the pop-up approach encourages a human-centered solution to hurdles from regulatory approvals and limitations of technology by using creative resistance in research method.

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Beyond Cooperation: Three-Way Body Transfer Illusions For Physical Play

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Abstract. Video is often used to give people sensations or insights into another person's perspective via providing real-time feeds of first-person viewpoints. Less explored is rapid and dynamic perspective changing that can make it uncertain for users whether or not they are viewing a direct feed, and if they are viewing themselves or another. We present a 3-person wireless headset system developed as part of an investigation into new forms of collaborative physical play. Each headset incorporates an external video camera and an internal screen that provides its wearers with visual information. Camera transmissions are rapidly and automatically switched to be received by different headsets, thus providing wearers with continuous cycling through 2nd and 3rd person perspectives. By asking participants to join a simple collaborative task in a shared physical space but dislocating their sense of sight, the system explores the interdependencies of users' actions and their communication in an unusual configuration.

Introduction

In "Beyond Being There", Hollan and Stornetta (1992) questioned whether the goal of computer-mediated communication should be to merely replicate the qualities of face-to-face conversation. They concluded that technology was likely to abolish understandings of what it means to be collocated. We are also interested in how small groups can go "beyond being there". We have been experimenting with developing wearable systems to challenge perceptions of the boundaries between self and other and thus explore new forms of triadic cooperation. We are curious how being highly interdependent, unsure of one's exact location and experiencing

ambiguity as to whether one is seeing oneself or another might affect collaborative physical activities. We are intrigued by the possibility that cycling through receiving visual streams from different directions might confuse participants not only about which camera they were looking "through", but also whether they were looking at themselves or another.

Through extending aspects of dyadic body transfer illusions (Petkova and Ehrsson 2008) into three-way interactions, our work offers a new form of interdependent play (Mitchell et al. 2015, Isbister et al. 2017) experience. However, our combination of video-mediated and collocated encounters may also provoke discussion on designing for cooperative work and social interaction more generally. For instance, facilitating a radically alternative set of relationships between accountability, visibility, and awareness vivifies aspects of social translucence (Erickson & Kellog 2000).

Figure 1. Three headset wearers attempt to explore the world together. A screen inside each helmet is receiving a visual stream from a camera mounted on the front of another wearer's helmet. An Arduino rapidly and automatically switches the camera transmissions between different headsets.

The Channel Surfers Platform

In this demo we will deliver an abridged version of intense, immersive experiences we trialled with over 80 participants at cultural festivals in Finland and The Netherlands. Our intention was to create and understand new forms of teamwork and social play. We have been fascinated by the great variety of ways users feel and act in response to the following set up:

Three participants will be asked to stack cardboard boxes into a tower while dressed in white full body suits and experiencing the world from a constantly switching 2nd and 3rd person video camera perspective. The participants will form a triangle by standing approximately 3-5 meters from each other, facing the centre of the formed triangle. A cardboard box will be placed in front of each participant. Participants are instructed to pick up one box each and to form a tower in the middle of the area (marked on the floor using sticky tape). The participants are allowed to talk and touch each other. There is no time limit.

White Suits and Silver Boxes

Participants are asked to wear white, full-body suits, and lightweight box helmets (figure 1). The suits are used to conceal users' normal clothing and thus making them less recognisable to self and others. The helmets have three purposes. First of all, they act as a housing for the system's hardware. Secondly, as the suits, the large box helmets disguise the users' visual identities and facial expressions. Lastly, building upon earlier experimentation (Sypniewski et al. 2018) placing the large helmets on users' shoulders instead of on their heads, slows down participants' movements, thus stabilising the transmitted video image seen by the others, and reducing the chances of motion sickness.

Perspective Cycling Hardware

The system is based upon modified radio transmitted, first-person view equipment, commonly used for piloting radio-controlled hobby vehicles, such as model airplanes. Inside each helmet, the wearer faces a 4.3-inch head-mounted colour video display. On the external front of each oblong helmet, a small factor camera is mounted. Also attached to each helmet, but more discretely, are a transmitter and radio receiver wired up to an *Arduino Uno*[1] microcontroller, and a lithium polymer battery. The Uno is programmed to switch frequencies of radio receivers. Using radio transmission allows for low image latency, increased distance between users, and independence of the locally available network infrastructure. This solution is

1 https://www.arduino.cc/

inexpensive, but results in rather low fidelity of the displayed image (480p) and occasional video noise and artefacts.

Feed Switching Behaviour

The Channel Surfers system removes the users' own perspective on the world. Instead the feeds cycle between the points of view of the other two users. The switching of perspectives happens every 15 seconds and is synchronised across the headsets. The interval is long enough for users to understand their position in the physical space and progress in a task, but not long enough to complete it. It is the relation between the short switching intervals and longer time needed to complete a task that forces the users to shift their attention and actions towards a different collaborator. The three-way split further complicates the interdependency. That is, no participant will receive and give video signal from and to the same user at any given time. A user will receive a video feed from the perspective of one participant and at the same time transmit their perspective to another, different participant.

