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Co-located and Remote Collaboration using MR: Exploring Interaction, Synchronization and Ownership Methods

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Abstract. Scenarios of co-located and remote collaboration require solutions to establish a common ground between team-members, allowing to discuss solutions for a given problem. Technologies like Virtual and Augmented Reality (VR & AR) have been facing a growing interest due to their capacity to share the real-world environment and enhance it with layers of digital information, allowing to share ideas and define strategies to address existing problems. This work describes a framework for addressing multi-user co-located collaboration, as well as considering the need of having remote elements participating in the collaborative process. As use case, an assembly serious game with distinct levels of complexity was contemplated. Given the inclusion of multiple members, methods for interaction, synchronization and ownership were designed and developed. To verify the correct functioning of the functionalities developed, two user studies occurred at distinct moments of the development process.

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1 Introduction

Computer-Supported Cooperative Work (CSCW) Researchers have been targeting Virtual and Augmented Reality (VR/AR) to address the challenges faced by team members during scenarios of co-located and remote collaboration (Ens et al., 2019; Sereno et al., 2020; Marques et al., 2021a). Solutions using these technologies allow to create a shared understanding, allowing to inform where to act, and what to do through distinct authoring features, thus providing real-time spatial information, e.g., highlighting areas of interest or sharing situated data from relevant objects (Wang et al., 2020; Barroso Rego et al., 2020; Marques et al., 2021b).

Thus far, most of the research efforts have been devoted on creating the enabling technology to overcome engineering hurdles and propose methods to support its design and development, in particular for handling co-located scenarios (Marques et al., 2023; Kim et al., 2020).

Regardless, even when multiple co-located individuals work together on a given problem, there may be a need for additional insights from team members unavailable off-site. Nevertheless, due to the natural multidisciplinarity of combining such fields, little work has been conducted to explore multi-user collaborative scenarios where AR and VR can be simultaneously used for achieving shared goals. To elaborate, topics such as content ownership, synchronization, as well as combining distinct interaction methods while using VR and AR devices have not been target of much attention by the community, suggesting several opportunities for research still exist (Grandi et al., 2017, 2018; Guo et al., 2019; Bovo et al., 2022).

This paper presents a comprehensive framework that addresses the challenges of multi-user co-located collaboration while also accommodating remote participants in the collaborative process. The framework is applied in a specific use case involving an assembly serious game with varying levels of complexity. The development of the framework includes the design and implementation of methods for interaction, synchronization, and ownership among multiple members.

2 MR Framework for Co-located and Remote Collaboration

Figure 1 illustrates the representation of the proposed framework for assisting co-located team members in accomplishing shared tasks through the use of AR. Moreover, it also incorporates the possibility of having remote members assisting with situated instructions, which can be created through the use of VR. The framework encompasses several key components and functionalities to facilitate an engaging and synchronized collaborative experience. While being present in the same physical space, co-located collaborators can use the cameras of their mobile devices to conduct a marker detection, visual cue that activates the AR experience, in this came, illustrated through the use of a collaborative serious game.
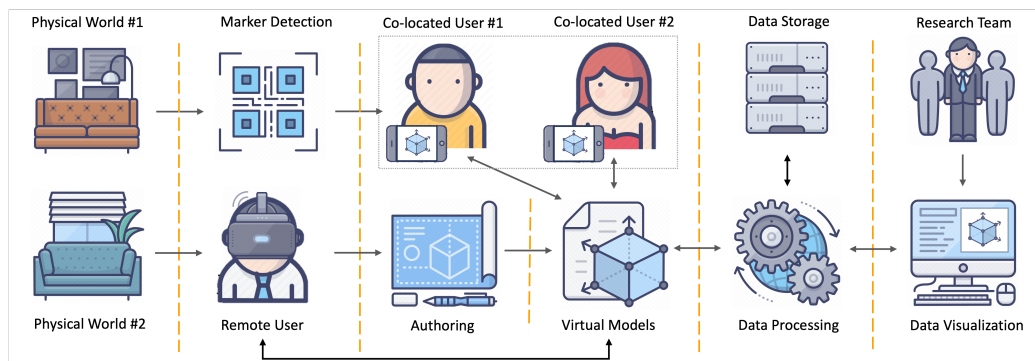
Figure 1. Framework overview for assisting co-located collaborators using AR to accomplish an assembly serious game. After the collaborators conduct a marker detection to trigger the game, various virtual models will appear, requiring selection and manipulation to conduct a given assembly according to the game level. All these changes to the virtual models will be analyzed by the data processing module, responsible for ensuring synchronization and content ownership during the game. In a distinct location, a remote user can also be consulted to provide guidance using authoring features. All changes made are stored in a dedicated server, which can also be accessed by a research time during user evaluations through the data visualization module, allowing to view all changes being made through a live stream mode. Assets obtained from iconfinder.com..

The game developed consists in a set of collaborative assembly levels, with increasing complexity. Once the game is triggered, various virtual models related to the assembly tasks appear within the AR environment. Then, collaborators are required to re-create specific structures (displayed by a transparent representation). using virtual blocks and surfaces.

Additionally, a data processing module is responsible for analyzing and processing the changes made by team members to the virtual blocks and replicate them in the interface of other collaborators. This module guarantees synchronization among the collaborators, i.e., their actions and modifications are reflected accurately in real-time. The data processing module does this while also managing content ownership, i.e., establishing distinct roles and asserting if a given team member has permission to conduct a specific action. To elaborate, a team member may only be able to move red blocks, limiting the range of their actions. On top of this, interacting with such blocks may only be possible at given moments, i.e., following the actions of other team members, thus forcing all individuals to collaborate in achieving the main shared goals.

All changes made to the virtual models by the collaborators, including their selections, manipulations, and assembly progress, are stored in a dedicated server. This server acts as a centralized repository, storing the data generated during the game. The server enables easy access and retrieval of the data for various purposes. For example, researcher's can access a data visualization module and analyze the assembly status in a distinct device, while a multi user team is participating in a user evaluation. This way, researchers can observe and study the modifications in real-time, gaining valuable insights for further analysis and assessment of the collaborative process.

In addition to the co-located collaborators, the framework allows for the inclusion of remote members immersed in a VR environment. These can provide guidance using authoring features in the form of situated instructions (i.e., informing where to act and what to do) like arrows, notes or other virtual models capable of highlighting and important area of interest, thus sharing expertise during the assembly process.

Regarding interaction with the virtual blocks, different methods exist. Co-located members interact with these models by selecting and manipulating them using: 1- touch on the screen of their mobile devices (Figure 2-A) or 2- control the blocks pose through the device movement (Figure 2-B) (Marques et al., 2020). As for the remote members, all interaction is made through the controllers of the VR headset (Figure 2-C). Notwithstanding, due to the ownership mechanisms aforementioned, interaction is only possible with pre-established rules. A scenario incorporating various team members using the framework can be visualized in Figure 3, illustrating a possible setup in which the functionalities of the framework are being used to accomplish shared goals.

3   User study

Next, we describe a set of users studies conducted to evaluate the AR and VR versions of the serious game developed.

3.1   Co-located User Study

A user study with 6 participants (2 female - 33.3%), whose ages ranged from 23 to 36 years old (M = 26.6, SD = 5.05) was conducted to evaluate usability, interaction methods, and collect their feedback on the main functionalities in order to elicit the next steps of the development phase. All participants had previous knowhow of AR and collaboration tools. They also knew each other prior to the study.

This study occurred in a meeting room with controlled illumination conditions and reduced levels of noise. On top of a table, a large marker was placed, working as the anchor for participants to detect and trigger the serious game being evaluated. Participants could and were encouraged to move around the table. Each participant used a Samsung Galaxy A52 smartphone. Besides the researcher responsible for the study and the participants, no other individual was present.

Participants started by giving their informed consent. Then, they were informed on the experimental setup and the task goals. Each pair of participants had to execute four different tasks, each one being associated with the four levels of the game, having increased complexity as the game advances (figure 4). To do so, both participants had to collaborate in completing the levels goals, while respecting the restrictions of only being able to interact and manipulate models of a given color. An adaptation period was also provided for participants to adjust to the interaction mechanisms and game rules. After accomplishing the intended
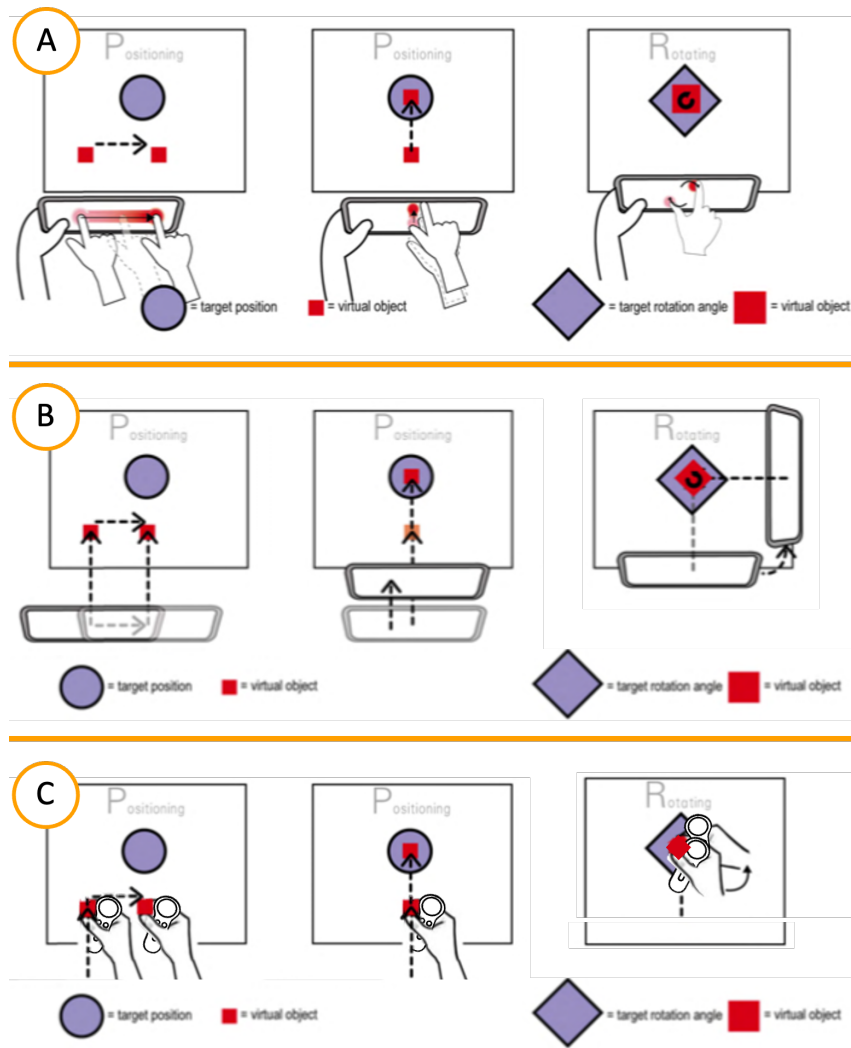
Figure 2. Representation of the various interaction methods available to interact with the virtual models: A- interaction using tough on a mobile device; B- interaction using the mobile device movement; C- interaction using the controllers of a VR headset. Adapted from: (Marques et al., 2020)..

tasks, participants answered a post-task questionnaire and gave their opinion and suggestions.

3.2 Co-located and Remote User Study

Later, an improved version of the framework was evaluated, this time allowing a remote member to provide guidance. As before, the goal was to evaluate the collaborative process of team-members during an assembly serious game. Also, gather first impressions about simultaneously using AR and MR. For this, 8 participants were recruited (1 female - 12.5%), whose ages ranged from 22 to 24 years old (M = 22.5, SD = 0.71), to evaluate usability, interaction methods, and collect feedback on the main functionalities, this time, including the VR approach.
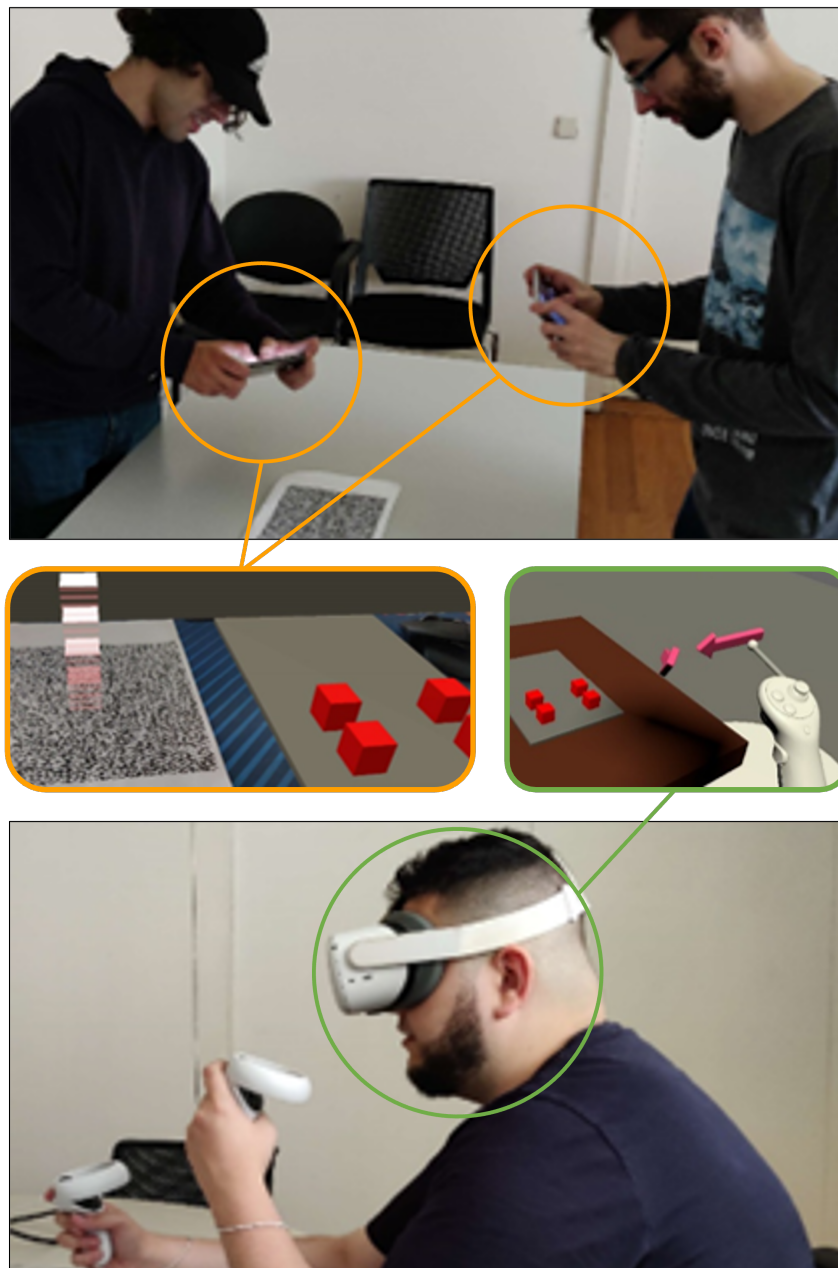
Figure 3. Collaborative scenario with two co-located users using AR to achieve a shared goal, and a remote user providing guidance through a VR headset..

All participants had experience with collaboration tools, 87.7% of had knowhow of AR, and 62.5% had previous experience with VR. From these, only 50% of the participants knew each other prior to the study. A researcher acted as the second co-located member, meaning the participants were divided in teams of two, plus the researcher.

For the co-located members, the experimental setup was the same as before. Regarding the remote participant, a distinct meeting room was used to generate the sense of being in distributed environments. Once again, the co-located participants
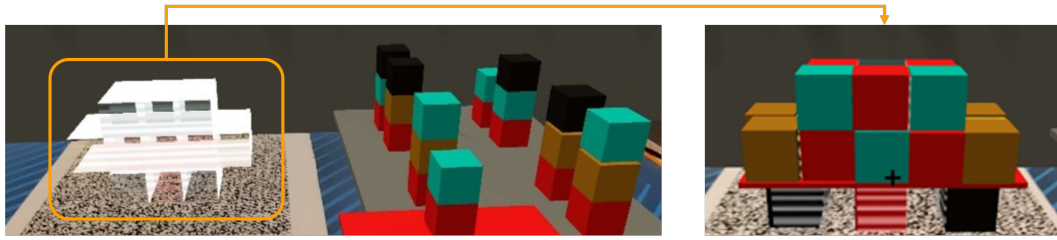
Figure 4. Example of a collaborative task used during the user study. On the Left, displayed using a transparent setting is a representation of the structure that must be built, as well as a set of virtual cubes with distinct colors. On the right, the structure created by a team of 3 participants..

used a Samsung Galaxy A52 smartphone, while the remote participant used a Meta Quest 2 headset with controllers. Besides the researcher responsible for the study and the participants, no other individual was present in either environment. A within-group experimental design was used and the order of methods was alternated, thus ensuring all participants tested both the AR and the VR methods.

As in the previous study, each team had to fulfill four levels with distinct complexity (which were improved based on the feedback collected during the aforementioned study) (Figure 4). The same ownership rules were applied, restricting the participants from manipulating virtual objects beside the ones they had authorship of. Besides that, the procedure was identical to the previous study, collecting subjective data through post-task interviews at the end of the experiment.