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Katerina Cerna, Johan Lundin, Anna Sigridur Islind, and Gunnar Steineck (2019): Supporting appropriation of self- monitoring tools in clinical settings: the case of pain in cancer rehabilitation. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p01

Supporting appropriation of self-monitoring tools in clinical settings: the case of pain in cancer rehabilitation

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Abstract. Self-monitoring tools, which support clinicians' work through collection of patient generated data, have been used increasingly in chronic care. Their appropriation by the patients is crucial but at the same time can be problematic, as unexpected use of tools used as a support for clinical decisions might lead to wrong decisions. In this poster, we present preliminary findings from an ethnographic study from a pelvic cancer rehabilitation clinic. We present an empirical example of a patient who appropriated a self-monitoring application to register her pain in an unexpected way. Our findings aim to understand better how to support appropriation of self-monitoring tool in a clinical setting.

Introduction

Recently, self-monitoring tools have been increasingly used in healthcare because of their potential to support and improve collaborative work that chronic care builds on (Fitzpatrick & Ellingsen, 2013). Self-monitoring tools facilitate continuous data collection by patients through engagement with a digital tool, often in a form of mobile applications. These tools can support healthcare professionals' decision-making and in turn improve patients' health (Mentis et al., 2017). Successful and meaningful use of these tools depends on how well they will be appropriated by the patients and the health care professionals (Dourish,

2003). We define appropriation as using a tool by the user in unexpected ways, that is, in ways that the designing team did not anticipated when they were designing the tool (Stevens et al., 2018). In clinical settings, self-monitoring tools are built in such way so that they support work of the healthcare professionals, but it is the patients who use the specific mobile application for data input (Grisot et al., 2018). Both of these stakeholders can appropriate the tools in different ways, as appropriation is socially situated (Stevens et al., 2018). Different ways of tools appropriation can lead to situations, which are problematic in the context of chronic care. For example, when the patients start using the tools in unexpected ways, it might stop being possible for the clinicians to interpret the data in a meaningful way (Piras & Miele, 2017). Therefore, we need to understand more how the self-monitoring tools are used in unexpected ways by the patients in clinical settings. Contributing to overcome this gap, this poster presents preliminary findings from an ethnographic study from a pelvic cancer rehabilitation clinic. We hope that our findings will help us understand better how to support appropriation of self- monitoring tool in a clinical setting.

Appropriation in cancer rehabilitation

This text reports preliminary findings from an ethnographic study, which we conducted in a pelvic cancer rehabilitation clinic. The clinic aims at helping patients, who received pelvic cancer treatment, and who now suffer from late effects of the cancer treatment, which dramatically decrease their quality of life. The oncological nurses working at the clinic get in touch with the patient and try providing them with help. To be able to provide the patients with suitable treatment, the nurses need to gain access to a specific information, such as development of pain over time, which is difficult for the patients to recall. That is why a self-monitoring tool - a mobile application - was built to support the nurses' work and their clinical needs and in turn the well-being of the patients. The nurses can access the data through an interactive portal. This text is part of a broader ongoing ethnographic study, which started in 2015. The ethnographic study involves understanding of the nursing work practices through observations and interviews, as well as recorded phone calls, during which the nurses talk to patients who had been using the mobile application.

The following example is from one of the recorded talks and we interpret it in the wider context of the nurses' work practices. The patient used the application for two weeks. The nurse made a phone call after that time to ask the patient several questions about the patient's experience with the application. When the nurse asked the patient how she had experienced registering her pain in the application, the patient answered:

“Em that was easy. Because I could not precise where pain is where pain sits completely I thought then I put [the point] in the middle of the abdomen. Like that I have at least a starting point so to speak the pain was in the whole abdomen So to say when it started.”
(Phone talk, Audio recording, November 2017)

In this example, we can see that the patient tried registering information about her pain. The first thing she had to do in the application is to show where their pain is located on her body, by placing a point on the image of a body (Figure 1, Image of a body in the application).

Figure 1 Image of a body in the application

However, the patient had difficulties doing this. It was not possible for her to show that her pain was in the whole abdomen area, because the application allows only placing a pin, which points to a very limited area on the picture. However, that did not stop her from using the application. Instead, she placed the pin in the middle of the abdomen, “to have a starting point”. The nurse inquired about this by summarizing the patient’s problem, and then they moved to another question.

This example shows how patient can appropriate the tool in unexpected ways: for the patient to mark a pain at one spot means that she was having pain in her whole abdomen. However, this is not an information that is accessible to the nurse when she reviews the data. The data in the system would indicate that the patient had pain in the middle of the abdomen; in contrast to where she actually experienced her pain: in the whole abdomen. As different location of pain indicates different causes, the nurse would have troubles interpreting the data in a meaningful way. In the given interaction it did not became a problem, because the talk was mainly focused on design of the tool and not on diagnosing the patient. However, if the data would be actually used by the nurse to diagnose the patient, the patient’s appropriation of the tool would become a challenge. If she would keep on continuously registering that she has pain in the middle of the stomach, the way the nurse would read the data would be also that this is where she has her pain, which could in turn lead to a wrong diagnosis.

Concluding remarks

In this poster, we focused on the problem of patients' appropriation of self-monitoring tools in the clinical context of pelvic cancer rehabilitation. In our empirical example, we illustrated that a patient can use a self-monitoring tool in a way that is meaningful to her, but not necessarily meaningful for the nurse and in the wider context of the pelvic cancer rehabilitation. Even though patient's appropriation of clinical tools might be problematic, in its consequences it should not be view as a problem but more as an opportunity. The question becomes how to handle this situation in design? First, the application could prompt the patient to register not only her symptoms but also the way she registers them, however that would add more questions that the patient has to handle and that are not valid for all the patients (as only some patients appropriate the tool in unexpected ways). Second, the design of the application could have been more pedagogically informed: the application could prompt the patient to communicate the way she uses the application to the nurse; or the system could prompt the nurse to ask the patient about the ways she collected specific data sets. In this text, we view appropriation in a very limited way, and mainly lift the issue of appropriation as a possible challenge in the clinical setting. In our future work, we would like to conduct an in-depth analysis of the phone call talks, where the nurse talks to the patient about her data, and study appropriation more in depth, to be able to understand the consequences of it in the clinical setting.

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Jiannis Giatagantzidis, André Sekulla, Volkmar Pipek (2019): "ZEIT.RAUM" – Collaboration Around a Tangible City Model. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p02

"ZEIT.RAUM" – Collaboration Around a Tangible City Model

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Abstract. Tangible objects and sensors are ubiquitous in our environment, the majority is also connected to the internet and provides information to the user. One of the few areas where tangible objects are rare to see is the museum. Our research tries to combine various directions to improve the experience in such places: creating a tangible object to tackle the vanishing visitors of the museum. In a heterogenous group of actors, we collaboratively developed a socio-technical infrastructure, consisting physical, virtual and social elements to increase visitors and attractivity inside the museum, but also building a living community interested in participating and writing local history.
[The project named "ZEIT.RAUM" can be translated with "TIME.SPACE"]

Introduction

Provincial museums fight against declining visitor numbers and intend to open up to new and younger target groups through the use of digital technologies. In their activity's museums build up cooperation more likely than any other public institution (Rodger et al. 2005, Marty 2008). In the presented project, a consortium was formed of three scientific and public representatives, the local fab lab, as well as donors, acquired and represented by the museum's regional support association. All of the stakeholders pursued their own goals and strategies and wanted to be highly involved in the conceptual and development process. The primary goal of the project was to activate citizen's identity-forming, interest and

participation in the local history. The basic history-concept called *points of remembrance* (Nora 1989) – these can be concrete places, personalities, mythical figures or symbol – should be considered in all development-steps. The effort of the project was to set up a fitting socio-technical infrastructure that promoted the achievement of the goals (Pipek et al. 2009).

Motivation and Realization

We defined four basic aspects, based on initial and ongoing meetings and workshops during the entire project. These aspects are the fundamental requirements, which the project should fulfil with the creation of the artifact:

1. a tangible and cost-effective representation of the city
2. a collaborative platform for writing history from a citizen's perspective
3. community building to activate participation of targeted groups
4. to enhance numbers of visitors in the museum

In order to meet the established requirements, we decided to combine the first three requirements within one city model in the museum as a kind of anchor. It was important that project-participants can flexibly expand and exchange parts of the model. Interactivity was requested, as well as the resulting tangible interface/city model should be imaged from above with a media projector to highlight the city's points of interest, while further historical information should be displayed on additional screens. In the following we want to sketch out the defined use case:

The user or museum visitor stands directly in front of the interactive city model. He sees a table in which a landscape model is embedded. The model is illuminated from above with a projector. Buildings protrude from the surface and can be *activated* by touching. Two TV-Screens installed beside the model display a QR-Code and brief historical information. Four tablets in the corners of the model allow access to the collaborative platform/city wiki. The information in the wiki is more detailed than the information on the TV-screens. In addition, museum visitors have the opportunity to access the QR-Code with their own mobile devices. By this, the visitor is enabled to take part in the discussion about locations, people, events, ideas and traditions related to the local history. These can gain meaning in the debate. By choice the model can be designed by the community, because also the three-dimensional terrain and building 3d-data can be accessed an edited via a public versioning platform.

The model itself shows a section of the city center, realized as 3D-printed tiles, including terrain with buildings on it and embedded electronics below to realize interaction.

The collaborative platform was sought in workshops and meetings with didactics and museum staff. As a result, the DokuWiki platform was chosen and hosted to the internet. In an iterative process with seniors, pupils and didactics, slight adjustments to the user interface as well as user tests (Thinking Aloud, Constructive Interaction) were carried out.

Figure 1. user accessing informations

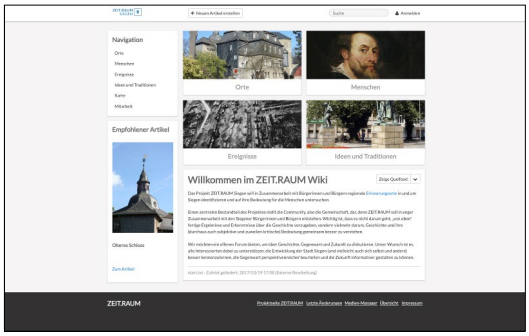

Figure 2. collaborative platform/city wiki

To create a community on the topic of city history, users are offered to enter their own knowledge of the city into a collaborative platform or to correct/ expand existing content. Through the common interaction on the artifact, the users should be encouraged to participate in an active way. Especially the location of the artifact or city model plays an important role in the community building effect. It stands in the middle of a prominent and high frequented museum room. In this way, (grand-)parents can interactively tell their children, but also teachers their pupils, or city guides to visitors about the history of the city. Furthermore, this activity supports the community building effect by encouraging the mentioned target groups to share their knowledge and enter it into the wiki.

To achieve the primary goal, the activation and empowerment of diverse citizens to use the collaborative platform for discussing, negotiating and continuously rewriting the local history from the citizens' perspective. Didactics of history conducted teacher training courses, worked together with local associations to explain the chosen bottom-up history concept, as well as the way of working with the collaborative platform.