4   Results and Discussion

During the study, participants were able to collaboratively fulfill the various levels of the serious game through, although some manifested difficulties in properly placing the blocks, i.e., understand if they were in the correct pose. As for interaction with the blocks, most participants preferred the use of touch in the mobile device screen. This may be attributed to the familiarity of touch controls, as well as the learning curve associated with the device movement alternative. Participants emphasized that it required more precise aiming, which took more time and practice to master. Additionally, some participants reported that the last level took too much time to complete, leading to a feeling of tiredness. This was associated with the higher amount of blocks, and the fact that workload among team-members was not balanced, meaning that one member had to wait until the other finished his assembly before being able to contribute. Regardless, the System Usability Scale (SUS) scored 72, indicating a positive usability evaluation. Notwithstanding, it was clear that some updates were needed before the next study.

Before the next study, where remote features were introduced to the co-located setting, a set of improvements were integrated. These changes were visible, given that all team members manifested no complain regarding placing the blocks in the desired pose. Contrarily to the precious study, this time, the device movement was

selected as the preferred AR method for interaction purposes. This illustrates that interaction is a very personal aspect, and that further attention should be given to this in a future study. Regarding the VR interaction through controllers, participants emphasized that it was easy to select and manipulate objects, allowing them to author instructions to assist the co-located members. The updates made to the serious game had a positive impact, in particular regarding the last level difficulty, and completion time, given that all participants believed it had a reasonable duration and complexity. In terms of collaboration between AR and VR collaborators, co-located participants found it fairly easy to understand the remote member instructions and reported that communication was moderately easy among all member of the team. A suggestion made by some participants was the possibility to have a list of changes made, allowing to review past actions and stimulate accountability.

5   Concluding Remarks and Future Work

In this work, besides proposing a serious game for co-located and remote collaboration, different interaction methods, virtual models synchronization and content ownership have been addressed. By exploring these topics, where little work has been conducted, it was possible to design a framework for considering multi-user teams, where all elements can clearly understand which virtual objects are theirs, allowing to reduce the amount of errors and time needed, which otherwise could occur, e.g., multiple members trying to simultaneously access the same virtual object. Initial user studies have shown that participant were able to quickly understand the interaction methods used, as well as actively participate in the game narrative. Additionally, all teams accomplished the intended tasks in a collaborative manner, emphasizing the potential of the framework in providing a serious game in a distributed manner, where various users could contribute, while respecting the ownership rules being applied.

This study is being expanded by integrating other AR devices, e.g., Microsoft HoloLens 2. Then, conduct a new study, comparing the use of distinct devices for co-located members. Additionally, expand the framework features to include a list of changes made, and by who, in order to set up an accountability mechanism. We also intend to explore distinct serious games, considering levels with higher complexity, and duration, as well as having different models, allowing to further assert how the collaborative process occurs.

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Collaboration planning using visual landscape metaphors in group meetings

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Abstract. This poster expands the human-computer interaction perspective of visual metaphors into group meeting contexts to improve collaboration planning. We present a study in which the participants used the LEGO® Serious Play® method as part of their group planning activity. Each group chose the topic of their planning meeting. The meetings were videotaped, and then transcribed and analysed using a thematic analysis method. We used the semantic, cognitive, and material properties of metaphors for this analysis. The analysis produced various coded themes and narratives of collaboration centred around the visual metaphor of landscapes. The participants created these landscapes by stacking and connecting LEGO base pieces, using metaphorical environments in which they placed and linked different stakeholders. Landscape metaphors were alternatively used to centre activities around key persons. This study shows that the use of physical artefacts to create visual landscape metaphors provides an effective method for planning collaborations in group meetings.

Keywords: Collaboration planning, group meeting, landscape metaphors, visual metaphors, physical artefacts.

Introduction

The concept of visual metaphor has long been used as the basis for developing graphical user-interfaces and other interactive artefacts (Blackwell, 2006). In this poster, we propose expanding this concept of visual metaphors to group meeting contexts to support planning collaborations using visual metaphoric artefacts. The use of visual artefacts in group meetings has been shown to facilitate generating creative ideas (Ylipulli et al., 2017), provide a harmonious work environment (McCusker and Swan, 2018), and improve recollection of meeting content (Bolognesi and Aina, 2019).

Based on this evidence, we suspected that the use of physical artefacts, such as LEGO® pieces, would support the communication of visual metaphors to help collaboration planning in group meetings. Therefore, we conducted a study of group meetings using the LEGO Serious Play® method. The goal of this study was to better understand how the use of physical artefacts helps the creation and communication of visual metaphors in group meetings. While this study focused on the use of visual metaphors in co-located meeting contexts, our work aims to support the development of tools and methods that can be applied to remote (Kim et al., 2018) and hybrid meetings (Saatçi et al., 2020) in CSCW contexts. This would allow future collaborative digital technologies to be used together with physical artefacts to facilitate a wider range of group planning meetings with visual metaphors.

Visual metaphors in group meetings

The concept of metaphor is about seeing one thing in terms of another thing (Lakoff and Johnson, 1980). These two things are referred to as the *target domain* and the *source domain* (Celentano and Dubois, 2014). In the context of group meetings discussed here, the source domain refers to the visual metaphors used (e.g., using LEGO pieces), and the target domain refers to their real-world counterparts (i.e., the ideas or objects to which they refer).

Jung et al. (2017) have divided the links between the source and target domains into three different types: *semantic*, *cognitive*, and *material*. The semantic link is constituted by shapes, colours, and textures representing the visual characteristics of metaphors (Heath et al., 2014). Cognitive links refer to the visual schemas of primary metaphors (Hurtienne et al., 2015). This is related to, for instance, which individual LEGO pieces are selected and how they are arranged to visually represent a metaphor (Reed et al., 2023). Finally, the material links of metaphors relate to morphologies such as graphic, tactile, and temporal uses of objects, as well as to their assigned meanings and functionality (Jung et al., 2017).

In terms of tangibility, psychologists have argued that physical artefacts can support the creation of metaphors by bridging abstract and concrete concepts (Bakker et al., 2012). Physical artefacts can also evoke memories, sensorial experiences, and ideas to help represent certain intended technical and social contexts (Jung et al., 2017). In addition, physical artefacts can reduce the likelihood of communication getting stuck during meetings (Huron et al., 2017). Although presenting physical artefacts can be reinforced by gestures (Sun et al., 2022), improvisation may sometimes be needed to apply certain artefacts to represent the desired metaphor.

Study of visual metaphors using physical artefacts

This study was conducted to better understand the visual metaphoric themes and narratives created using physical artefacts in collaboration planning group meetings. We videorecorded a series of meetings in which the participants chose the topic of their planning activity and then followed a facilitated process that required them to build, combine, discuss, and present their individual narratives around their planning topic using physical artefacts they had made with LEGO pieces. To do this, the participants presented their visual metaphors using a storytelling method (Boje, 2008).

Table I provides a summary of our study dataset. It consists of 16 video-recorded presentations collected from 5 different group meetings, in which several participants presented their narratives. This included 24 presentations, with one participant presenting twice, once in Video 3 and another time in Video 5.

We adopted Brown and Clarke's (2021) thematic analysis method to identify, analyse, and report on the use of visual metaphors in the recorded presentations. Using this method, the identified themes are creative interpretations of the researcher analysing the data, based on their analytic skills and available resources (Brown & Clarke, 2021). Thematic analysis is, however, meant to be a flexible process (Kadir et al., 2020). As such, we included both content data through coding themes and narrative pattern data in the form of presentation fragments.

The analysis of our study data was conducted by the first author of this poster paper, who occasionally reviewed the process of analysis with the other co-authors. The analysis started by transcribing all the individual presentations from each video, which resulted in a transcript totalling 5381 words. Since some of the meetings were in Finnish, the study participants' quotes included here may be from among those that have been translated by the first author, and as such they are not meant to be considered verbatim.

Table I. A summary of the dataset used in this study.

Videos	Presenters (n)	Topic	Time (video number)
1-2	City planners (4)	What is a good strategy collaboration like?	01:45 min (1), 02:42 min (2)
3-6	University entrepreneurial education students (3)	What are central contributing factors to failure in digital disruption technologies?	03:06 min (3), 04:40 min (4), 03:40 min (5), 07:25 min (6)
7	Construction company and university representatives (3)	How can platform business, data and platform solutions improve flows of building constructions?	05:35 min
8-15	Middle managers from energy businesses (8)	How to build a joint model for the most central success factors for the company?	02:19 min (8), 01:13 min (9), 01:41 min (10), 02:10 min (11), 00:39 min (12), 01:44 min (13), 01:01 min (14), 00:56 min (15)
16	Consultants for digital services (6)	How to seal the deal with potential customers?	15:39 min (three presentations)

The iterative coding process of the transcribed data has resulted in the following main themes: *collaboration* (45 codes), *business* (39 codes), and *innovation* (25 codes). At this stage of the analysis, we have noticed that the theme of *collaboration* occurs more frequently in these planning meetings when artefacts made of LEGO pieces are used to create and communicate visual metaphors. For this reason, here we will focus the discussion of our findings only on the use of visual metaphors for planning collaborations during group meetings, and particularly the visual metaphor of landscapes.

Planning collaborations using landscape metaphors

Our analysis shows that the study participants created various kinds of landscapes of collaboration. Differently coloured flat LEGO base pieces were used to represent the separation of geographic locations in the business contexts discussed during the planning meetings. In some cases, the base pieces were also used to represent more abstract concepts such as sustainability in corporate

communication through, for example, the use of green or blue coloured base pieces.

In addition, landscape metaphors were used to communicate development areas for ecosystems, illustrate service networks, or represent operational environments. The symbolic meanings associated with these landscape metaphors were related to the size, colour, location, and layering of the LEGO base pieces.

Figure 1 shows an example of a landscape metaphor, recreated from one of the narratives presented in the meeting recorded in Video 14. In this example, the presenter marked a smaller area, using light grey coloured LEGO base pieces (see top right in Figure 1, next to the pink flag) to indicate their local actors. The darker grey coloured base piece underneath represented their global business environment and its related stakeholders (see the LEGO humans in Figure 1). The presenter gave the following narrative in this case:

"We acknowledge the support from the different continents. And then the information flows, as here are these local experts who have received help from there and improved. Then, here is this kind of a hero who observes this group so that they also work accordingly and works as a link with these international persons."

The presenter subsequently moved on to discuss the broadest and more abstract landscape created with the blue coloured base pieces. This area metaphorically represented sustainability and their future business plans to become "a bit more colourful and international", as noted in the narrative:

"When we get help from here, we get colourfulness so we will be separated from that grey mass where the other builders are in. We are a bit more colourful and international."
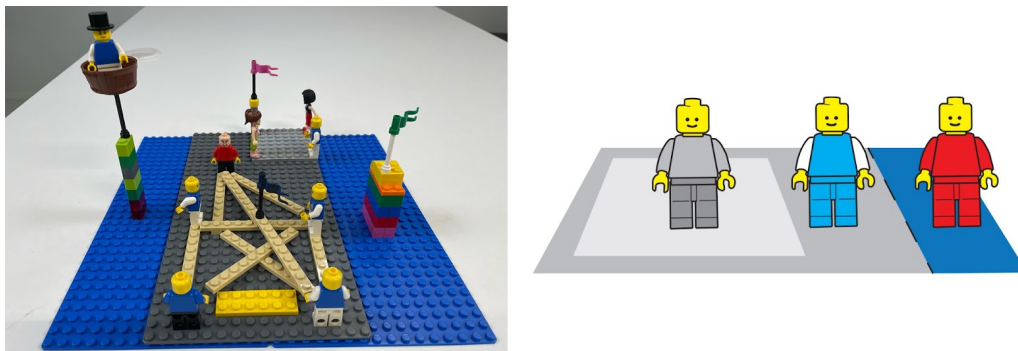
Figure 1. The example shown on the left uses the landscape metaphor to represent various geographic and abstract business environments, which are separated by stacking differently coloured and sized base pieces on top of each other. Human figures show different stakeholders in each environment.

Figure 2 shows another example of a landscape metaphor recreated from the one presented in the meeting recorded in Video 16. The landscape shown in this example presents a centre-peripheral arrangement around a single central

figurehead person – or gatekeeper – needed for a business project to take place. Using this landscape, the presenter created a peripheral metaphor around a central customer in relation to their surrounding base pieces and other material. The presenter described their narrative from the perspective of this central person, who had a problem to solve, saying:

> *"So, we need to find this person, because otherwise, it is sort of, this project does not proceed. We need to see this from that person's perspective, this artificial intelligence and the situation otherwise."*
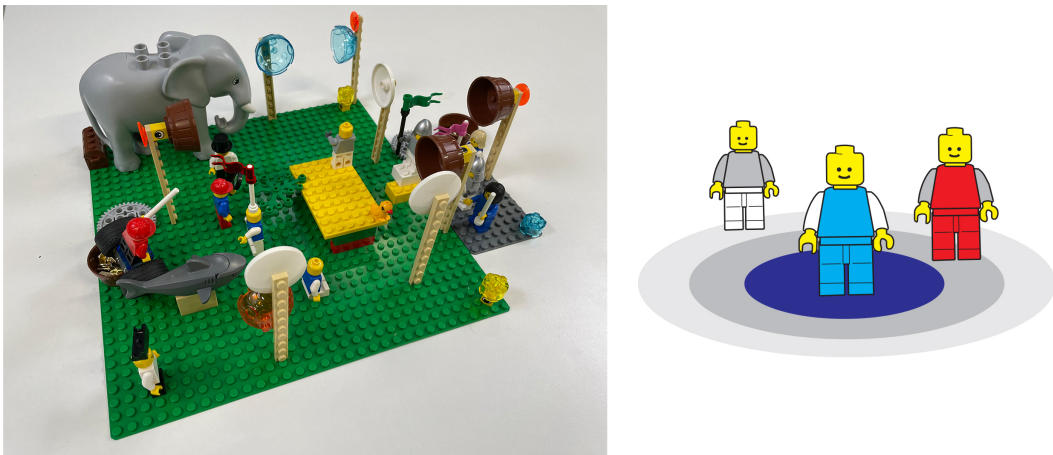
Figure 2: In the example shown on the left, a centre-peripheral landscape metaphor represents the character with a red flag on its head (near the grey shark's head) having a central role.

Discussion and conclusions

The study presented here has focused on the thematic content and narrative patterns of landscape visual metaphors used in collaboration planning group meetings. By adopting the framework proposed by Jung et al. (2017), we have used the *semantic*, *cognitive,* and *material* characteristics of visual metaphors to analyse the collaborative landscape metaphors used in our study meetings.

The *semantic* characteristics relate to seeing different areas made from base LEGO pieces. These pieces are either stacked or joined together to show different business environments, either geographically or in a more abstract sense. The landscape metaphors are sometimes centred around key characters or stakeholders, and the business world is perceived from their perspective.

The *cognitive* characteristic is identifiable in visual schemas of diversion, stacking, centre-periphery, near-far, and big-small schemas connected to LEGO pieces. The *material* characteristics, on the other hand, relate to building base pieces and assigning meanings to them. For example, local or global business collaborations – or more abstract concepts such as future sustainable development

– are represented through the material characteristics of the LEGO pieces, including, for instance, their colour or size.

These findings show that the use of physical artefacts (e.g., LEGO pieces) can facilitate creation and communication of visual metaphors such as landscapes to support collaboration planning in group meetings. While in this poster paper we have only focused on one group of visual metaphors, our analysis is providing promising results in terms of a wide range of other types of visual metaphors. We are planning to continue with our analysis to develop a more comprehensive understanding of the use of visual metaphors in group meetings.

In addition, we are currently planning future studies which will aim to investigate the use of other types of physical artefacts in group meetings to better facilitate the communication of visual metaphors. In these studies, we will also use eye-tracking tools to analyse and understand group meeting dynamics and interactions around physical artefacts used for communicating visual metaphors.

Finally, although our studies have so far been based on co-located group meetings, the ultimate objective of our work is to guide the design of future CSCW environments that facilitate metaphoric communication and interaction around shared workspace across distance using physical artefacts.

Acknowledgements

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Exploring the Ethical Dilemmas of Generative AI in Chinese Cyberspace: A Case Study of the "Cyber 10" Online Community

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Abstract. This study examines grassroots Chinese Internet users' perspective on the ethical implications of generative AI from a sociological standpoint by analyzing opinions expressed in the "Cyber 10 Certification Station" online community on Weibo - a popular Chinese social media platform. "10" is a homophone of "corpse," symbolic of feeding the corpse of artistic work to generative AI systems. Our thematic analysis and content analysis of the best posts of the community reveal several primary concerns surrounding generative AI, including copyright infringement, privacy issues, fake news, utilization in

pornography, and potential threats to creatives' livelihood. This research adds valuable insights into the underrepresented viewpoints of Chinese practitioners and users regarding AI ethics within the CSCW community.

1   Introduction

Generative Artificial Intelligence (AI) models are now widely available to the public and completely revolutionizing the way an image is created, viewed, and shared. While generative AI makes it much quicker and more convenient for companies and individual designers to create sophisticated images, it also comes with ethical trade-offs. In the CSCW community, there has been more and more attention paid to the idea of "ethical AI" (Fleischmann et al., 2019; Robert et al., 2020; Wong et al., 2023) and the vision of "human-centered AI" (Lee et al., 2020; Oppermann et al., 2019; Xu, 2019; Xu et al., 2023). There is also an increasing number of studies that pay attention to the development of AI systems from an HCI perspective (Inkpen et al., 2019; Loi et al., 2019; Xu et al., 2023). Additionally, concerning the automation of creative work with the help of AI, HCI scholars have contributed to proposals of new AI-supported design practices and design guidelines (Gal et al., 2022; Ko et al., 2023; Liu & Chilton, 2022). In the CSCW community there are, however, still few discussions on the ethics of generative AI from a sociological standpoint. Taking a bottom-up approach, this study contributes to the discussions of the ethics of generative AI by accounting for the opinions of grassroots Chinese Internet users whose everyday life and work are drastically transformed by the new technology.

This study uses thematic analysis and content analysis to examine the "Cyber 10 Certification Station" community (赛博十块鉴定所) on Weibo, a popular Chinese social media platform. The community consists of mostly designers, as well as a small number of artists and anime lovers (see Figure 1). This analysis focuses on the collection of "featured posts" (集锦), which a carefully curated assortment of important posts related to generative AI handpicked by the "Cyber 10" account manager and pinned to the top of the community page (see Figure 2). Community members are strongly encouraged to peruse these posts prior to anonymously contributing with new content or comments.

The collection consists of a total of 56 posts, plus comments. A large portion of these posts are republished posts from the "Cyber 10" community. Additionally, there are contributions from well-known creative accounts expressing criticism towards generative AI. These posts have received a significant number of comments, ranging from dozens to hundreds, and considerable engagement in the form of thousands of likes. A few posts have over 10,000 likes. In this study, we analyze all of the 56 posts, plus their comments, which serves as a representative sample of the ideas and opinions of the "Cyber 10" members on the ethical dilemmas of generative AI. This unique dataset offers insight into Chinese

Figure 1. Screenshot of the user interface of the "Cyber 10 Certification Station" account (accessed 23 February, 2024).

practitioners and users on the ground who encounter generative AI on a daily basis but are seldom accounted for in studies of generative AI in HCI.

We ask the following research question: How do the members of the "Cyber 10" community perceive the ethics of generative AI?

2 Background

"Cyber 10" is a Weibo "toilet" (厕所) devoted to the general discussions of the ethics of generative AI. Weibo "toilets" are accounts that receive and publish posts on a certain topic or theme anonymously, but do not publish any of its own content. The account manager is in charge of receiving, anonymizing, and posting received content, but does not express opinions of its own. Against the backdrop of a highly controlled cyberspace (Han, 2018; Yang, 2016), Weibo "toilets" cleverly serve the purpose of anonymity for grassroots Internet users. Specifically, in the case of designers, their open criticism of AI could potentially result in job consequences, which is why they seek refuge and engage in discourse within the "Cyber 10" community. The first group rule of this community declares: "This anonymous group will not disclose any information of the posters, so please do not ask!"

As one of the most popular AI groups on Weibo, the "Cyber 10" community first became active on February 26, 2023. As of February 17, 2024, the group has over 345,000 members, 27,263 posts, and over 1,000,000 reads (see Figure 1). When observed in June 2023, the group claimed to be a "female toilet" in its group rules but did not reject male participants. Since the new group rules published on

Figure 2. Screenshot of the collection of "featured posts" (集锦) (accessed 5 April, 2024).

September 12, 2023, the community became a strictly "female toilet" serving only female users.

The community not only offers a safe space for its members to discuss generative AI, but also share posts and articles that popularize generative AI knowledge, as well as offer tools to designers and creatives to "fight against" generative AI.

3 Methodology

We employ qualitative research methods, including inductive thematic analysis (Braun and Clarke, 2006) and content analysis in this study. Our analysis focuses on the collection of "featured posts" which was published on September 15, 2023, prominently displayed at the top of the community page (see Figure 2). As of February 17, 2024, the post of "featured posts" has received over 1,000 reposts, 128 comments, and 5,162 likes. The collection and all the other posts of the community are accessible to both members and non-members. Our analysis covers all of the 56 "featured posts" and their corresponding comments. Researchers in our team collaboratively examine distinct portions of the collection, ensuring comprehensive analysis of all posts.

To supplement this textual data, a member of the research team has been observing the group since June 2023. Memos were written to document the observatory data and conduct preliminary thematic analysis of the collection. We went through a reiterative process of analysis until all researchers agreed upon the most popular themes of this community based on the collection of the best posts.

We present the results of this preliminary study based on the three most popular themes:

- Criticism of generative AI
- Call to action
- Gendered use of AI

4 Results

4.1 Criticism of generative AI - "Built upon the labor of countless artists, generative AI is essentially a form of exploitation and parasitism."

Copyright infringement and privacy issues. One of the key issues of generative AI identified by the "Cyber 10" members is that the majority of the generative AI tools use artists' work as their training data without the permission of the artists, constituting clear copyright violations. Furthermore, many posts discussed how copyright infringement was frequently accompanied by privacy issues. Numerous commenters expressed the concern that "any content posted on the internet could potentially become part of an (generative AI) database." This raised fears among the members that their previously posted photos on the Internet could potentially lead to dangerous issues such as identity leaks due to the misuse of generative AI.

Authenticity issues such as fake news. Furthermore, we noticed that the authenticity of AI-generated work was fervently debated in the "Cyber 10" community, particularly regarding art and information. For instance, one post stated that, "AI art is not authentic art, since it is without human intention." Many members believed that the misuse of AI in art has led to increasingly stereotyped and generic creative work on the Chinese Internet. Others were concerned that AI will blur the boundaries between real and fake news, as AI makes the creation of misinformation and disinformation increasingly easy.

The problematic use of generative AI in pornography. Another widely criticized negative effect of generative AI in the "Cyber 10" community is its role in producing pornography, leading to the exploitation of women and children. Our observation showed that a large number of the daily posts in the "Cyber 10" community were reports of AI-generated pornographic content from all over the Internet.

Threats to the livelihood of the creatives. Some popular posts also highlighted deeper concerns, namely that the livelihood and creative space of artists and designers are being increasingly squeezed by generative AI. One post observed that the widespread application of generative AI in China has led to the situation where "the work of the creatives is overshadowed by AI-generated content and buried in the vast ocean of content." One commenter said solemnly, "Built upon the labor of countless artists, generative AI is essentially a form of exploitation and parasitism." Many members agonized that if no support was given

to the creatives, the popularization of generative AI would culminate in mass unemployment of creatives and potentially the destruction of the creative industries in China.

4.2 Call to action - "I hope that AI use in our country can be regulated by the EU."

The "Cyber 10" community urges both its members and the Chinese government to take action against the unregulated application of generative AI, especially in the creative industries. For example, one post suggested the community members to "express their hatred (towards generative AI) together" and emphasized that our society "should not try to coexist (with generative AI)." Adding a call to action, the poster proposed, "we have to express our opposition and outrage together." While some commenters concurred with the poster's stance, others challenged the idea that AI could be abandoned. For instance, one member commented: "Although I agree (with the poster), I don't think we can resist AI. It is already a foregone situation. Whether we are willing or not, we can only come up with solutions to coexist with AI."

Apart from personal actions, the "Cyber 10" community also urges the Chinese government to regulate the use of generative AI, as no clear regulations of AI are in place yet in China. Numerous posts and comments attempted to specify the negative impacts resulting from the unregulated application of AI (also see Section 4.1). One featured post informed that "The draft of the EU AI Act has passed by a high vote." The post received 818 likes and 310 reposts. The news attracted a response expressing that "I hope that AI use in our country can be regulated by the EU."

4.3 Gendered use of AI - "This is a crime committed against all women."

The issue of gender has become increasingly prominent in the "Cyber 10" community. Based on our observation, while the group claimed to be a "female toilet" right from when it was launched in February 2023, it initially allowed male designers as long as they did not openly support the problematic use of AI. As the gendered use of AI became an increasingly salient topic in the community, the manager of the "Cyber 10" account responded by turning the "toilet" into a space exclusively for female users. The latest group rules published on September 12, 2023, announced, "get out of this toilet, men."

Many comments and posts in the collection touched upon the issue of generative AI from the gender perspective. One post read,

"Cancer-brothers" ("癌哥" in Chinese, "癌" or cancer is the Chinese homonym of "AI") always talk about AI-generated art as advancement of technology, but what they actually love to do and what they do most is to generate naked photos of women, or create fake pornographic images. This is a crime committed against all women.

"Cancer-brother" is a derogatory nickname the "Cyber 10" members give to men who embrace AI technology. This featured post and other similar ones received an overwhelming number of supportive comments. One of the commenters said sharply, "By getting rid of men, we would resolve 99% of the problems discussed in this toilet." This comment received 12,000 likes. Another commenter stated, "If I see any pornographic photos of women from now on, I will assume it is AI." The fervent discussion of the gendered use of AI inside the community has undoubtedly contributed to the gradual exclusion of male participants from the community, as the discourse of ethical AI and the discourse of gender gradually merged.

5   Discussion

Despite a shared position against AI, there are some noticeable divided opinions and dilemmas within the community. To start with, the community has yet to reach a consensus about whether and how humans can coexist with AI. Some believed that coexisting with AI is impossible. They argued that continuous opposition is necessary to prevent AI from replacing human in creative work. Some disagreed by suggesting that resistance to the popularization of AI is futile. They advocated for finding ways to coexist with AI. Such division highlights the dilemmas brought by the rapid advancement of AI and the ongoing process of human exploration in the face of this new technology.

Moreover, the prevalence of male pronouns in this community marks this "female toilet" with a considerable amount of hatred towards men. AI supporters were mockingly called "cancer-brothers," which reveals the common assumption in this community that AI supporters tend to be men. Moreover, the poster and the commenters used the intimate term "husband" to call each other. This term was used when the posters called the members to action, or when the members expressed their appreciation for the posters' efforts in creating content for the community. This unexpected contradiction reflects a complex gendered discourse surrounding the topic of AI.

These unresolved issues and debates point to the need for a more nuanced understanding of generative AI technology and its societal implications. We plan to conduct in-depth interviews in our future research to further investigate the psychological factors, social factors, and design implications behind these phenomena.

6   Conclusion

In this study, we analyzed the opinions of the members of the "Cyber 10" community on Weibo regarding the ethics of generative AI. Our findings revealed several key ethical concerns. The community urged personal actions and stronger government regulations to address these issues. Overall, our study underscores the

importance of addressing ethical concerns surrounding the use of generative AI in the CSCW community.

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Towards a better quality of life at work: How to collectively define digital communication conventions

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Abstract. The consumption of digital services has increased and has negative effects on the quality of life at work and even on the health of employees. Some solutions, such as charters, have been considered to address these problems and standardize practices. However, these solutions are often rigid and not aligned with work practices. As a result, they are little or not used at all. Faced to these findings, we are interested in studying existing practices of defining digital communication conventions in an organization. This poster presents an ongoing case study within a French national public agency where most of the agents are nomadic workers. We are intended at involving these workers so that they can collectively negotiate conventions and dynamically handle these conventions to make possible an evolution of their work practices.

Introduction

Emails have undoubtedly become part of communication practices. Everyday, a significant amount of emails is sent and received, causing information and communication overload (Whittaker et al., 1997). Employees frequently check their mailbox in order to avoid their saturation (Jackson et al., 2001, 2003; Dabbish and Kraut, 2006) or they have to extend the time spent working (Barley et al., 2011). The frequency of email consultation can cause an increase in psycho-social risks such as stress at work (De la Rupelle et al., 2014; Mark et al., 2012; Renaud et al., 2006), phenomena of overload (Bobillier-Chaumon and Triposelli, 2012; Whittaker and Sidner, 1996), or work intensification (Klein and Ratier, 2012). Apart from quantity problems, emails also present quality problems, such as a lack of details or information (Burgess et al., 2005; Friedman and Currall, 2003). In addition, the content of an email can provoke negative emotions such as stress, irritation, fear, anger or frustration (Gauducheau, 2012) and can convey verbal violence and mediated harassment (Gauducheau, 2012). Uncertainty about communication conventions like the expected response time (Denis and Assadi, 2005) or the absence of formality in messages (Akrich et al., 2001) can finally cause communication problems. Acknowledging these issues, we are interested in understanding how workers use digital tools and services to communicate with their co-workers, managers, and clients, what are the conventions that they put in place or are lacking of, and how could we support them to collectively define and adapt conventions in order to reach for a better quality of life at work.

In this paper, we present an ongoing case study within a French national public agency where most of the agents are nomadic workers (Su and Mark, 2008). Based on observations, interviews, collection of communication traces, and cultural probes, we aim at understanding their current practices in order to design a socio-technical system allowing to collectively elaborate and adapt communication conventions.

The remaining parts first review existing research on digital communication at work, nomadic work, mailbox disconnection, and charters put in place within organizations. Then, we describe our ongoing case study and its expected outcomes.

Related Work

For decades, the consumption of digital services such as shared digital agenda, messaging and enterprise social networks, collaborative platform, or project management systems has increased. Electronic mail in particular quickly became popular for its speed and simplicity in exchanging information (Sproull and Kiesler, 1991).

This possibility for workers to be reachable at any time has beneficial effects for companies. Indeed, the intensity and number of emails exchanged between employees promote performance and productivity : the more employees consult,

receive and respond to emails, the more efficient they are (Mano and Mesch, 2010). However, this accessibility encourages individuals to be reactive to interactions via messages, whether at work or not (Morand et al., 2019).

Originally asynchronous, email is gradually supporting synchronous communication; when new messages arrive in their mailbox, workers often have to interrupt themselves, which can fragment their activity (Denis and Assadi, 2005). Therefore, when an employee sends an email to their colleague, they have to take into consideration their activity and anticipate when they will receive a response. Indeed, if they send an email during working time to ask for help, the employee must anticipate that their colleague will be busy (they must be working on a task). In a way, the activity must appear "transparent". In these situations, awareness plays an important role in supporting individuals understanding what their co-workers are doing and accordingly adjust their own activities (Gutwin and Greenberg, 2002). Being aware becomes complicated when workers work from home, or travel most of their working time (to meet colleagues, superiors on other sites, clients, etc.. . .), or do not have a single head office and are responsible for carrying, managing and reconfiguring their work resources (Mark and Su, 2010).

Being reachable at any time conflicts with the wish of seeking a better work-life balance (Thompson, 2019; Reichenberger, 2018). Various strategies can be applied to limit an excessive use of emails and to disconnect from work. For example, some employees will not take their laptop charger with them to limit working time based on battery life or by simply turning off the work mobile phone (Créno and Cahour, 2016). Even if these strategies can be initiated by employees who wish to preserve their health and quality of life (Felio, 2014; Jauréguiberry, 2006, 2012; Prost and Zouinar, 2013), work organizations are becoming aware of the link between permanent connection and psycho-social risks (Carayol et al., 2013).

Indeed, to tackle the constant connections of their employees, some companies propose initiatives such as charters on how to use electronic messaging (Datchary and Gaglio, 2014). By applying them, these organizations hope to put in place best practices on how to handle digital communication. However, it has been proven that charters are generally not well known by the employees and even poorly followed (Carayol et al., 2013). Moreover, charters are generally rigid and impose communication standards (for example constraints on the days or times for sending emails) whereas communication practices are transforming and evolving. These solutions are then not well appropriated (Jensen, 2018). In addition to charters, technological solutions have been proposed to monitor and control data flows generated by individuals (Barakabitze et al., 2020) or to control the use of electronic mail after working hours via servers or dedicated software (Prost and Zouinar, 2015). Once again, other problems were noticed. First, these solutions are not always compatible with professional practices and their evolution. For example, if a system makes it inaccessible to check an inbox and to send messages after working hours, this can cause problems for employees who would like to process and communicate urgent information. Another limitation is the fact that

the deployment of these technical solutions creates a feeling of control without any real possibility of intervention.

This is the reason why it is essential to involve users in the design of a socio-technical system so that they can collectively negotiate and establish collective conventions, and to make these conventions evolve if necessary (Mark, 1997). Cabitza and Simone (2007) defined conventions as a "shared agreement and related practice that is either established or consolidated by usage". In fact, conventions are respected because it is worth it for everyone involved. By establishing conventions, an organization can come to an agreement on how to handle digital communication. Mark and Prinz (1997) identified sources of difficulties in establishing conventions as the lack of feedback (social and visual information) when people are at a distance. Additionally, establishing conventions may impact existing practices, and individuals may be reluctant to adjust their practices to suit those defined collectively.

Taking inspiration from this existing work, we are interested in better understanding the current ways in which workers deal with the use of digital communication systems to articulate their work, and how to support the emergence, definition and evolution of collective conventions on this use in order to improve their quality of life at work.

Case Study

We have partnered with a French public agency dedicated to accompanying companies (mainly very small businesses and small and medium-sized businesses) in improving the quality of life and working conditions of their employees. The agency is organized with a head office in Lyon gathering all the supporting functions (human resources, finances, information system. . .), and regional subsidiaries, each of them having a director managing a team of project managers who intervene within their "clients" offices. These interventions can consist of training sessions, and deployment of systems and/or methods to improve working conditions. The main expertise areas of the regional agencies are : home office (eligibility and negotiation criteria, workplaces and spaces, digital equipment and tools, organization of time and workload, etc.), psycho-social risks (stress, burn-out, etc.), gender equality, prevention management, seniors' employment (promote the sustainable employment of young people, retention in employment or recruitment of seniors and the transmission of skills and know-how).

Data collection

Our data collection for the Ile-de-France agency is organized as follows: we have started with six semi-structured interviews lasting one hour with project managers and the director to understand their profile (their background, training, seniority in the network, on which topics they work), their activities and work practices. We conducted interviews either in person within their agency or by video-conference.

All interviews were recorded and transcribed. We then conducted a thematic analysis, for the moment based on the themes discussed during the interviews.

Project managers explained how they are contacted by the organizations with whom they work, what are the usual requests they face and how they respond to them. They explained the different moments when they exchange with their colleagues and their clients, and the modality of these exchanges. They also presented their different workplaces (such as home or co-working spaces) and their travel arrangements. By doing so, we got an understanding of the organization of their working days and the different artefacts they use to communicate and coordinate their work. In particular, they presented the way they manage their emails: when they consult them, how often, how they respond, and the strategies they use for their management.