Reflections on development and appropriation

The interface was developed in a university Fab Lab. Therefore, the artifact was not produced in a closed laboratory, all progress could be observed, tested and commented by the diverse Fab Lab community. Some of the community members gave hints to improve the 3D-printing process, also the final projection mapping

and the use of capacitive sensors is a result of the discussion and engagement in the community.

In the prototyping process, but latest after presenting the installation to the public, it has been indicated, that most attention is given to the tangible interface. The users switch content by interacting with the model, so their focus is on touching and viewing it. Sometimes attention escapes and users miss looking at the TV-screens for further information. Regarding the tablets, which were mounted on goosenecks, one group of pupils misused them like a steering wheel to play races and caused a defect by doing this. Children like to touch the model, adults have to be advised, that they are allowed to touch and use it as an interface. Observations of the museum staff and usage statistics show that the tablets besides the city model and city wiki are not in use as intended.

This encourages our future plans to improve the information value on the model-projection itself. Also, more capacities will be spent to build up the community to push the use of the collaborative platform and the physical extension of the model. The whole installation in the museum is in further development and can be understood as a public prototype.

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Ruth Neubauer (2019): Design Thinking: From Individual Thinking Towards a Technohuman Reconfiguration. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p06

Design Thinking: From Individual Thinking Towards a Technohuman Reconfiguration

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Abstract. This paper calls 'design thinking' a closed tool, and tentatively proposes 'technohuman reconfiguration' as a methodological opportunity to visualise the reproductive cycle of making whole and splitting partials, in order to support a moving away from individual thinking towards collaborative courses of action.

Design as a Closed Tool

'Design thinking' has become a successful export of design practice for the purpose of helping organisations innovate (Brown, 2009; Martin, 2009; Verganti, 2009). Design is here (re)presented as a human-centered methodology for the production of technologies. These representations describe design's function as the synthesising and integrating of different interests and needs – such as technological possibilities and human needs. The 'nature' of design work is often described as 'holistic', and although design representations differ in detail and focus, they generally describe how design work integrates divergent interests into a "coherent whole" (Lawson & Dorst, 2009, p. 42).

A recently concluded research project with UK designers allows a close-up view on these practices of designerly synthesis and integration. In the close-up view it becomes visible how design work unfolds amid entrenched organisational practices, such as traditional top-down business management practices and difficult-to-access engineering practices. In the navigation of these practices,

designers use the represention of design as a holistic tool and as an innovative way of ordering production activity.

In the research project, DesignerX, a user experience (UX) designer, showed me the design process diagram she had made. Her aim had been to help the organisation change from a "technology-driven" to a "user-centered" one. In the diagram, DesignerX defined specific activities, ordered these into groups, and allocated roles and responsibilities with each activity. She allocated locations to the user-related 'User Experience' role (herself) throughout the design process aiming for an even and constant distribution of user-centeredness. In the design process diagram, DesignerX placed the senior engineers ('Technical lead') alongside herself in the front tasks such as 'Scope Definition' or 'User Stories Definition', and so put both, designers and engineers, together in the driving seat. The 'visual designers' and 'developers' are placed in areas of limited scope, such as 'Style guide' and 'Technical validation' respectively. Five things are happening in the map:

1. Separate activities are defined and and chronologically split into defining activities ('Discover', 'Define') and implementing activities ('Design', 'Develop').

2. The (human-centered) design professionals and the (technology-centered) engineers receive the same 'strength' representation in the defining part of the process, and thus the activities which come before all other activities.

3. Design professions are split apart ('UX designer' versus 'Visual designer') and the engineers ('Technical lead' versus 'Developer'). DesignerX explained that 'Visual designers' (in contrast to 'UX designers') are designers who join the process later, because they are only "working on effects and visual interactions, rather than user/product interactions".

4. 'UX designer' and the 'Technical lead' are placed in the defining part of the process, while the 'Visual designer' and the 'Developers' are in the implementing part of the process, achieving an equal distribution of designers and engineers across the defining and the implementing activities.

5. 'UX designer' (DesignerX) is present in almost all activities of the design process. Specific locations are assigned to other roles, and an all-encompassing presence to DesignerX.

Because of design's representation as a human-centered methodology which can integrate different interests in a holistic process, designers are in the position of devising design process diagrams which are aimed at reordering production processes. Through the integrating of human and technological concerns within the design process, designers simultaneously split 'human needs' and 'technology' into separate roles and activities, at the same time as making the case for design requiring to integrate these. Through the mapping of design activity, the designers achieve advantageous negotiation positions. They assign locations to others whilst they themselves remain free to appear in all locations,

or what Haraway called “to represent while escaping representation” (1988, p. 581). As Suchman observed in design practice, decontextualized designers are “unlocatable” and thus escape accountability (Suchman, 2002, p. 95). Through this flexible ‘presence’ within design activity, designers (design thinkers) are able to use the human-centered design process as a device of flexible accountability, by shifting accountability between themselves and the human-centeredly ordered design process. Design thinking is thus in danger of becoming another tool for redefining human-centeredness in ways that suit the organisational practices. Several authors before have described how users are constructed within organisational practices, and configured to fit where they most suit the organisations (Oygür, 2017; Wilkie, 2010; Woolgar, 1991).

Opening Up Design?

It is through the practices of ordering design activity, rather than through the nature of design, that organisational practices are configured as ‘human-centered’ and as ‘integrative’. Design thinking is in danger of becoming a tool of flexible accountability. Suchman (2004) has called for a decentering of the designer through collective prototyping, in order to integrate use within production environments. However, it will prove difficult to open up design without opening up the practice of ordering design activity. Current practices do not leave open the possibility of design as a collaborative and integrative tool. This is unlikely to change through a simple changing of who designers prototype *with*, as long as design processes are ordered and facilitated by design (thinking) practitioners. The ordering of design activity itself needs to be reconceptualised in order to turn design thinking from an export of individual thinking (and flexible tool of accountability), into an openly accessible tool.

Haraway (1991) reminded us with the concept of the cyborg that identity is the work of “mapping our social and bodily reality” (p. 150). The machine is as ‘natural’ or ‘artificial’ as the human body. Suchman (2006) describes the boundaries of who and what we are (humans, machines) as the effects of reconfigurations in situated action. Boundaries are the “more and less durable and contestable” effects of relations (re)producing the “materialization of subjects [and] objects” (p. 286). It is so that design thinking – as the ordering of activity, the continuous splitting and integrating of technology and human needs – can be reconceptualised and opened up as reconfigurations in practice in which technology, humanity, and integrated technohumanity are effects of practice. Seen as reconfigurations-in-action and as effects of action which reproduce each other, they can be negotiated in a collaborative way. ‘Design thinking’ can be reconceptualised as a programme of technohuman reconfiguration.

Following Suchman and Haraway, the locations within the maps/orders of activities configure who we are and what we do – who we can be and what we can do. Represented as a programme of technohuman reconfiguration, designers are brought into presence within the design activity. Designers begin to speak from locations, alongside everyone else. They become accountable through their location in the collective ordering and action of design.

A mapping of locations within the sociomaterial arrangements of design action can can open up design activity to make it collaborative and accountable. In a map of locations, activities such as 'scope definition' and 'usability tests', or roles such as 'developer' and 'user', are publically suggested units of negotiation. The negotiation of mapping roles and activities as separate entities (splitting them) and putting them in relation (integrating them) can be collaborative work. This work is not a reconciliation of the 'natural whole', but it is making explicit the work of making partials and making whole, in order to become accountable, accessible, and open. Instead of designers (design thinkers) creating design processes, the technohuman reconfiguration takes over the work of mapping locations.

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David Goddard, Paul Mulholland, Lara Piccolo (2019): Deriving Personas Based on Attitudes to Interruption and Information Overload. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p10

Deriving Personas Based on Attitudes to Interruption and Information Overload

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Abstract. Ubiquitous devices provide users with notifications that continue to blur the distinction between work and personal activities. This research aims to understand how users manage - and would like to manage - such notifications in order to design better support. A methodology was developed to create design scenarios from a survey of people's attitudes and perceptions. The survey asked participants how they interact with various collaborative, social and communication services, and about their views regarding trust in those services, privacy and how they have experienced information overload. A two-step clustering technique was then used to identify distinct archetypes within the respondents resulting in 5 personas. A technique uniting personas and empathy map has been applied to model typical behaviours, goals and pain points, which will inform the design of a solution to manage interruptions and information overload.

Introduction

Most users of social and collaborative software have experienced some form of Information Overload (IO) (Schmitt et al., 2018). Studies on social media platforms – where volumes are likely to be particularly high – have shown such IO to have a measurable effect on performance, as noted by Rodriguez et al. (2014).

This research aims to develop an approach to ameliorate IO due to large volumes of content and interruptions across multiple sources. Of particular interest is the intersection between users personal and work life; for many people, the boundary between work and personal applications has become increasingly blurred, particularly where the same devices are used for both.

A key problem for an individual using a system with high information volume is identifying and accessing items that are relevant to them in a format that is useful. Many systems - such as Facebook and Twitter - have their own algorithmic approaches to attempt to alleviate these problems. We hypothesised that these were flawed in many cases[1,2] because of: a) inconsistency of approaches between applications; b) the values and priorities of the user may not match those of the provider; c) privacy concerns over sharing data with the provider; and d) inconsistency of notification technologies between providers.

A survey was used to test the validity of the hypothesis and provides a basis for solution design and evaluation. Personas (Cooper, 1998) can be used to reveal requirements for a solution from the perspective of substantially distinct users. In the next sections, the survey will be briefly described, followed by the method to create the personas. The results are then discussed before concluding the paper.

Survey

The survey asked questions about the reasons for interacting online, optional demographic information, and about how people prefer to receive information under a variety of circumstances. The main body of the survey solicited respondents' opinions on a number of topics as a Likert scale, with some optional open questions, grouped around five themes:

A: Attitudes to interruptions originating from application notifications
B: How well online services understand users' preferences and interests
C: Degree of trust and confidence in online services
D: General views on online services, connected applications and smartphones
E: Differentiation between work and personal use of apps and services

The questionnaire was published using Jisc Online Surveys, and advertised with an intention to reach people who may experience IO - such as IT professionals and academics. Channels used included Twitter, Facebook, LinkedIn, a university noticeboard, internal channels in a large technology company, and directly to personal contacts. To encourage response, optional entry into a prize draw of two gift vouchers was offered. Anonymous responses were permitted, although contact details were required for the prize draw. The survey was open for a total of 40 days ending August 31 2018, with a total of 135 responses received.