Secondary data

This research is conducted as part of a larger research intervention in France, with colleagues from Toulouse who are working with the "Occitanie" (South-West of France) agency. We then have access to the data they have collected, which constitutes secondary data which nourishes our analysis since it is the same organization with the same type of workers but in a different region. The only differences lie in territorial and economic attractiveness, politics and regional issues. The data shared consists of interviews, observations, feedback from design workshops, photos of work environment layout (teleworking). This data will allow us to compare and cross-reference our results on the working practices of employees, what are the similarities or differences in their working practices, communication, travel, etc... Do they use the same strategies or artefacts?

Preliminary results

The regional subsidiary (based in Ile-de-France, Paris) in which we are conducting our study comprises a newly arrived (9 months ago) director, a deputy director (who is also a project manager), a management manager, nine project managers (among which three are newcomers), and a person in charge of communication. An interesting characteristic of this agency is that the director is looking for physical offices, as they are currently renting some rooms in a co-working building in the center of Paris. In addition, there are not enough offices or space to accommodate everyone (whether for agency workers or for invited guests). Partly due to this situation, most of the project managers are nomadic workers, working from their home, the shared offices, from their clients' office, and travelling between these different places. They use a constellation of artefacts to organize and conduct their work and to articulate with their colleagues and clients. Some of these artefacts are officially supported by the headquarters, and others are put in place by the project managers themselves. There is no charter (either defined by the headquarter or locally) defining best practices in terms of digital mediation of

work. Indeed, employees do not get any guidance on how to use digital services at work nor how to communicate online.

During the interviews, two digital technologies were particularly mentioned: the project management system and the diverse communication systems. The participants mentioned constraints when using these systems and characterized their use as a poor appropriation due to a gap between the features and their work practices. From the management point of view, these systems are intended to foster cooperation among the different members of the agency but unfortunately, the workers feel that they are only used for reporting their activity. Some workers reported that they did not know where to share documents, or how to name files. Therefore, workers expressed their difficulties in finding resources and coordinating their activities within the team. For instance, they mentioned the risk for two persons to work on the same document at the same time without managing versions. Various strategies or tactics are put in place to overcome these issues.

First, they use an alternative platform for sharing and collaboratively writing documents, and finally store the result on the "official" document management system of the agency. Furthermore, they have defined some codes or rules for exchanges and communication, that remain superficial: in order to avoid overloading mailboxes and snowballing effects, all workers agree to not respond to emails to simply thank the sender. However, one person found it important to do it once in a face-to-face meeting for simple courtesy and good manners. This raises the issue on how to transpose the rules of good manners and respect that we follow during our face-to-face interactions into written digital communication without overloading mailboxes or disturbing colleagues in their work. Finally, participants expressed their interest in discussing, negotiating, and establishing communication conventions in order to avoid communication and information overload.

We also collected data about the different communication modalities that exist in the team and the channels that are used. When she arrived in the agency, the new director established face-to-face meetings once every two weeks for analyzing requests sent by organizations. Her intention was to establish a work collective and create links between workers who are often required to travel and work remotely. The agency members are favorable to this practice since it also allows them to anticipate and organize their work by interacting simultaneously with several of their colleagues. In addition, being present for meetings allows workers to get informal, so-called hallway information, which they would not get otherwise. This information can be valuable and interesting for their missions. We will go one investigating the different ways workers get information, when being physically in the office or remotely, and how does it influence the articulation of their work. Although most of the workers come in person for meetings, it still happens that some cannot come. In that case, hybrid meetings are established. However, most of the workers told us that they did not like these hybrid form because remote people may be forgotten or not being listened enough, and in-person people may converse and not discuss the purpose of the meeting. We will investigate this

modality, as, in a way, its limits and disadvantages are partly due to the lack of communication conventions.

Additionally, participants explained the strategies they have put in place to manage emails and interactions within the team and with their "clients'" organizations. For example, workers tend to use the instant messaging feature of their email system for discussions when persistence is not important. The "subject" field of emails was also raised. Indeed, at some point, when several responses have been sent, the topic of the message may have evolved, which is not reflected in the "subject". Therefore, this poses problems when people want to find information by looking at emails subject lines. One person also told us that she has now decided to send one email per topic.

Generally speaking, workers check their emails throughout the day, but they all said that they always start and end their work day by checking their mailbox to make sure that they have not miss any important information or any emergency that would have to deal with. Some workers even schedule the sending of their emails to not show when they have looked at and written their email. We will further explore the balance and boundaries between their personal and professional life. Indeed, even if they check and process their emails outside of their work time, the members of the agency do not perceive their work as being invasive in their lives. One of them told us that once she finishes work and is at home, her professional cell phone is in airplane mode. Therefore, she cannot be bothered by work. But she also said that her colleagues or superiors know her private phone number and can call her if there is any particular issue.

Apart from working from home, the members of the agency are required to travel frequently to meet their clients. They told us the equipment they take with them when they travel and how they reconfigure their work resources. Several of them argued why they could or could not work on public transport such as trains. Other clearly told us that their backpack is their office even if they raised limits and points of vigilance (confidentiality, comfort, risk of theft, etc.). Their clearly confirmed that they can be characterized as nomadic workers.

Ongoing data collection

We are currently planning to observe the group during meetings when most of the workers will be in the office space which will allow us to understand how they collectively analyze requests from organizations and how they distribute missions. In fact, these requests come from different ways: from the head office, from project managers and from the website. Sometimes, they have to send requests back to the head office because they do not correspond to a regional request but to a national one. So, after treating and analyzing requests, they work in pairs (one experienced and one less).

After observing the meetings, we will are planning to follow some of the agency members and the director during their working day. Through these observations, we intend to get a deeper knowledge on their work practices, how do they manage their

different communication channels, and the number of time they are interrupted in their activities, and how do they articulate their tasks.

These observations will complete the declarative information collected during interviews and will allow us to cross-reference the perceptions they have of their practices and their workload, with the situations we will observe.

As we will not be able to shadow the workers when they will be at their clients' office, or when travelling, these observations will be completed by the distribution of cultural probes (Gaver et al., 1999) for several weeks. The two probes we are planning to offer are a diary in which participants will be able to describe striking elements of their practices, and a clock in which they will indicate how their working days are organized, coloring the different periods of the clock according to the type of activity, and using stamping pads with smileys to indicate their level of quality of life. With these probes, we are aiming both at collecting data and offering a way for employees to reflect on their practices. Semi-structured interviews will be conducted again to clarify some of the things we have observed, and to discuss the collected probes, that should help us to trigger discussions on particular situations.

Finally, the emails received, read, and responded also constitute data that we wish to collect. We have therefore asked to get access to sets of emails and other communication exchanges that seem relevant or interesting to analyze. Here, it is not a question of looking at and interfering in their work, but to understand the elements that lead to an exchange by email.

At the end of this data collection and analysis phase, we will organize two participatory design workshops. The first one is intended to support the employees in collectively identifying everyone's issues and expectations and to start defining conventions. As mentioned above, we are planning to offer the participants a sociotechnical solution so that they could be autonomous in defining their conventions and making them evolve. This is why we are aiming to support them in defining both face-to-face moments and a collaborative system to support their decisions and their on-going adaptation of the defined conventions. At the end of the first workshop, we will then be able to design the digital solution for these debates.

In the second workshop, approximately 4 to 5 months later, the first version of the designed collaborative system will be presented and discussed, in order for all the participants to bring new elements. The results of the second workshop will be integrated into the collaborative system and we will then follow its deployment into the agency for 6 months.

This case study will contribute to providing new elements on the organization and working practices of nomadic workers and how they use digital communication to articulate their activity. The design and introduction of a sociotechnical system within a work collective will allow us to understand what happens when communication practices are collectively negotiated. Finally, our work will provide new concepts on digital communication conventions as part of improving the quality of life at work.

Conclusion

Digital communication at work can negatively affect the organization, social life and health of employees. Charters have been offered to resolve these problems but they seem to not consider the realities and working practices of employees. In this poster, we present our ongoing research study that will offer a practice-centered design of a sociotechnical solution to collectively define communication conventions and improve the quality of life at work.

Acknowledgments

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The Overlook of Maintenance Practices in the Digitalization of Railway Maintenance Records

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Abstract. We present an ethnographic study of railway maintenance work, with a focus on digitalized maintenance records. This on-going research is taking place in a small private railway maintenance company in the south of France for two years. We describe the integration of maintenance records in a wide material environment, and the evolution from filling in these records on paper to smartphones. This research brings some nuance on the beneficial effects of the 'digital transformation' in this industry, and shows how the workers compensate for the overlook of their practices in the design of the digital records.

Introduction

Railway maintenance records allow the gathering of information on the status of the infrastructure, which is central for maintenance work. The digitalization of these formerly paper-based records is an on-going process in France, with software companies offering systems that can be used both on personal computer (in offices) and on smartphones (on the field of work). This research focuses on this transition, and its impact on the collective work done by technicians. We have in particular

discovered that maintenance practices have been overlooked, and by then socio-material constraints of the workers have not be taken into account.

This work is part of a large project funded by the French Public Bank for Innovation, piloted by Vossloh, a leading global rail technology company that sells integrated offers for rail transportation including for instance track fastening systems, concrete ties, switch systems, crossings, so as services associated with the lifecycle of rail tracks. The aim of this major 4-year project is to bring together players in the rail and safety industries and researchers to develop a new-generation, secure remote monitoring system dedicated to rail infrastructures, using a range of devices: Innovative sensors, new-generation concentrators dedicated to local data collection and transmission, a centralized data acquisition system with real-time data processing and analysis, modular user interfaces with key indicators based on usage, maintenance prediction and alarms, and an operator support system for the maintenance on the field.

Our research contributes to this last action and aims at ensuring a practice-centered development of the technology that will be offered to the workers in charge of the maintenance. In this respect, it resonates with questions raised by CSCW researchers about the links between ethnography and design (Blomberg and Karasti, 2013). We have introduced in the project the idea of working with technology probes (Hutchinson et al., 2003 ; Hemmings et al., 2002), as this research and design method "combines the social science goal of gathering information about the use and users of technology in a real-world setting, the engineering goal of field-testing the technology, and the design goal of inspiring users and designers to think about new kinds of technology to support their needs and desires" (Hutchinson et al., 2003, p. 18).

In the remaining parts of this paper, we position our work in the literature, present our case study, followed by our preliminary results, before concluding.

Related Work

The question of technical supports for action in the very specific work environment of the maintenance site remains relatively unexplored both in Sociology of work and in CSCW. There is a whole body of knowledge from Science and Technology Studies interested in the question of maintenance and repair (Graham and Thrift, 2007; Orr, 2016; Denis and al., 2016), which in turn stems from reflections on the infrastructures (Star, 2016) that characterize this activity as such. The main thrust of this literature is to move away from the paradigm of innovation and to be interested in every action that allows things to last and contributes to the ordering of the world. However, this body of works shows very little interest in railway maintenance workers as a professional group with its own resources, skills and organizational constraints.

In order to address the question of artifacts which is central in our work and also to the concerns of CSCW, we mobilize the "ecology of artifacts" concept (Bødker and Klokmose, 2012; Lyle et al., 2020), sometimes referred to as a constellation of technologies (Rosito and al., 2014) or digital assemblages (Sawyer et al. 2014). These concepts are particularly useful for understanding work activity as it happens and for grasping the situated nature of the use of artefacts at work, describing in precise terms the places, temporalities and resources of action. In addition, these concepts offer a dynamic vision of digital tools and their appropriation by workers that can evolve.

Moreover, since its first ethnographic works, CSCW researchers have always been interested in the question of the use of paper and the issues raised by the transition from paper to digital (Schmidt and Bannon, 2013; Ciolfi et al., 2023), with the well-known case of paper flight strips (MacKay, 1999). We can also mention the research in Management Science that examines, from a socio-historical standpoint, the evolution of the coordinative practices of tramway maintenance workers, especially with regard to changes in managerial and organizational processes (Arena and Relieu, 2022). In French sociology of work, two authors have taken an interest in maintenance records, offering an ethnographic study of a department of the French metro company RATP, that explores the "role of the production and circulation of maintenance records as a written aspect of the collective re-ordering process" (Denis and Pontille, 2014, p. 83). Our study extends this work by looking at digitalized records.

Case Study

This case study takes place in a small (around fifty employees) French private railway maintenance company, which was created less than ten years ago. This organization is considered as "innovative" in the railway domain because both the railway infrastructure is recent and the organization is equipped with relatively new maintenance machines (with several inspection wagons) and surveillance technologies (notably in remote monitoring systems and sensors).

This research is based on a set of ethnographic data collected by the first author in the framework of their sociology thesis. The main material comes from in situ observations of maintenance interventions for about eighty hours. It was possible to take numerous notes on a smartphone during the interventions, which mainly took place during the night.

Semi-structured interviews were also conducted; 8 in 2023 and 14 in march 2024: 12 with maintenance technicians, 5 with maintenance workers in a coordination center and 5 with middle management. Three main themes were discussed during the interviews: socioprofessionnal trajectories, work activities and working conditions, and the different ways employees use digital technologies. When possible, the questions were related to on-site situations observed

beforehand, in order to go beyond generic discussions on the supposed benefits or problems offered by digital technologies.

Findings

During our observations, we first realized that there is nothing obvious about the beneficial effects of the 'digital transformation' of maintenance records. Indeed, filling in an online record requires a special effort in a physically restrictive environment exposed to changing weather situations (rain, luminosity…) and where on-site mobility is required. In fact, digital technology plays a marginal role compared to the other tools and technical aids on site. Indeed, there is already a constellation of tools to carry, such as toolboxes, ruler tools or adjustable wrenches, in addition to personal protective equipment (figure 1). Technicians also often have to adopt restrictive positions when they use these tools (figure 2). Paper has not completely disappeared either.

Figure 1. Two pictures depicting non-digital maintenance tools.
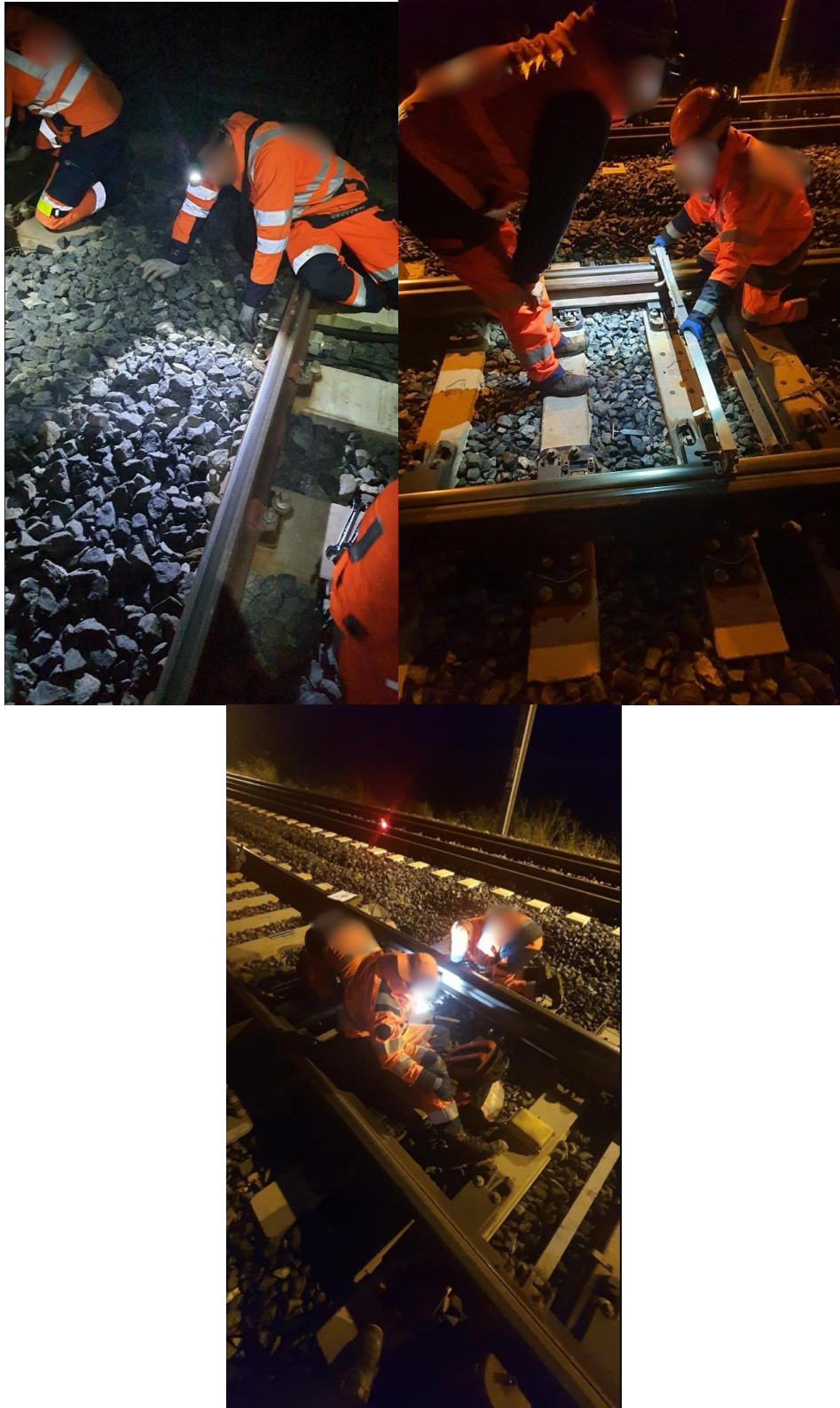
Figure 2. Three pictures of maintenance postures and material environment.

The introduction of a smartphone in the existing ecology of artifacts also gives rise to critical forms of appropriation, cooperation and circumvention by the technicians, which main issue is to save time.

The problems with the digitalized records raised by the technicians and observed on site can be summed up in three main categories: the loss of time due to loading duration of the application; the loss of autonomy (compared to paper) in the way to enter data in the records, with an imposed vertical scrolling; the lack of integration with the existing information system. In order to keep on doing their job properly, workers have then to bypass the application, for instance by taking pictures of the damaged infrastructure or of the measures written on it; or by taking notes on their smartphones (figure 3) or, ironically, on small sheets of paper to fill in the records after the work is done.

Figure 3. Note taking outside of the maintenance records system.

These examples illustrate that the system that has been bought and configured by the company to replace the paper-based maintenance record is overlooking the practices of the technicians. Therefore, instead of being supported to coordinate their work and share information, technicians have to find workarounds to go on doing their work properly.

Conclusion

Our contribution is two-fold. First, we offer a recent ethnographic study that gives insight into maintenance work on a French railway site. Then, we situate the use of digital records in an already highly equipped technical environment, illustrating the complexity of this digital transformation that seems to have been overlooked by the railway company

Our preliminary results will be completed thanks to new observations and interviews and the introduction of two technology probes, one aiming at identifying how to offer an easy access to documentation while being involved in a maintenance task on site, and the second one focusing on facilitating the escalation of critical problems on the infrastructure.

Acknowledgments

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The practice-centered research program in CSCW

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The practice-centered research program in CSCW

As a research area, CSCW was formed in response to the early development and use of collaboration technologies, as researchers from different disciplines and in different practical domains began to try to understand the potentials and issues of these new technologies. Accordingly, CSCW was from the outset a rather heterogeneous research area, spanning not only computer science and social science but also a manifold of distinctly different research paradigms. In important ways, CSCW is still characterized by such heterogeneity, not least because the challenges emerging from new collaborative technologies give rise to new potentials and issues, but also because collaborative technologies become applied in new work domains and use contexts. At the same time, however, in the midst of this persistent heterogeneity, a research program has been articulated and developed that attempts to build, from the bottom up, a conceptual framework for our understand of the design and use of collaboration technologies in actual work practices.

Based on an initial overview of the emergence and history of the CSCW research areas, the master class will focus on outlining the practice-centered research program in CSCW:

1. *The unit of analysis of CSCW research*: coordinative practices and artifacts.
2. *The key challenge CSCW research*: The problematic nature of collaborative technology: constructing and embeddng models of social relations in computational artifacts.
3. *The analytic axis of CSCW research*: The notion of 'plans and situated action' or 'theory and practice'.

Format

The master class will be in the form of a lecture with discussion, half day session. Maximum 25 participants. Equipment requirements: A working projector

Recommended reading

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Bio

Kjeld Schmidt is Professor Emeritus of Work, Organization, and Technology at Copenhagen Business School, Denmark, and Senior Professor at the University of Siegen, Germany.

Initially a software programmer (1965-72), Schmidt studied sociology at the University of Copenhagen, Denmark, and obtained his MSc degree in sociology from the University of Lund, Sweden, in 1974.

Schmidt has been involved in the research area of Computer-Supported Cooperative Work (CSCW) since the 1980s. Bridging from philosophy to sociology to computer science and encompassing ethnographic studies, conceptual analysis, and development of demonstrator prototypes, his research primarily has centered on the conceptual foundations of CSCW research. He is the author of *Cooperative Work and Coordinative Practices* (Springer 2011). Altogether, he has published a large number of scholarly books and articles in English and Danish. At the same time, he has been Editor-in-Chief of the international journal *Computer Supported Cooperative Work (CSCW)* since its launch in 1992 and has been involved in organizing a large number of CSCW conferences.

Schmidt was awarded the honorary title of *dr.scient.soc.* in 2007, and in 2013 he received the EUSSET-IISI Life Time Achievement Award.

Beyond Charts & Graphs: creating Data Visualizations to enhance knowledge

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Abstract. In an era characterized by a continual increase in the volume of information and data from diverse sources and presented in various formats, the challenge of effectively representing them and enabling users to derive meaningful insights becomes relevant. This underscores the growing significance of Data Visualization, defined as the systematic representation of data to convey information clearly and impactfully, leveraging human cognitive abilities. The objective is to create a valuable decision-making tool, spotlighting patterns or anomalies within the data. Moreover, Data Visualization enhances data processing in the human brain more efficiently than textual information, fostering comprehension of heterogeneous and large data sets, improving collaboration, and providing an adept ad-hoc data analysis tool.

This masterclass aims to empower participants with the skills and insights necessary for creating visualization. Focusing on the principles of data visualization, participants will explore diverse techniques to transform information into data representations, combining theoretical lessons with hands-on group activities.

The theoretical sessions cover the fundamentals, techniques, and best practices in data visualization, allowing participants to gain a solid understanding of the field. Complementing the theoretical aspect, practical group activities offer participants the chance to apply learned concepts in real-world scenarios and foster teamwork.

Contextualisation

In an era characterized by a continual increase in the volume of information and data emanating from diverse sources and presented in various formats, the challenge of effectively representing this vast data pool and enabling users to derive meaningful insights becomes relevant. Consequently, the relevance of Data Visualization has grown, defined as the systematic representation of data to convey extracted information in a clear and impactful manner, harnessing human cognitive abilities. The ultimate objective is to develop a valuable tool that aids the decision-making process, highlighting patterns or anomalies inherent in the data (Chen, 2017; Fernandez and Fetais, 2017; Wang et al., 2015).

Furthermore, Data Visualization facilitates the human brain in processing data faster and more effectively than simple textual information, increasing the ability to understand and process heterogeneous and large data sets (Chen, 2017), improving collaboration in an information-sharing scenario and providing a better ad-hoc data analysis tool (Wang et al., 2015).

Moreover, data visualization is often investigated in CSCW contexts to enhance collaboration by analyzing the effect of shared visualization Balakrishnan et al. (2010), make sense of data Beeferman and Gillani (2023), support target users Yoo et al. (2023), or facilitate the exploration of data Liao et al. (2023) in order also to enhance knowledge.

To derive maximum benefit from Data Visualization, different techniques are employed to represent and interact with the data, contingent upon the type of data under analysis. Understanding which techniques are the most efficient to enhance user comprehension of the represented information is crucial.

Data representation techniques and interaction methods are widely studied to understand the relationship between the type of data analyzed and their visual representation and to improve the user experience (Fernandez and Fetais, 2017; Schotter et al., 2018; Figueiras, 2015; Kosara, 2016).

However, it's not always enough to simply present the data - sometimes, users need to be able to interpret it for themselves in order to gain deeper insights and understanding. That's why this type of visualization is designed not only to convey the designer's message but also to allow the final users the freedom to explore and extract knowledge based on their own unique perspectives and experiences (Cairo, 2016). For this reason, it is crucial to recognize and admit the aspects of charts that may mislead users and take steps to prevent them. In literature, studies like Cairo (2016) and Pandey et al. (2015) aimed at pinpointing the misleading elements so that designers and users can become more conscious of them.

Often, data visualizations, especially if interactive, are designed by a multidisciplinary team with different skills (e.g., designers, computer scientists, and domain experts) that collaborate to enhance the knowledge of the target users. To do so, it is necessary to have the basis of data visualization and understand the best techniques and how to involve other users in the creation of these graphs.

Goals and Activities

The program is designed to empower the participants with the skills and insights needed to effectively communicate and collaborate through data. Participants will understand the principles of data visualization, exploring various techniques to translate complex information into visually compelling data visualizations. The course equips learners with the skills and knowledge to create impactful visualizations that foster awareness and decision-making processes. This masterclass is designed to be a comprehensive and engaging learning experience that will combine theoretical lessons with hands-on group activities.

During the theoretical lessons, participants will have the opportunity to learn the basics, techniques, and best practices in the data visualization field. The interactive sessions will allow attendees to ask questions, share their insights, and engage in discussions with their peers.

In addition to the theoretical part, the masterclass will also feature practical group activities, allowing participants to apply the concepts learned in real-world scenarios. These activities will be collaborative to encourage teamwork and problem-solving skills, providing attendees with a valuable opportunity to learn from each other.

Format and schedule

The masterclass will take place in person and span half a day, including theoretical lessons and practical group activities.

Outline:
- Welcome & introduction
- Fundamentals of Data Visualization
- Fundamentals of Collaborative Design Processes
- Practical activity on paper
- Introduction to some Interactive Visualization Tools
- Practical activity on laptop
- Some Ethical Considerations
- Wrap up

Target group

This Masterclass is designed for all students: master students, as well as PhD students, who would like to learn more about using visualization and visual tools in scientific or professional contexts.

To give all participants enough time during the interactive discussions and practical activities, a maximum of 15 participants will be admitted.

Required Resources

In terms of infrastructure, a room capable of accommodating the maximum number of participants, provided with a projector will be sufficient. If feasible, it would be beneficial to provide papers to the participants (approximately 2/3 for each) along with colored pencils for the practical activity session. Participants will be required to bring a laptop (no software installation is required).

Organiser's short bio

Chiara Ceccarini is a junior assistant professor at the Department of Computer Science and Engineering, University of Bologna (Italy), where she is currently teaching Web Systems Engineering and virtualized systems. Her research focuses on developing a methodology for designing interactive data visualization tools aimed at promoting and raising awareness among specific communities on issues of public relevance and interest, such as sustainability and the 17 Sustainable Development Goals (SDGs) identified by the United Nations. In particular, she investigated several case studies such as (1) Human-Building Interaction and the saving of energy resources and dematerialization, (2) sustainable tourism exploiting the concept of smart tourism for the creation of authentic connections between tourists and locals, and (3) Machine Learning for Data Visualization (ML4Viz) for the analysis of employee or former employee reviews related to the work environment which should reflect the values of the employee. However, she is also currently exploring alternative methods of data representation that extend beyond visual perception, delving into auditory or tactile modalities such as sonification and physicalization.

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Implementing Electronic Health Records – Objectives, Obstacles, Outcomes

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Abstract. Electronic health records (EHRs) support healthcare professionals in their treatment of patients by providing the means to order, document, and follow up on the steps taken to care for each patient. To fulfil this function, EHRs are complex systems with numerous features and associated work processes. As a result, the implementation of EHRs in healthcare institutions is a major undertaking, which has received sustained attention in computer-supported cooperative work (CSCW) and other research fields. This workshop aims to provide a forum for participants to get updated on current CSCW studies of EHR implementations and create connections with a select group of researchers who study EHR implementations from a CSCW perspective. Within the overall theme of implementing EHRs, the workshop specifically focuses on the objectives, obstacles, and outcomes of such implementations. The key activities at the workshop will be presentation of the participants' position papers and thematic group discussion.

Introduction

The use of information technology for supporting the coordination, documentation, and safe conduct of healthcare work has received sustained attention in computer-supported cooperative work (CSCW) research (Fitzpatrick and Ellingsen, 2012). This long-term attention continues in studies of the many recent and ongoing implementations of electronic health records (EHRs), which are the healthcare sector's equivalent of large-scale enterprise resource planning systems (e.g., Bossen and Piras, 2020). While this research has a strong footing in CSCW, it extends into health informatics, human-computer interaction, information systems, and other fields. A bewildering array of new studies appears every year; it is difficult to stay up to date. This workshop is the second in a series that started at the previous ECSCW conference (Hertzum et al., 2023). The workshop provides a forum for getting updated on current studies and creating connections with other CSCW researchers who study EHR implementation.

EHR implementation and use

The overarching objective of EHRs is to support patient treatment by providing healthcare professionals with the means to order, document, and follow up on the steps taken to care for each patient. This overarching objective entails a number of more specific objectives, such as avoiding medication errors (Bates, 2000), improving interprofessional communication (Winman and Rystedt, 2012), reducing data fragmentation (Bansler et al., 2011), and increasing the reuse of EHR data for statistical and research purposes (Pine et al., 2016). In many EHR implementations, the objectives are stated in an atmosphere of high expectations. While this atmosphere helps create momentum, the expectations sometimes result in promises about outcomes that appear very optimistic. For example, the CIO of one of the two healthcare regions in a recent Danish EHR implementation stated during the preparations for go-live (Hertzum et al., 2022):

> We are lowering our cost, we are getting better quality, we are getting better patient satisfaction, and we are getting better processes and so forth. It is a win-win all round […] There is absolutely no reason not to move in this direction.

Large-scale EHR suites, such as those supplied by CERNER and EPIC, integrate still more intra-organization information into one database and also increasingly support interorganizational workflows (Winblad et al., 2011). However, the increased information sharing among healthcare professionals is also realized through smaller projects that employ bottom-up and user-driven processes. In these smaller projects, EHRs and EHR extensions enter use through processes of gradual enrolment rather than mandated adoption (Aanestad and Jensen, 2011; Dæhlen and Grisot, 2021).

While the objectives may dominate during the processes of project chartering and implementation preparations, obstacles often take center stage when EHRs go live and start having consequences for clinical work and patient treatment. Because EHR implementation is a complex endeavor, only some of the consequences of the EHR outputs can be planned ahead; the rest emerges in use and will likely include both positive and negative surprises. These surprises have led to a discourse about the last mile of EHR implementation (Cabitza et al., 2020; Coiera, 2019). This discourse highlights the obstacles that delay, redirect, or discontinue EHR implementations. Sometimes systems are rejected by the intended user group and, instead, adopted by another user group for related, but different, purposes. For example, Aarts and Berg (2006) found that a computerized physician order entry (CPOE) system was rejected by the physicians but adopted by the nurses, who saw it as an opportunity to document nursing care. On other occasions, the implementation efforts involve multiple innovation tactics to create conditions conducive for adoption, yet adoption remains unattained (Gyldenkærne et al., 2024). The obstacles that cause the delays, redirections, and discontinuations include slow and unintuitive user interfaces (Aarts and Berg, 2006), mismatches between the EHR and the work processes it is intended to support (van den Hooff and Hafkamp, 2017), errors in the interfaces for integrating the EHR with other health information systems (Viitanen et al., 2011), and concern among the users that, once implemented, the EHR will be a 'huge colossus' that is difficult to adapt to clinical needs, which evolve continuously (Ellingsen et al., 2022). Among the underlying reasons for these issues, researchers point to ineffective user participation in the many decisions that precede go-live (Zahlsen et al., 2023) and insufficient understanding of user practices among IT staff (Eikey et al., 2015).

Despite the obstacles, the use of EHRs is associated with several positive outcomes. For example, the 1727 physicians surveyed by King et al. (2014) found that EHR use enhanced patient care overall (78% of respondents), alerted them to potential medication errors (65%), and notified them of critical lab values (62%). In addition, 30-50% of the surveyed physicians reported that EHR use had benefits related to providing recommended care, ordering appropriate tests, and facilitating patient communication. Relatedly, Rotenstein et al. (2022) surveyed 291 primary care physicians about their EHR use and found that each additional 15 minutes of daily EHR use was associated with significant increases in the quality measures of hemoglobin A1c control, hypertension control, and breast cancer screening rates. However, these positive outcomes are tempered by findings that EHRs obstruct the building of a coherent patient history (Varpio et al., 2015), necessitate workarounds to coordinate clinical workflows (Mörike et al., 2024), and lead to increased documentation burden (Baumann et al., 2018). In some cases, the increased documentation burden has led to burnout or even to physicians who hate their computers (Gawande, 2018). These unintended outcomes show that the consequences of EHRs become salient to clinicians after the EHRs have entered

daily use and after decisions about their design and planned use have been made (Wagner and Newell, 2007). However, the unintended outcomes also show the need for continuing implementation activities during use. These continued implementation activities are needed to mitigate negative effects and to realize benefits that have not yet materialized but still appear attainable. In these implementation activities, it is important to avoid using new EHRs to mimic old ways of working but rather to exploit the opportunities for creating better clinical practices (Islind et al., 2019).

Aim

In continuation of the workshop at ECSCW2023, this workshop aims to provide a forum for participants to get updated on current CSCW studies of EHR implementation and create connections with a select group of CSCW researchers who study such implementations. Three additional aims supplement this primary aim. By bringing the workshop participants together, we hope that cross-fertilization will ensue among their focal questions, their conceptual frameworks, and their empirical cases. Second, we will collaboratively reflect on what CSCW contributes to the study of EHR implementation and how we, as individuals and a community, can facilitate the transfer of these contributions to practice. Third, we will discuss the interest in further networking initiatives about investigating EHR implementation from a CSCW perspective; the possibilities include a third workshop at the next ECSCW conference.

Workshop themes

The workshop is about the objectives, obstacles, and outcomes of implementing EHRs. Within this overall topic, the workshop themes include, but are not limited to, the following:

- Case analyses of EHR implementations at different stages of completion – from vendor selection, through configuration and training, to design-in-use
- Conceptual pieces that propose models or frameworks for understanding EHR implementation and begin to apply, refine, and validate them
- Discussions that expound critical features of EHR implementation, such as increased documentation burden, reduced data fragmentation, and so forth
- Studies of the many stakeholder groups that are affected by EHRs and of the conditions for these groups to make their voices heard in EHR projects
- Methodological reflections on how to conduct studies, manage research data, and behave ethically amid clinicians, patients, and EHR vendors

- Comparative studies that call attention to how situated practices determine EHR outcomes across the modules, groups, or sites in an implementation

Participant recruitment and selection

The workshop can accommodate a maximum of ten participants (in addition to the organizers). Participants will be recruited from the CSCW, health informatics, human-computer interaction, and information systems communities. The organizers will reach out to these communities through their extended research networks and by circulating a call for participation on relevant mailing lists, such as EUSSET. Detailed information about the workshop will be made available at our workshop website.