Survey Analysis - Clustering

A two-step clustering process was chosen, with clusters first generated for each thematic group of questions (A to E), which were then used as a basis for an overall

[1] https://www.engadget.com/2018/12/18/twitter-chronological-timeline-feature-latest-tweets/
[2] https://www.reviewgeek.com/1328/facebooks-news-feed-algorithm-is-completely-busted/

cluster of clusters. This approach was selected because the first analysis suggested that clusters of users tended to respond similarly across all questions within a theme. The second level clustering was used to identify commonalities across clusters.

The first level of clustering was applied to the questions of each theme, with Cluster A relating to questions in section A (attitudes to interruptions and IO) and so on. Clusters were produced using a k-means algorithm using a k value of 3. Alternative k values were tested, but lower values did not generate sufficient differentiation, while higher values did not result in meaningful clusters.

The second level of clustering was applied using a k-means algorithm on clusters A-E, with a k value of 5. Again, different values of k were tested, with 5 being found to be optimal. The resultant clusters are referred to as clusters 1-5, to differentiate them from the first-step clusters A-E.

Personas

A data-led approach described by McGinn and Kotamraju (2008) was used to generate personas, albeit with a smaller sample survey size and different clustering technique for data analysis and modelling. Cluster analysis for personas has already been considered by Tu et al. (2010), who compared quantitative generation using clustering with the more traditional qualitative method of observing, interviewing and abstracting. They found that the combination of the two produced more representative and less ambiguous personas than qualitative methods alone.

Persona construction used a hybrid of quantitative and qualitative inputs: the clustering output evidenced the personas, but also supplied some more descriptive criteria; demographic and personality traits compatible with the clusters were selected to represent a blend of characteristics embodying typical users. The PATHY technique for persona development (Ferreira et al., 2018) was selected for this work, which is itself based on empathy maps (Gray et al., 2010).

Each cluster was assessed for how members had responded to each of the individual questions of the survey (for example, how did Cluster *N* members respond to the question: *I receive so much information online that I often miss things that are important or time critical*?). Chi-squared tests determined whether responses to the questions differed significantly across clusters.

Applicable significant responses to questions were assigned to individual clusters in order to frame archetypes. For example, members of cluster 1 said that they separated work and personal usage, could switch off from work, were less happy to receive work notifications in personal time, and were not comfortable sharing personal information. These attributes, combined with any significant demographic information, fed the PATHY technique to derive individual personas. As well as the data-driven development, some descriptive input was also used to help generate realistic personas and achieve a reasonable balance of different types and demographics. Short persona summaries are included here for illustration[3]:

[3] The full set is described at https://doi.org/10.21954/ou.rd.7700579

Persona 1 (Susan) - Less adept IT user; mainly social user, experiencing some IO; wants to keep track of friends and family whilst frequently offline.

Persona 2 (Adam) - IT professional; evangelical about technology for social and for work use; experiences IO but very positive about having AI help out.

Persona 3 (Phoebe) - Very computer literate young professional; prolific app user, mainly on mobile; needs help separating work and personal usage.

Persona 4 (Kenton) - Experienced IT user for work and social; doesn't suffer IO, but keen to use technology to ensure important things are never missed.

Persona 5 (Usha) - Computer literate and pragmatic user of IT; does not have IO volume issues, but does experience problems with interruptions from apps.

Conclusion

The survey confirmed the assumption that many IT users experience IO, having diverse relationships with online services and varying levels of trust in the integrity and competence of those services. While some embraced AI as an aide to cope with the variety and volume of information that they have to deal with, others were more reluctant. The clustering technique evidenced distinct sets of attributes for five user archetypes. Statements expressed in the survey were taken from those survey responses having a significant relationship to cluster, and used to build empathy with these notional users. PATHY was applied to flesh out what the potential users of a solution need according to their current perceptions and problems.

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Romina Kühn, Mandy Korzetz, Karl Kegel, Uwe Aßmann (2019): Creating Business Model Canvases with a Collaborative Mobile Application. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_d01

Creating Business Model Canvases with a Collaborative Mobile Application

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Abstract. Business models are important for both start-ups and established companies because they form the basis for a company's success by outlining their key factors. Business models can be created and documented in several ways. We focus on Business Model Canvases (BMC) and present *MobiLean*, a mobile application for the collaborative creation of BMCs. *MobiLean* is an easy and interactive smartphone app for groups of varying size in mixed-focus collaboration scenarios. We apply mobile-based interactions for the ease of use and the support of the creativity process. We contribute to the field of CSCW by providing a mobile application for the domain of co-working and aim to demonstrate how *MobiLean* supports creating, revising, and documenting BMCs.

Introduction and Related Work

Business models are important artifacts in business development both for start-up companies to orient themselves and to receive funding and for established companies to describe their key factors. Creating and documenting business models is necessary to ensure a company's sustainability. A template that can be used for this purpose is the Business Model Canvas (BMC)[1]. A BMC consists of nine so-called building blocks and describes value propositions, customers, finances, and infrastructure. BMCs help to structure and evaluate business strategies and to get new ideas, e.g., for increasing efficiency of business processes. The usage of BMCs is