Participation in the workshop requires the submission of a position paper. We encourage potential participants to explain their interest in the workshop and particularly welcome position papers that address one (or more) of the workshop themes outlined above. Position papers are limited to a maximum of six pages (excluding references) in the ECSCW paper format.

The submitted position papers will be reviewed by the organizers on the basis of the relevance and development of their content. If the number of people interested in attending the workshop exceeds its capacity, the organizers will prioritize submissions that make for rich presentations and discussions, while also seeking diversity among the participants. We encourage both junior and senior researchers to submit position papers. To promote participation from practitioners, we also offer the option of submitting alternative material of rough equivalence to a position paper (e.g., an experience report or abridged implementation plan).

Workshop activities

The workshop is a half-day, on-site event. Online participation will not be possible. The agenda will involve four activities:
- *Introductions*. The organizers introduce the aim and agenda of the workshop. Participants introduce themselves and their interest in EHR implementation.
- *Paper presentations*. All participants present their position paper, followed by discussion. The discussion is key and should provide for cross-presentation issues to emerge. The organizers have a special responsibility for drawing attention to such issues.
- *Thematic discussions*. Participants split into break-out groups of about four people to explore the workshop themes further. The aim of these discussions is to delve deeper into issues from the presentations and to provide room for inspiration and debate.

- *Wrap-up*. To summarize the workshop, the break-out groups give highlights from their discussions. The organizers will also probe the interest in a third workshop at the next ECSCW conference or in other initiatives to support further networking and collaboration.

Equipment needs

In addition to a room with wifi and projector, we will merely need flipchart-size paper and markers.

Organizers

The workshop is organized by four senior researchers who have investigated EHR implementations for decades and are currently involved in research projects about such implementations in different European countries. The workshop organizers have a longstanding engagement with the CSCW community.

Gunnar Ellingsen is professor in health sciences at UiT - The Arctic University of Norway, Department of Health and Care Sciences. Gunnar has for several years studied the implementation and use of large-scale EHRs in Norwegian hospitals. Currently, he is engaged in the Norwegian implementation of EPIC's EHR, artificial intelligence in radiology practices, and electronic medication management. His research interests are in information systems, CSCW, and health informatics.

Miria Grisot is associate professor in Information Systems in the Digital Innovation group at the Department of Informatics, University of Oslo. Her research interests are in information systems, CSCW, and health informatics with a focus on user-driven approaches, information infrastructures, and continuous design. Currently she is involved in projects about the implementation and scaling of technologies for remote care in Norway and China, and about the development and design-in-use of interorganizational infrastructures in primary care.

Morten Hertzum is professor of digital technology and welfare at Roskilde University, Denmark. His research interests are in CSCW, health informatics, human-computer interaction, participatory design, and organizational implementation. He has been studying the implementation of information technology in healthcare for the past two decades. Currently, he is involved in projects about electronic medication management and the implementation of EPIC's EHR in the Nordic countries.

Anna Sigridur Islind is associate professor in information systems at the Department of Computer Science at Reykjavik University in Iceland. Her area of interest is information systems, CSCW, and health informatics in general and data-driven research with a focus on co-design, development, and use of digital platforms, mobile applications, and emerging technologies for improving human

conditions, in particular. She leads the digital innovation in Sleep Revolution, a 15 million Euros project funded by the European Union with a large-scale consortium of 39 partners across Europe.

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Future of Home-living: Designing Smart Spaces for Modern Domestic Life

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Abstract. The evolution of smart home technologies, particularly agentic ones such as conversational agents, robots, and virtual avatars, is reshaping our understanding of home and domestic life. This shift highlights the complexities of modern domestic life, with the household landscape now featuring diverse cohabiting units like co-housing and communal living arrangements. These agentic technologies present specific design challenges and opportunities as they become integrated into everyday routines and activities. Our workshop envisions smart homes as dynamic, user-shaped spaces, focusing on the integration of these technologies into daily life. We aim to explore how these technologies transform household dynamics, especially through boundary fluidity, by uniting researchers and practitioners from fields such as design, sociology, and ethnography. Together, we will develop a taxonomy of challenges and opportunities, providing a structured perspective on the integration of agentic technologies and their impact on contemporary living arrangements.

Introduction and Motivation

The questions regarding the meaning of "home" and people' exaptation's of their ideal future home have been around since 2003 (Eggen et al., 2003). In recent years, there has been a considerable and burgeoning interest in 'smart home' technologies. Nevertheless, the technology is developing as fast, if not faster, than academic output. Today, various forms of agentic technologies, whether ChatGPT, robots, or virtual avatars, are making their way into our homes, playing various roles in everyday home life (e.g., (Heiyanthuduwa et al., 2020; Koomsap et al., 2023; Seymour, 2020; Urquhart et al., 2019)). This makes the exploration of their impact and integration into domestic settings more pertinent than ever.

Historically, homes have been recognized as central to social networks and sites for intimate relationships (Easthope, 2004). Households organize themselves around a variety of tasks, roles, and positions, creating a hierarchy that is significantly influenced by technology (Thoyre, 2020). With the advent of smart home technologies, new domains of domestic practices have emerged (Aagaard, 2023). For instance, Tolmie et al. (2007) explored the tasks and work involved in setting up and maintaining a networked home describing these activities as "digital housekeeping" .

However, less attention has been paid to the ordinary and practical ways in which the evolving smart home devices are used on specific occasions. Instead, much of the available research has focused on what we might call 'broad brush' issues such as age stratification (e.g., Choi et al., 2019; Demiris et al., 2004; Zhang et al., 2009), disability (e.g., Jamwal et al., 2022; Mtshali & Khubisa, 2019), and so on. This has led, in our view, to a conspicuous gap in our understanding of the day-to-day dynamics of household life in these "smart" environments, and the various roles that the devices play in everyday practices, given the rapidly evolving nature of these technologies and new possibilities for their integrated use.

This gap is further highlighted as we observe the significant transformation in the social construction of living arrangements. The concept of home is evolving beyond a static physical space embracing fluid interaction with programmable devices that are becoming an integral part of our daily lives. In parallel, the construct of living arrangements is expanding to include various forms of co-living, such as co-housing and communal living, reflecting broader social and economic shifts. This evolving context highlights the critical need to examine boundary fluidity: the increasingly blurred lines between private and communal spaces, as well as between digital and physical realms. Understanding this fluidity is important for designing smart homes that not only adapt to the complexities of modern life and the diverse relationships of its inhabitants but also promote new forms of collaboration and interaction within these dynamic living environments.

Given the emergence of transformative agentic technologies—large language models, virtual reality, and dynamic avatars—it becomes urgent to discuss their

integration into our homes and the opportunities they offer for navigating the complexities of domestic life. This workshop aims to foster collaboration between multidisciplinary researchers and practitioners, encouraging a joint effort to develop a taxonomy of the challenges and opportunities presented by these new, emerging technologies. By doing so, we strive to uncover insights that will guide the thoughtful design and implementation of technology, ensuring it harmonizes with and enriches our modern domestic lives.

The Smart Home Ecosystem

There is little agreement on the definition of a smart home ecosystem; in fact, definitions vary according to the analytical lenses applied. Drawing from Gann et al.'s (1999) distinction between homes that simply contain smart appliances and those that allow interactive computing both within and beyond the home, Randall (2003) categorized smart homes into five types: (a) homes with intelligent stand-alone appliances, (b) homes where appliances exchange information to enhance functionality, (c) connected homes with internal and external networks for interactive control and access, (d) learning homes that record usage patterns to anticipate user needs, and (e) alert homes that monitor activities to proactively meet user needs . Taylor et al. (2007) highlighted that the 'smartness' of a home is not inherent in the devices themselves but emerges from how users integrate technology into their daily routines and activities. Advancing the discussion, Mennicken et al. (2015) proposed viewing smart homes as dynamic entities capable of evolving with users throughout their lives. Similarly, Reddy (2020) described the smart home as a Do-It-Yourself (DIY) 'process of be(com)ing with things,' during which the households appropriate, personalize, and customize their devices.

Building on this, our workshop focuses on systems that offer interactive elements, allowing users to actively construct their living spaces. This approach enables us to explore the intersection between people's routines and their practical use of new technologies. We aim to reveal how these interactions give birth to, or critically shape, the character and spirit of modern home living.

Designing the Smart Home

"Home is a feeling", but a "smart home" as a notion has been contentious with people wanting technology to be more in the background since the advent of smart technologies for home environments (Eggen et al., 2003). This ongoing dialogue on how technology can augment home life's tasks, routines, and experiences has spurred extensive research (e.g., Aagaard, 2023; Mennicken et al., 2016; Woźniak et al., 2023). For example, Taylor et al. (2007) explored asynchronous communication within households and suggested the use of interactive artifacts, which was further expanded to enhance the connection among distant family

members. Similarly, Jakobi et al. (2017) examined issues related to technology adoption, including the development of skills and the emergence of new technology-focused household responsibilities.

However, the HCI community's conceptual understanding of 'home'—its essence, location, creation, and creators—often seems limited. Typically, 'home' is viewed as a conventional house, while 'domestic life' is seen through the lens of family dynamics (Oogjes et al., 2018). A few pioneering studies have expanded the HCI discourse on home life by exploring the dynamics in unique settings such as subsistence communities, off-grid living, and cohousing communities (e.g., Jenkins, 2017; Leshed et al., 2014; Woodruff et al., 2008). Such research is critical to broadening perceptions of the notion of 'home' and fostering a richer understanding of the diversity of domestic life. Despite the value of these contributions, they remain few and far between.

The European Conference on Computer-Supported Cooperative Work provides an ideal setting for our workshop, aligning with the conference's focus on practice-oriented computing and the design of cooperative technologies. Our workshop aims to create a practice-oriented and reflexive environment to explore questions such as: 1) In what ways might new forms of agentic technologies, such as ChatGPT, robots, or virtual avatars, transform domestic life and what new practices might emerge from these changes? 2) What challenges and opportunities do these technologies introduce for collaborative and communal living spaces, such as gardens, meeting rooms, and hallways? 3) Specifically, how can we systematically categorize these challenges and opportunities into a taxonomy to better understand the integration of agentic technologies in home environments?

Workshop Format

We are organizing a half-day event designed to engage participants in a meaningful exchange of thoughts and ideas regarding the challenges and opportunities presented by new technologies and their integration into the routines and practices of modern domestic life. We aim to host between 15 to 20 participants at most, with a minimum of 8, not including the organizers.

After setting up a workshop website, we will recruit via email lists (such as CSCW, CHI, Digital Culture, AOIR) and social media platforms (Facebook groups: SigCHI, Researchers of the sociotechnical, etc.; Twitter; Discord Channels; Slack Channels). Further, we will reach out within our respective networks, inside and outside of academia.

The important dates are:

Submission Deadline: April 22, 2024
Notification of Acceptance: May 10, 2024

Camera Ready Version Due: May 31, 2024

All deadlines are 23:59 anywhere on earth (AoE).

Workshop Plan

We are planning an interactive workshop in which the participants will primarily engage in guided tasks to create a shared understanding of the current role technologies play in the everyday practices of domestic life. Our goal is to have pre- and post-workshop activities that will be tailored based on the submissions received and participants' desires and objectives for the workshop. We have created a tentative plan and schedule for the workshop day, which will be adjusted depending on the submissions received.

Pre-Workshop Activities:

- Posting questions for the group to reflect upon.
- Uploading submissions to Miro, look over the others and give feedback.
- Tentative (depending on group size): Informal online meetings to get to know one another.

Preliminary Workshop Schedule:

09:00–09:20: Welcome, Agenda, Intros.
09:20–9:50: Discussions in smaller Groups (Exploring how new forms of agentic technologies might transform domestic life and what new practices could emerge).
9:50–10:50: Discussions in smaller Groups (Exploring the challenges and opportunities of emerging technologies for modern domestic life).
10:50–11:15: Activity Break.
11:15–11:45: Sharing results of group work.
11:45–12:30: developing a taxonomy by categorizing the challenges and opportunities.
12:30–13:00: Next steps and closing.

Note: No special equipment is needed. We will likely need a moderation kit for the on-site participants to write, scribble, and draw on.

Post-Workshop Activities:

- Adding reflections from the workshop; engaging with others.
- Follow up announcement for the follow-up workshop.

Planned Outcome

All the notes, documentation, and other materials that are created during the discussions will be shared among the workshop participants. We plan to organize follow-up workshops on other conferences to help this newly formed collaboration to continue, through discussions and new initiatives, thereby encouraging more researchers to reflect upon their own challenges when conducting research in home environment. We also plan to use the generated taxonomy of challenges and opportunities as a foundation for future work.

We aim at creating a network of researchers, practitioners, and designers engaging with the topic of future homes. We will set up a slack channel (for the workshop) that shall be used afterwards as well for sharing resources and planning collaborations.

Call for Participation

We welcome and appreciate submissions in various formats, including traditional workshop papers, short essays, reflections (up to 4 pages, excl. references), video and audio recordings (max. 5 minutes), which focus on:

- The role of ChatGPT and similar models in creating new interactive possibilities
- The design of mobile or robotic installations which facilitate new interactional relationships
- The role of avatars
- Technologies at the boundary of the home, e.g., public spaces in co-living environments, such as gardens, meeting rooms, hallways, and so on.
- The impact of different lifestyle arrangements on smart home technology use
- Environmental considerations

Although this list is in no way intended to be exhaustive, creative and inspirational submissions would be particularly welcome. All submissions should come with a short bio of the applicant(s).

Submissions should be sent to Fatemeh.alizadeh@uni-siegen.de and will be reviewed based on relevance and potential for contribution to the workshop. At least one co-author of each accepted paper must register to the ECSCW 2024 conference to attend the workshop.

Organizers

Fatemeh (Mahla) Alizadeh (main contact) and Dominik Pins are doctoral researchers in the field of HCI at the University of Siegen, Germany. Their research primarily explores users' sense-making of AI-based technologies and how to empower users in the face of technological limitations. Some of their publications include: "*I Don't Know, Is AI Also Used in Airbags? An Empirical Study of Folk Concepts and People's Expectations of Current and Future Artificial Intelligence*," published in the I-com Journal in 2021, "*Does Anyone Dream of Invisible AI? A Critique of the Making Invisible of AI Policing*" published in Nordic Human-Computer Interaction Conference in 2022, and "*Alexa, We Need to Talk: A Data Literacy Approach on Voice Assistants*," presented at the Designing Interactive Systems Conference 2021. They have also successfully co-organized a workshop at the ECSCW conference in 2022 on "*Building Appropriate Trust in Human-AI Interactions*" (Alizadeh, Vereschak, et al., 2022). In their recent project, SAM Smart (https://samsmart.de/), they explore the integration of smart home technologies into modern domestic life, aiming to design a home assistant that supports users in error handling and making sense of the collected data.

Dennis Paul is a research associate at Fraunhofer Institute for Applied Information Technology (FIT) in the department of Human-Centered Engineering and Design. In his quantitative UX research, he focuses on psychological factors that influence technology acceptance and user well-being.

Yuhui Xu is a Doctoral researcher in the field of HCI in the department of Industrial Design at Eindhoven University of Technology. His work focuses on care through home things. In his recent qualitative research, he explored designing a chatbot as an agent of everyday objects for mediating expats' loneliness in home contexts.

Mikołaj P. Woźniak is a doctoral researcher in human-computer interaction at University of Oldenburg, Germany. His work focuses on understanding smart homes as multi-user environments, with focus on empowering inhabitants in diagnosing and troubleshooting glitches with their domestic technology. In his recent work, he applies various qualitative methods to understand user strategies to cope with smart home malfunctions. Having his background in electronic engineering, Mikołaj also explored designing non-visual interfaces for smart home control. He has been a part of organizing committees for ISS, TEI, CHIWORK and CHI, responsible for volunteer coordination and hybrid technologies.

Sarah Mennicken is currently the founder of DREI Solutions, a UX consulting firm for startups focusing on user research, design and prototyping. She held

industry research roles at Spotify and Microsoft Research where she focused on the integration of emergent technologies like conversational assistants, AR/VR, and interactive machine learning into everyday experiences. During her PhD, she explored user-centric smart home experiences and hosted workshops on the topic at CHI and Ubicomp.

Minha Lee is currently an assistant professor at the department of Industrial Design's Future Everyday group at Eindhoven University of Technology since 2020. Lee's expertise is in ethics and conversational user interfaces. She was the General co-chair of the ACM CUI Conference in Eindhoven in 2023, after being a Full papers and Provocation papers co-chair (2021, 2020), and was recently elected to chair the CUI Steering Committee. She has hosted workshops on CUIs and ethics at conferences like CHI, HRI, CSCW, and IUI.

Dave Randall is a senior professor at the University of Siegen. He has co-authored and edited eight books and in the order of 200 peer revied papers on a range of themes, in the main orienting to the role of qualitative research in various domains. This includes one of the earliest studies of people actually living in a Smart home in 2003.

Peter Tolmie is Principal Research Scientist in the Information Systems and New Media group at the University of Siegen. He has co-authored and edited six books, with another two in preparation, and over 180 research papers and book chapters, tackling a diverse set of themes across the fields of HCI, CSCW, and Sociology. He is also Field Chief Editor for the Frontiers journal *Human Dynamics*. A great deal of his research from 2000 to 2015 was conducted in domestic environments and this forms the background to two of his books and over 25 of his published works.

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Discomfort in the making of technologies: (re-) choreographing agency

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Abstract.[1]

We invite CSCW scholars to collaboratively explore *discomfort* in the practices of technology design and production. As technology practitioners, we are often believed to have responsibility for the development of technology, yet building of technology is always a collective enterprise. We are inviting the workshop participants to explore the collective, embodied, experiential and ecological nature of technology production with the help of choreography-inspired techniques. With this complexity in mind, we want to collaboratively reflect over designer's awareness, responsibility, and agency in technology production.

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[1] Both first and second authors contributed equally to this research.

The first part of the workshop will be devoted to the sharing of participants' submissions. In the second part, with the help of body-based exercises, we will articulate the discomforts of building and researching technology in the age of surveillance capitalism. The main workshop goal is to facilitate community building among the tech practitioners and researchers, who share the experience of discomfort around topics such as ecological crisis, post-colonialism, and social (in)justice. Our second goal is to explore the limits of individual responsibility in small and large scale technology production. Our third goal is to create a shared data base of methodologies of exploring discomfort and, more broadly, the embodied nature of technology.

Introduction

The goal of this workshop is to facilitate a space to collectively explore 'discomfort' related to the prevalent extractivist technologies that are based on data exploitation, unfair labour conditions, environmental damage, and digital rights violation (Crawford and Joler, 2018). We ask: how can bringing attention to experience of *discomfort* guide an alternative future of technology? We assume that discomforts can be easily *felt* individually, yet articulating them together is needed to build solidarity and resistance. We will use embodied design methods inspired by choreography for making discomfort tangible and shared. Body-based exploration will direct our discussion and frame the hands-on session aimed at rethinking the technologies and algorithmic systems prevalent in our personal and professional lives. This in turn will lay ground for discussing strategies of resisting extractivism, which will foster community building among the participants.

As technology creators, we often believe we carry individual responsibility for building ethical technology (Popova et al., 2024), which implies tackling high scale societal issues, such as data extractivism (Crawford and Joler, 2018). Yet we are limited in the ability to resist as we rely on existing infrastructure, often large-scale data-driven computational systems and their devastating ecological impact (Dourish, 2010). We often have to work with technology whose production relies on supply chains that have embedded histories of oppression and colonialism. Our individual potential to act is limited, when there is no solidarity and co-operation. Developing awareness and the feeling of responsibility without means of action can lead to the feeling of isolation and helplessness (Widder et al., 2023; Popova et al., 2024).

The complexity of agency and related to it problems with responsibility in tech are well studied and well known to CSCW scholars, who have long studied the interplay between individual, organisational and technical (Dourish, 2001; Wulf et al., 2011). These conversations have become even more relevant as problems of extractivist technology, ecological crisis, ethical AI have come into focus. As Wong et. al have shown in relation to ethical toolkits, technical decisions are never 'just technical'—they are taken within organisations and specific collectives of

people (Wong et al., 2022). Our workshop connects with the ongoing exploration of ecological underpinnings of CSCW (Light et al., 2023; Rossitto et al., 2023), experiments in descaling (Lampinen et al., 2022), alternative technological futures (Light et al., 2017), and novel practice-based methods of inquiry (Dolejsova et al., 2023). As a novel contribution, we are aiming to draw attention towards the embodied and experiential aspects of practice. We aim to use body-based ideation techniques to collaboratively reflect over the designer's awareness, feelings of responsibilities, and agency within their production and design practices and the role of ethical design.

We will explore agency and responsibility in technology production and design, focusing on the experiences of technology practitioners—specifically the experience of discomfort. Our interest in discomfort comes from feminist theories and feminist interest in the body as source of knowledge (Federici, 2004; Ahmed, 2017; Butler, 2016). By discomfort we understand not-yet-specified sensations of unease, dissatisfaction, a vague feeling of something not being quite right—a sensation that is purposefully open. Discomfort is a pointer to something that has to be attended to and explored, to the injustice for which we may yet not have a conceptual language to claim that it is indeed an ethical issue and/or political injustice. Discomfort is related to the moment of 'affective dissonance' (Hemmings, 2012)—the embodied understanding of injustice, a moment of opportunity, when solidarity and shift towards new values becomes possible. Discomfort is a visceral experience that is lived in the body, perhaps without yet being articulated conceptually.

Discomfort can characterise our experience both as users and developers. For example, Cochior et al. Cochior et al. (2022) look at discomfort in relation to contemporary computational practices, in particular extractivist technologies and techno-solutionism. They describe digital discomfort as the potential to confront, resist, pay attention to, and intervene in the subtle moments of innovation driven by techno-capitalism, the overly simplistic approach to problem-solving, and the seemingly seamless functioning of digital systems. Similar to physical discomfort, digital discomfort can arise from a politicized reorganization of an environment—a deliberate effort to challenge established structures to pave the way for alternative ones to emerge.

We will experiment in combining the agendas of CSCW with techniques from choreography. The choreographic exploration of agency that will be undertaken in this workshop is influenced by the Brazilian theorist André Lepecki's view of choreography as a control mechanism and the need to question how to assert our freedom of movement and agency in societies that are intricately, even if subtly, controlled (Martin, 2015). Another influence is the theatre practitioner Augusto Boal, known for the method Theatre of the Oppressed (Teatro do Oprimido) developed in the 80's. Boal understood theatre as a rehearsal for everyday life, not an end in of itself but the beginning of social transformation that supported the de-alienation of bodies and towards disrupting the repetitiveness of daily tasks (Boal, 2019).

Our methodology will focus on embodiment, felt experience and the integration choreographic approaches (Chicau and Bell, 2022) to investigate technical systems. We will use movements (such as walking in different directions in the room or performing specific gestures) and the prompts that participants generate during the discussion part of the workshop to articulate participants' experiences of building technology. During the workshop, we will go through an iterative process for generating new prompts with participants, inventing together the choreographic language to explore discomfort. In between each body-based exercise, there will be a moment of discussion followed by a collaborative ideation over the forms of resistance to extractivist technology framed by a general direction: how can we move from individual discomfort to collective solidarity?

Workshop themes

The participants are invited to submit their workshop submissions in relation but not limited to the following themes:

From individual discomfort to collective solidarity — How do we build the structures of solidarity on our shared discomfort? We invite participants to explore alternative structures of co-operation and solidarity, for example, tech labour unions, and other forms of collective organization.

Researching affect and emotion in tech design and production — Emotions have long been excluded from the serious matters of technology development and ethics; we want to bring them back, relying on the recent move towards emotions in technology production (Ruckenstein, 2023; Garrett et al., 2023; Su et al., 2021).

Embodied methods as a way to reflect on technological production — In the field of human-computer interaction there has been an increased interest and attention to bodily, felt experiences and tacit knowledge (Höök, 2018). We welcome critical and reflective approaches that experiment with physical involvement or draw inspiration from theater, performing arts, or somatic practices, among others.

Strategies for resisting extractivism and techno-solutionism — We are interested in learning from existing work that empowers communities and individuals to become more resilient in their relationship with technology, in particular in the workplace.

Workshop structure

The workshop is structured as a full-day event. In the first part, we will have a round of introductions where workshop participants will present their submissions:

- Group mapping exploration: participants will share their reflection on the workshop themes, from their pre-workshop submission. This part will focus on experiences of discomfort as creators of technologies and of resisting extractivist techonologies and the organisational practices that stimulate their development.

In the second part we will conduct an embodied exploration of the issues:

- Group design ideation and intervention: With the help of choreographic prompts and body-based exercises, participants will propose forms of countering the issues raised in the first part of the workshop.
- Reflective discussion, summary and conclusion: Participants will reflect on their proposals and how these can inform alternative modes of co-operation, solidarity and digital equity rather than technological production driven by extraction and infinite growth.

Workshop goals

The main workshop goal is to facilitate community building among the tech practitioners and researchers, who share the experience of discomfort around the topics such as ecological crisis, post-colonialism, and social (in)justice. Our second goal is to explore the limits of individual responsibility in small and large scale technology production through choreography. Our third goal is to create a shared data base of methodologies of exploring discomfort and, more broadly, embodied nature of technology. Furthermore, participants will be invited to join an online community discussion group, to contribute to a report to be published in the website as well as potential future publications.

Equipment needs and space requirements

- A3 paper, pens and markers for writing for all participants (max 25 people);
- access to wi-fi;
- a projector (HDMI) and loudspeakers;
- power connection for laptops;
- a furniture-free open space big enough for all participants to comfortably move around, with 3-4 tables and chairs (1 per participant) on the side for participants to use if they wish to;

Participants recruitment

We plan to create a website prior to the conference which will host the studio's information and materials, call for participation, registration, schedule, important dates and the contact information of the organizers.

During the recruitment phase the link to the website will be shared in various channels such our social media accounts (Twitter, LinkedIn, Mastodon), relevant mailing lists (such as PhD Design and AioR) and internally within our universities.

We welcome anyone with an interest in the workshop themes, in particular, but not exclusively, discomfort around realising ethical issues in technological

development. We are especially interested, but not limited to, practitioners working in areas such as:

- Digital Product and Software Development;
- Digital Rights and Tech Labour Rights;
- Ethics in Technology;
- Somaesthetic Design and Interaction;
- Sustainability in Technological development;
- Feminist and Decolonial approaches to Computational Practices;
- Pedagogy and Education;
- Policy in the field of Technology.

Those interested in taking part in the workshop are invited to send us a short reflection on the workshop themes. We are open to various submission formats, such as a 2-3 written pages, a 3-5min video, a portfolio of artistic practices or a combination of the above.

Organizers

Kristina Popova[she] is a PhD candidate at the Department of Media Technology and Interaction Design at KTH University of Technology, where she explores ethics of technology through lenses of feminist epistemologies. With a background in social sciences and ethnomethodology, she approaches ethics empirically as situated within the design process. She is developing a theoretical take on ethics that takes into account emotions of both users and creators of technology.

Joana Chicau [she/ela] is a designer — with a background in dance. She researches the intersection of the body with the designed and programmed environment, aiming at widening the ways in which computer sciences is presented and made accessible to the public. She participates and organizes events involving collaborative algorithmic improvisation and community round-tables on digital equity and activism. Chicau is a lecturer (FHEA) pursuing a PhD at the Creative Institute, University of the Arts London.

Rebecca Fiebrink [she] is Professor of Creative Computing at University of the Arts London. Her research focuses on developing new technologies to support human creative practices, and investigating how these technologies change creators' working processes and outputs. She is the developer of a number of creative machine learning tools, used by tens of thousands of creators, that enable more embodied approaches to design, including Wekinator and InteractML.

Rob Comber [he] is an Associate Professor of Communication at KTH Royal Institute of Technology. His work over the last ten years has been concerned with the social and ecological sustainability of socio-technical systems, incorporating feminist ecological perspectives on civic technologies and algorithmic systems.

Clàudia Figueras [she/her] is a PhD student at Stockholm University in Sweden. Situated at the crossroads of AI ethics, STS, CSCW, and Critical Data

Studies, her research delves into the technology practitioners' perspectives on AI system design, development and use. In this way, her work focuses on understanding how ethics is perceived and applied in practice by technology practitioners. With a multidisciplinary background, she sees ethics as something enacted through everyday interactions instead of rigid frameworks and rules to be followed.

Acknowledgments

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Data at the Workspace

Working with data: collecting, analyzing, and using traces of work activities

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Abstract. The digitization of work has expanded the possibility of collecting traces of activities, and AI techniques are now expanding the potential for analyzing this large amount of data. This phenomenon is mostly associated with forms of control and evaluation of worker's activities, thus generating forms of resistance. It is therefore important to think about ways of collecting and processing this data that could improve the quality of life at work, by tackling information, cognitive, or communication overload. Indeed, this data could be used to improve deliberation in organizations, by providing digital representations of the activity that is not easy to grasp in day-to-day professional work. The objective of this workshop is to gather researchers interested in discussing how data could be collected, analyzed, and discuss improving the quality of life at work: which data? Which methods for its collection and its analysis? Under which conditions?

Author keywords

- Quality of life at work
- Information overload
- Cognitive strain
- Communication overload
- Digitization
- Traces of activities
- Data collection
- Data analysis
- User-centered computing
- Artificial Intelligence
- Deliberation in organizations
- Digital representations
- Data collection
- Data analysis methods
- Conditions for data utilization

Detailed proposal

The second edition of the VERTUOSE workshop builds upon the success of our 2023 gathering, titled "Collectively Improve the Quality of Life at Work: How and Which Data to Collect and Analyze?" In that 1st workshop, 11 researchers convened to explore data collection and processing methods aimed at enhancing work quality by addressing information overload, cognitive strain, and communication challenges (Fiore-Gartland, et al., 2015). We delved into various work contexts, including healthcare, shop floors, learning environments, and office settings. Beyond the immediate focus on work quality, we also engaged in broader discussions about data within the workspace.

For this year's workshop, we retain our initial inquiry but expand its scope. In addition to improving working conditions, we now emphasize the efficiency of workers' actions, all while respecting the collective agreements established by the relevant stakeholders. By efficiency, we refer to the optimal execution of tasks under favorable conditions.

Every work activity generates digital traces that can be recorded live (Burnett, J. R., et al., 2021) or collected retrospectively. The aim of this workshop is to question the methods by which this data is collected, analyzed, and used, whether by those involved in the workplace or by researchers (Flyverbom, et al. 2018). These questions will be raised from a particular angle. In practice, working with data is often associated with the issue of hierarchical control of work (Holten Møller, et al., 2021; Flügge et al., 2021; Levy, 2002). The aim here is to approach data processing for other purposes. Particular attention will be paid to studies that present other uses for the data collected, for example, in terms of improving working conditions (Mark, G. 2023) or developing democracy in the workplace (Kristiansen et al., 2018). We will be looking at the opportunities associated with computerized data collection, especially for organizational actors (managers, workers, trade unions) (Khovanskaya et al., 2020; Pedersen

& Bossen, 2024). It seems to us that thinking of alternative uses for control or surveillance is crucial for the design of labor data collection and analysis tools that promote organizational efficiency (Faraj, S., et al., 2018).This topic (data at the workplace) therefore raises many questions:

- How can we effectively collect data from work activities? What are the best practices for recording digital traces, whether in real-time or retrospectively?

- What methods can we use to analyze the collected data? How can AI and other analytical tools provide meaningful insights?

- How do we move beyond hierarchical control when working with data? Can data processing serve purposes beyond oversight, such as improving working conditions or promoting workplace democracy?

- What innovative applications exist for the data we collect? How can it contribute to worker well-being and decision-making?

- What advantages does automated data collection offer? How can organizational players (managers, employees, trade unions) leverage data for informed decision-making?

- How can organizations ensure responsible data collection and handling? What protocols should be in place to protect privacy and confidentiality?

- How do we address biases in data collection and analysis? What steps can we take to ensure fairness, especially when making decisions based on data insights?

- What processes should be followed to obtain informed consent from employees regarding data collection? How can transparency build trust?

- Who owns the data generated in the workplace? How can we balance organizational needs with individual rights?

- What are the potential long-term consequences of data utilization? How can we mitigate negative effects?

- How do different stakeholders (employees, management, customers) perceive data usage? How can we align their interests ethically?

Description of themes:

To address the questions posed, we invite contributions on the following themes, while recognizing that this list is not exhaustive:

- **Empirical Studies on Data Collection**: How do different forms of data collection impact work environments? What insights can empirical studies provide regarding data gathering practices?

- **Metrics and Workplace Dynamics:** What role do metrics play in shaping work experiences? How can we strike a balance between measurement and employee well-being?

- **Debates and Norm Formation:** How do debates around data collection influence the collective formation of norms? What tensions arise, and how can they be resolved?

- **Navigating Resistance and Workarounds:** When faced with data-related challenges, how do individuals and teams respond? What creative workarounds emerge, and what can we learn from them?

- **Methodological Innovations:** What novel methodologies can enhance data collection and analysis at work? How can we address methodological challenges effectively?

- **Conceptualizing Agency and Trust:** How do different forms of agency and trust intersect with data practices? What ethical considerations arise when individuals interact with data systems?

- **Participatory Software Design:** How can software and AI systems be designed collaboratively to collect, analyze, and visualize data? What role does participatory design play in shaping usage norms?

- **Implementing Ethical Infrastructure:** What IT systems and algorithms are needed to ensure responsible data utilization? How can we program infrastructure that aligns with ethical principles?

Regardless of the type of work context, these themes offer valuable insights. We particularly welcome reflections and testimonies—both positive and negative—on data collection for workplace democracy and the enhancement of working conditions.

Activities

Maximum number of participants : **15**
Length of the workshop: **1 day**

The workshop is planned as a full day event divided into two sessions and will include additional online activities organized prior to the workshop. The contributions will be made available on the workshop website in order to prepare the attendees for the discussions at the workshop. In addition to the themes highlighted here by the workshop organizers, other themes for the workshop that emerge from the position papers will be posted on the website. Participants will be invited to reflect on these themes. Depending on the scope and focus of the contributions, we will consider proposing some guiding questions.

The first half of the workshop would be devoted to brief presentations of participants' research. In order to stimulate the exchanges, each selected proposal will be assigned to a discussant who will give a short summary of the short paper's main topic and its contribution to the workshop, talk about the submitted short paper and raise questions to the author(s) during the workshop. The author(s) will be able to answer the questions by sharing empirical material or results, by explaining conceptual framework or by developing methodological choices. The second half of the workshop will consist of the collective development of a synthesis upon identified themes with a review of the literature. The group would be first divided and then gathered for a final restitution.

Equipment needed:
- Projector
- Paper board, ideally with markers and post-it notes.