[1] For example provided by Strategyzer AG: https://www.strategyzer.com/canvas/

growing and widespread across different domains, e.g., agriculture (Dudin et al., 2015) or retail industry (Zolnowski et al., 2014), and with different purposes, e.g., as analytic tool for government (Ramlan and Hasibuan, 2018) or for risk assessment (Proença et al., 2015). Usually, building blocks are filled by a companies' management, leading employees, or other involved parties in collaborative sessions. To create BMCs the majority uses analog tools, especially sticky notes and pens. Group members fill building blocks in a specific order by writing their thoughts on sticky notes, discussing them, and putting them on a large sheet of paper or a board. Normally, such discussions need more than just one meeting and, therefore, have to be resumed. For preparing follow-up sessions efficiently, building blocks are assigned to different group members for further processing. As a result, already created entries of building blocks need to be distributed within the group. This way of working collaboratively as well as individually to reach a common goal is called mixed-focus collaboration (Gutwin and Greenberg, 1998). Although, working analogously is easy to perform, content often gets lost or into disorder during distribution, which impedes further processing. A direct digital creation instead enables sharing building blocks easily and enhances further editing as well as permanent documentation. Current approaches for creating BMCs digitally include desktop tools that adapt the sticky notes metaphor (Fritscher and Pigneur, 2010) and web-based tools optimized for desktop and tablet screens (e.g., *Canvanizer*[2]). They both focus on creating BMCs digitally but lack collaborative editing or sharing. The mobile app *And Voil'App*[3] aims to document analog BMCs with smartphones but without the creation process itself. Although, these tools address direct digitization of BMCs with different devices they do not address useful collaborative work in terms of mixed-focus collaboration. This includes not only creating but also sharing and merging activities for digital content (Kühn and Schlegel, 2018). Furthermore, the tools lack intuitive interactions for a seamless integration into collocated groups. We present a mobile application for creating, discussing, and sharing business model canvases within collocated groups. The tool aims to support the creation by utilizing standard smartphones, providing intuitive and easy-to-use interaction techniques, and addressing the relevant activities for creating BMCs extensively.

Collaborative Creation of BMCs with MobiLean

MobiLean is a mobile application that uses smartphones without further equipment to enable users to collaboratively create and share BMCs (see Fig. 1). It aims at supporting the direct and digital development as well as the location-independent creation of BMCs due to smartphone usage. Furthermore, it overcomes disadvantages of presented work concerning working simultaneously on different building blocks and the integration of devices into collaboration. *MobiLean* includes several

[2] https://canvanizer.com/
[3] http://www.andvoilapp.com/

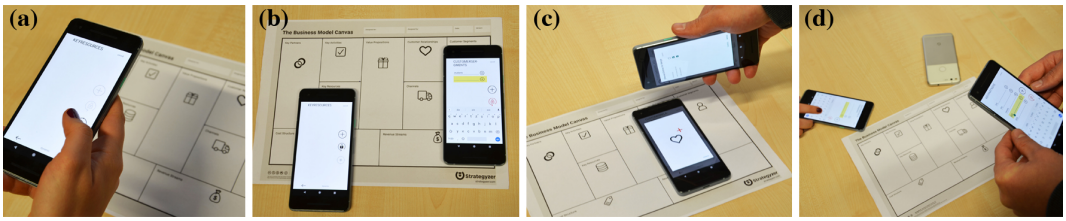

Figure 1. Collocated use of *MobiLean*: (a) Initiate collaboration by detecting blocks, (b) edit and highlight entries, (c) share and merge content using *Pour to Compose*, (d) select content for moving.

mobile device-based interaction techniques for collocated mixed-focus collaboration (Kühn et al., 2016). These interaction techniques enhance the interactivity of the creation process and increase user experience (UX) due to their spatiality and tangibility described by Korzetz et al. (2019). They further aim at simplifying the usage of mobile apps by reducing complex text input and utilizing gestures that are based on everyday actions. To work with *MobiLean* collaboratively, one group member creates a new BMC project or opens an existing one as host of a session. Hosts can invite a various number of group members to join the session while they, in turn, can connect to the host device and the respective project. Connection is established with an API that builds upon the Nearby Connections 2.0 API. Group members can either create entries together or split up the building blocks among each other according to mixed-focus collaboration. In order to edit building blocks, a particular block can be selected and locked. For selecting, the group members can open the BMC template digitally, print it, or draw the icons of the blocks on a board or a piece of paper. By holding the smartphone above the particular icon, the device detects the block (see Fig. 1a) using image recognition. Then, the block can be locked for individual editing (see Fig. 1b) by tapping on a locking button. Switching between several blocks works similarly. To edit blocks simultaneously, they can be forked. Forking enables individual users to edit a block independently and merge created content later with entries of other group members during a joint discussion. Joint decisions lead to higher acceptance within the group. Another advantage of forking a block is that entries of others cannot be deleted by mistake. For executing a merge of several blocks, *MobiLean* utilizes the interaction technique *Pour to Compose* by Korzetz et al. (2016) (see Fig. 1c). Selected entries from different group members can be merged to complete blocks. Furthermore, entries can be easily copied and pasted into other blocks by performing a tilt interaction (see Fig. 1d). Thereby, *MobiLean* provides a high level of functionality for an easy and collaborative creation of BMCs.

Conclusion and Future Work

We presented our mobile application *MobiLean* that helps to create Business Model Canvases digitally using conventional smartphones. *MobiLean* applies mobile device-based interaction techniques that are easy to learn and to perform to

facilitate the creation of BMCs. Using such interaction techniques enables users to focus on the content (the business model), the resulting discussions, and the overall social interaction instead of struggling with the usage of a device. Further steps comprise user evaluations of the current version concerning its integration and UX and implementing additional functionality to address mixed-focus collaboration.

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Claudia Müller, Heidi Kasper, Katharina Pelzelmayer, Karin van Holten, David Struzek, Martin Dickel (2019): Designing for Sustainable Caring Communities – the CareComLabs Framework. In: Proceedings of the 17th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing and the Design of Cooperation Technologies - Demos and Posters, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2019_p09

Designing for Sustainable Caring Communities – the CareComLabs Framework

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Abstract. The CareComLabs framework intends to provide a design and research space which in the long-term has the potential for setting up a collaborative learning space which serves both, a fruitful environment for developing appropriate socio-technical measures for ageing and caring at home, and to create structures which help the patients and community stakeholders in sustaining practices in the long-term, after the end of the project.

Introduction and Motivation

Adequate long-term care for people with chronic health conditions is one of the most pressing issues of our times (World Health Organisation 2015). Many CSCW researchers are exploring how IT systems might be employed as meaningful components in homecare settings supporting multi-actor networks (e.g. Procter et al., 2014), and addressing sensitive issues of ageing at home in a human- and value-oriented perspective (Leong et al., 2016; Light et al., 2015). The human- and value-oriented as well as participative stances in socio-technical design communities find an analogy in the conceptual care approach of "caring communities": *"Caring*

communes (or communities) in essence are concerned about sustainability, children, integration, values and spirituality, towards others, towards the sick and the dying and the bereaved" (Klie 2016, p. 198). *Caring communities* is increasingly seen as an inspiring concept for healthcare research and policies. It defines a set of characteristics and orientations that communities and its members have or aspire achieving. Hence, *caring communities* is both a normative and an analytical, and always process-oriented, concept. Caring communities are characterized by co-responsibility, co-production and the acknowledgement of interdependency and reciprocity that expands beyond families (Klie 2016).

The purpose of this paper is mainly conceptual and it takes two complementary perspectives: It, in the first place, focusses on homecare and elaborates on the question of – against the background of the growing needs for sustainable homecare arrangements – how new cultures of care might be fostered by means of participatory research. The second perspective is a methodological viewpoint, linking participatory care research with the conceptual frameworks of Design Case Studies (Wulf et al. 2015) and Praxlabs (Ogonowski et al. 2018). By linking both strands, we strive to develop a perspective on technology development in sensitive settings under the perspective of sustainability in design (Meurer et al. 2018).

The CareComLabs framework intends to provide a design and research space which has the potential for setting up a design and action space which serves both, an environment for developing appropriate socio-technical measures for ageing and caring at home, and to create structures which help the patients and community stakeholders in sustaining practices in the long-term, after the end of the project.

Project Setting and Methods

The project CareComLab aims at exploring and adapting the concept of caring communities in order to stimulate an overall shift in the field of home care work. In order to reach this sustainable shift, community based participatory research (CBPR) (Minkler & Wallerstein, 2008; Wallerstein et al., 2018) will be at the heart of the project, framed in an overall living lab/Praxlab research design (Ogonowski et al., 2018) which will comprise three different pilot communes in Switzerland.
Each CareComLab connects interested stakeholders from government and non-government organizations, profit and non-profit and civic society that contribute to fostering home care for people with comprehensive care needs. Furthermore, it strives to reach out and engage additional actors, not yet linked to care work in order to expand the project's reach and root the caring community idea. The three CareComLabs will work interdependently, i.e. they constitute individual Living Labs, but are connected through workshops to exchange experiences. CareComLabs will span and exceed the entire project period and hence coordinate a broad range of activities (with varying intensity) throughout the project. They will (I) co-produce empirically grounded original insights into comprehensive home

care needs and services, (II) strengthen, expand and adopt existing and initiate, assess and adjust novel local caring community initiatives and (III) participatory evaluate processes and gained insights for knowledge transfer. These three parts follow a circular, rather than a linear logic.

On Sustainability in Home Care Arrangements

Designers and researchers are often led by a strong motivation to create a workable IT-based solution that will make a difference for those people, communities or organizations that appropriate it, helping them to develop their practices: for them sustainability is about how to achieve a lasting effect in the target setting that may even stimulate further developments. In discussing health interventions Altman (1995) articulates this goal by defining sustainability as 'the infrastructure that remains after a research project ends': this infrastructure includes 'consideration of interventions that are maintained, organizations that modify their actions as a result of participating in research, and individuals who, through the research process, gain knowledge and skills that are used in other life domains' (p. 527).

Research that demonstrates the sustainability of IT-based solutions, especially in the field of homecare or ageing at home is scarce, with some exceptions (e.g. Meurer et al. 2018, Müller et al. 2015). But sustainability is a larger issue that also requires studying *the conditions within and beyond a research project* for a design result to be appropriated, maintained and eventually further developed. It is helpful to conceptualize designing for sustainable IT-based solutions as taking place in a multi-dimensional space and that combining participatory research work from the care and social sciences with participatory design and Praxlabs conceptions may provide new ways for thinking about sustainable IT design in homecare settings.

Co-Production of Technology in Sensitive Settings

This project focuses on situations in which comprehensive home care is needed for people with multiple chronic conditions. A solution approach being pursued during the last decade is technology support. But studies show that socio-technical infrastructures including multi-stakeholder networks are necessary for meaningful and sustainable technical support and that solely "parachuting in" technology will not prove successful for sensitive settings such as long-term care (Ekeland et al., 2012; Greenhalgh et al. 2015). Taking individual preferences to stay at home seriously, this project explores ways to expand caring responsibilities from individuals and families to local communities. Through participatory fieldwork with communes and communities, this study provides knowledge in order to develop future-oriented, sustainable, affordable and acceptable models of technology-supported, community-based long-term home care.

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