Means of recruiting and selecting participants
Participants will be recruited through:

- EUSSET mailing list
- CSCW mailing list
- Announcements on social networks
- International Communication Association mailing list
- International Sociological Association mailing list
- Professional network of the organizers

We will use the workshop website which was created last year, and we will update it until the closing of the workshop. Participants will be selected based on their position paper submissions (up to 4 pages in length using the ECSCW Exploratory paper format). The selection will be made by the workshop's organizers based on their interest, compliance with the workshop themes, and the extent (and diversity) of their backgrounds.

Goals

The first workshop brought together researchers interested in these topics, we wish to strengthen these links and broaden the community.

Depending on the outcome of the workshop's discussions and on the interest of the participants, we may explore further publication outlets for the workshop papers. We were thinking of a special issue of the CSCW Journal about collecting data in the workplace.

Background of the organizers

- **Christophe Chassot** is full professor in computer science and networks at the INSA Toulouse (France), where he is director of research and development. His research activities focus on next-generation communication networks and systems, and their applications. His contributions deal with dynamic and autonomous reconfiguration of new communication architectures taking advantage of recent opportunities in network softwarization and virtualization.
- **Caroline Datchary** is full professor of sociology at Toulouse Jean Jaurès University (France) where she is deputy director of the LISST research laboratory. She is interested in situations of dispersion at work with a view to improving working conditions. Her research fields concern various work situations and combine different methodological approaches.
- **Sylvie Grosjean (Ph.D.)** is full professor at the University of Ottawa and the chair of the Com&Tech Innovations Lab (http://ctilab.ca). Her current research interests include the design and implementation of telehealth innovations as well organizational communication by studying the role of technologies (e.g. Medical Information

Systems, telemedicine technologies) on care coordination and clinical decision-making. She develops a codesign approach in health and uses various qualitative methods to analyze human/machine interactions (e.g. video-ethnography).

- **Myriam Lewkowicz** is Professor at Troyes University of Technology where she heads the pluridisciplinary research group Tech-CICO and the master program. She is interested in defining digital technologies to support existing collective practices or to design new collective activities. This interdisciplinary research proposes reflections and approaches for the analysis and the design of new products and services to support cooperative work. The main application domains for this research for the last fifteen years have been healthcare (social support, coordination, telemedicine) and industry (digital transformation, maintenance). She is a member of the program committees of the main conferences in Cooperative Work, Social Software, and Human-Machine Interaction, chairs the European scientific association EUSSET, and is deputy editor-in-chief of the CSCW journal, « The Journal of Collaborative Computing and Work Practices ».

- **Samir Medjiah** is associate professor in computer systems and networks at Paul Sabatier University - Toulouse III (France) and a researcher in LAAS-CNRS. His main research interests include overlay networks optimization, network virtualization, and software defined networking. He has worked on various R&D projects related to application-driven networking and Network-Application co-optimization.

- **Claudia Müller**: is a Professor of Socio-Informatics, specializing in "IT for the ageing society" at the University of Siegen, Germany. Her expertise is PD with and for older adults, vulnerable user groups and local communities. She is representative chairwoman of the commission of the Eighth Federal Government Report on Older People.

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Practices of Participation and Co-Creation in Healthcare: Lessons Learned and Advancements of Established Methodologies

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Abstract. Participatory research in the healthcare sector is fraught with obstacles. In particular, choosing appropriate methods to involve the heterogeneous stakeholders in the healthcare system can be difficult. Not only are time constraints and hierarchies between professional (and non-professional) healthcare actors a challenge, but also dealing with patients who may have different physical and psychological limitations. Accordingly, not all qualitative methods are applicable to all stakeholder groups. Limitations such as impairments and low literacy levels can make it difficult to participate in focus groups or design workshops. In this workshop we will discuss experiences with participatory methods in the health sector and explore how established methods can be made more inclusive so that they can be adapted to a wide range of stakeholders.

Introduction

In healthcare, involving a diverse group of stakeholders, including end-users, patients, relatives and health professionals, is crucial for the successful development and acceptance of technology (Symon and Clegg 2005; Wallerstein and Duran 2010). In the context of eHealth, co-creation involving technology developers, researchers and other stakeholders is both a necessity and a particular challenge for understanding and addressing complex problems in dynamic and complex environments (Hartley and Benington 2000; Rittel and Webber 1974; Jackson and Greenhalgh 2015). Qualitative methods are frequently utilized in co-creation to gain a comprehensive understanding of the socio-cultural context, including the needs and perspectives of all stakeholders involved. This approach not only leads to the development of better products but also provides direct added value to doctors, patients, caregivers, relatives, and others (Ogonowski et al. 2018). To ensure success, it is necessary to not only carefully select methods but also to integrate various interdisciplinary perspectives and needs. Despite the high relevance of user involvement in the technology development process, the conception and handling of participation within research projects is very heterogeneous (Osterheider et al. 2023). This is not least due to the unique challenges brought by the various stakeholders involved. Healthcare professionals, such as doctors and nurses, may face resource constraints (Gulland 2016; Younger 2010), while patients' participation in research projects may be hindered by limitations and vulnerabilities (Lazar et al. 2017; Bittenbinder et al. 2021). In this context, vulnerabilities refer to health-related aspects and include groups such as the young, old, sick, or disabled. Researchers often encounter challenges when working with these groups.

van der Meide et al. (2013) describe the challenges faced by participants in interviews to keep up with researchers and express themselves verbally.

Conversely, in observations, researchers must adapt to the pace of participants. The study focused on older individuals with illnesses. The participants frequently mentioned feelings of fatigue, sluggishness, disinterest, discomfort and tedium, which varied depending on the time of day. These factors hindered the research conditions and made it challenging to gain insights into their lives. Additionally, the researchers experienced discomfort and a sense of being out of place, particularly when sitting in silence for extended periods next to a bed. Working with participants experiencing depression can also be overwhelming for researchers (Kim et al. 2020). However, ethical concerns can be multiplied when working with vulnerable populations, as demonstrated in Sharkey et al.'s (2011) study of internet-based discussion groups with young people who self-harm. Research has shown that there is an increased risk of displaying or engaging in unwanted responses as a result of the research. Additionally, the burden of research participation is high, both when participants are highly symptomatic and when they report traumatic events (Alexander et al. 2018). Furthermore, there are often difficulties in recruiting and involving participants (Lindsay et al. 2012) and in building trust (Amann and Sleigh 2021). In HCI, a significant challenge is the literacy of the communities involved. When using methods like surveys or cultural probes (Gaver et al. 1999), it is important to consider different literacy levels. Additionally, the digital literacy of participants is crucial in HCI. This results in additional expense to enable participants to participate in technology development projects. (Müller et al. 2015). Although there are risks and challenges, it is crucial to ensure that the voices of vulnerable groups in our society are not ignored. Vulnerable groups often express a desire to discuss sensitive issues for reasons such as altruism, gaining new knowledge, and feeling relieved to share their story with an interested listener (Alexander et al. 2018). Additionally, involving vulnerable groups can have an empowering and self-actualizing effect (Davidson and Jensen 2013; Knight-Davidson et al. 2020; Schepers et al. 2018). This can have a positive impact not only on the final product but also on the people involved. However, appropriate and sensitive methods must be chosen to minimize challenges and risks and to achieve a positive outcome for all involved.

CSCW research has been addressing the sensitive selection of co-creative-methods for involving different stakeholder groups for many years (Schuler and Namioka 1993; Gaver et al. 1999; Wulf et al. 2018). However, the rapid pace of technological advancements and ubiquitous technologies moving more and more into everyday life, the emergence of complex algorithms, machine learning, and artificial intelligence have altered the landscape (Grönvall and Kyng 2013). Merely

asking older individuals how a complex algorithm should be adapted to their needs is no longer sufficient. Participants should be empowered for co-creation (Semmann and Grotherr 2017). However, direct and prolonged participation may not always be possible, depending on the research objectives, desired level of participation, and participant characteristics.

Research in sensitive contexts, such as healthcare, requires the involvement of a broad range of stakeholders, including patients, healthcare professionals (such as doctors and nurses), hospital management, and relatives. This ensures that the entire context is taken into account and that the perspective of actual practice is understood. This interdisciplinary and interprofessional context involves various tensions that established methods fail to consider, such as hierarchies (Noyes 2022; Green and Johns 2019; Kaspar et al. 2024; Israilov and Cho 2017), power relations (Green and Johns 2019; Egid et al. 2021), differences in language and understanding (Kaspar et al. 2024), and potential limitations of individuals (Lazar et al. 2017; Bittenbinder et al. 2021), especially in large-scale projects (Hochwarter and A. Farshchian 2020). Co-creation is not merely an exercise, but it has the potential to provide added value not only for the research but also for the participants if utilized correctly (Cila et al. 2016; Vargo and Lusch 2008). According to CSCW and HCI research, this task demands more than just running workshops. It involves establishing trust (Jirotka et al. 2005; Müller et al. 2015; Carros et al. 2020), creating infrastructure (Karasti 2014; Monteiro et al. 2013), ensuring sustainability (Meurer et al. 2018; Simone et al. 2022), building long-term relationships (ibid.), and addressing other relevant aspects. It is crucial to select appropriate methods and adapt them to the context and stakeholders' characteristics. Therefore, this workshop aims to highlight and discuss current co-creative practices in the healthcare sector, including both success stories and failures, as well as lessons learned. Based on this analysis, established co-creative methods such as interviews, focus groups, participatory design workshops, cultural probes, and participatory observation will be examined for their adaptability and potential for further development. These discussions will be based on two ongoing research projects and cases from workshop participants.

Case 1

The N!CA project focuses on the digitalization of care processes to support and empower caregivers. It is a collaboration between Joanneum Research HEALTH (JR), the Medical University of Graz, hospitals, nursing homes and health tech

companies. The goal of the project is to optimize care processes and reduce documentation effort through co-creation activities with nurses and patients. In addition, innovative AI models based on real-world data (RWD) will be developed and a digital decision support system will be created to enhance nurses' professional skills. The project aims to increase nurses' job satisfaction and retention by providing tools for evidence-based decision making and streamlining care processes. The co-creation activities include:

- re-thinking and re-designing current nursing processes
- a general data strategy is developed in a co-creative process with nursing staff, AI experts and healthcare IT experts
- Development of decision support systems (diabetes and pain management) are designed, prototyped and evaluated together with nursing staff and experts.

Case 2

The second research project (TeleDiag@Smart) is investigating the long-term health effects of COVID-19. The project will run for 2 years and was almost 9 months old at the time of the workshop. The variety of symptoms of post-COVID syndrome makes diagnosis difficult. New diagnostic approaches are needed to better differentiate post-COVID disorders. The aim of the project is to develop an interactive system based on artificial intelligence (AI) for holistic and interdisciplinary symptom recording. This system will enable patients to record a variety of symptom descriptions and symptoms independently and continuously via voice input and passive monitoring of vital signs. The data is seamlessly transmitted to healthcare professionals to enable accurate diagnosis and early initiation of appropriate treatment. The research team uses participatory and qualitative methods to ensure that the solutions developed meet the needs of healthcare professionals and patients. The co-creation activities include:

- Developing a digital, voice-based health assistant using a living lab approach in real-world settings
- Recruiting patient households for preliminary and pilot studies to test and optimize the technology at home
- Conducting co-creation workshops with patients and physicians to ensure that the system meets the requirements and needs of users.

Workshop Goals and Activities

The aim of this workshop is to highlight different challenges when using co-creation methods in healthcare, especially when working with heterogeneous groups like healthcare experts and patients with vulnerabilities. Therefore, we want to bring together a diverse group of researchers with experience in co-creation in healthcare, so that a discussion from different disciplines and perspectives is possible. In order to maximize interaction and networking between participants, the workshop will take place on site in Rimini for one full day. In addition to the on-site activities, we will invite a healthcare expert to join the session virtually. We expect the expert to have fruitful insights and to be an important factor in the discussion. The discussion points will be recorded and prepared in such a way that participants who are unable to attend will be able to benefit from the workshop. Upon receipt of acceptance, the workshop website will be published with all relevant information, including position papers and authors.

Workshop introduction

The workshop begins with an introduction to the objectives, timetable, expected outcomes and structure, including paper presentations, group discussions and possible adaptations to existing qualitative methods.

Clear and concise communication from the organizers will engage and focus participants for full participation. Participants will introduce themselves and their research, building empathy and understanding for the interdisciplinary discussions that will follow.

Presentations

Participants will be asked to prepare a max. 2-page position paper, sharing and reflecting on experiences, best practices, lessons learned and possible difficulties or even failures encountered in previous co-creation projects. The papers will be presented during the workshop. Presentations should last no longer than 5 minutes and be presented on 2-3 slides. At the end of each presentation, each participant should identify three keywords that describe the conditions for success in participatory health research.

Brainstorming session

In a brainstorming session participants are asked to discuss the experiences from the previous presentations and what impact they have on participatory methods used. The session therefore deals with questions like:

- What other challenges might there be beyond those presented?
- Which traditional qualitative methods might not be applicable to vulnerable people without adapting the method to their needs and perspectives?
- Which vulnerabilities require which adaptation of qualitative methods?
- What are good practices in participatory research in healthcare?
- What innovative approaches or technologies might help?
- What are the reasons behind the potential failures when using existing methods?

Designing the future

In this session the participants are divided into small groups for discussion. Each of these groups will be given one of the qualitative methods discussed earlier, with the aim of adapting it to minimize the challenges of working with the previously collected stakeholder groups and the cases presented by the organizers and participants. To do this, the groups first clearly define the problems and challenges that arise. Ideas are then generated, prioritized, and collected (e.g. in the form of a mind map, storyboard or similar). Participants are encouraged to express unconventional ideas and not to evaluate solutions immediately. The ideas are then discussed and evaluated against the background of the different stakeholders, projects, work cultures and hierarchies, institutional settings, resources and time constraints and political influences.

Working Group

To ensure the publication of the workshop results, we have allocated the second half of the workshop solely to the joint publication. Our goal is to produce a high-quality report on co-creation in healthcare. Therefore, we will start by discussing the type of publication and where to publish. After that, we will form groups to research the literature, gather and compare case studies and reflect on discussions and the workshop itself. This will be an active writing session to support publishing results afterwards. Wrap up and next steps.

Results from the former sessions will be collectively synthesized into a methodological and conceptual "road map" of appropriate design concepts and methodological approaches for participatory work in the healthcare domain. These findings will reveal an understanding on specific actions to make co-researchers comfortable and experience co-creation as a meaningful activity while being aware of possible limitations.

Table 1 - Workshop agenda

Time	Activity
09:00 – 09:05	Brief workshop introduction
09:05 – 09:50	Keynote: Rob Procter
09:50 – 10:30	Project presentations
10:30 – 10:45	*Coffee/Tea break*
10:45 – 11:15	Brainstorming Session
11:15 – 12:00	Designing the future
12:00 - 13:00	Lunch Break
13:00 - 15:30	Working Group Session
15:30 - 16:00	Wrap Up and next steps

Submission details

Potential participants are invited to submit a position paper of no more than 2 pages, excluding references, formatted according to the ECSCW template. Authors are invited to submit methodological reflections, reflections and lessons learned of former case studies, challenges and failure stories of former case studies, ethical or political considerations, philosophical or theoretical reflections. Example cases could be problematizing the motivation for WS participants (Why should I attend? What do I gain from this?) or sustainable partnerships and collaborations beyond single co-creation projects/workshops. Following submission, the organizers will review and select papers based on their quality, innovation and relevance to the workshop.

- March 28, 2023: Workshop website is published together with the call shared in all our communication channels.
- May 03, 2023: Paper submission deadline.
- May 08, 2023: Acceptance notification.
- June 17 or 18, 2023: Participation and presentation.

We will notify participants of acceptance at an early stage so that both the early bird rate can be selected, and conference travels can be arranged.

Post-workshop and expected outcomes

During the workshop, we will start creating a joint reflection paper on co-creative methods in healthcare with the participants. In this paper we would use the position papers of the participants and reflect on the discussions of the workshop in the form of a workshop report in collaboration with the participants or in the form of a special issue of a journal. The journal in which the report will be published will be discussed with the participants during the workshop. One suggestion would be IRSI - an open-source online journal (https://www.iisi.de/international-reports-on-socio-informatics-irsi/). This will require further collaboration after the workshop, so we will establish a communication channel with all participants for sustainable collaboration between all.

Organizers' short bio

Tim Weiler is a research associate at the University of Siegen, Germany. His research focuses on PD and Co-Creation in healthcare. Hybrid interaction systems for maintaining health even in exceptional situations are analyzed and a framework for co-creative methods is to be defined.

Stefan Hochwarter is a senior scientist at Joanneum Research HEALTH, Graz, Austria. His doctoral thesis at the Norwegian University of Science and Technology investigated a case on moving healthcare activities into homes. At his current position, his research focuses on digitalization and digital transformation of healthcare services, mainly in hospital settings.

Sourav Bhattacharjee is a research associate at the University of Siegen, Germany. He studied master's in Human-computer Interaction program at the University of Siegen in Germany and completed his bachelor's degree in Computer

Science in Engineering from Shahjalal University of Science of Technology in Bangladesh. His research interests are in participatory health research and designing interactive systems for health promotion.

Babak Farshchian is an associate professor in software engineering. His research focuses on digitalization in service organizations, in particular within healthcare and social and welfare services, using interpretative qualitative research methods.

Claudia Müller is a Professor of Socio-Informatics, specializing in "IT for the ageing society" at the University of Siegen, Germany. Her expertise is PD with and for older adults, vulnerable user groups and local communities. She is a representative chairwoman of the commission of the Eighth Federal Government Report on Older People.

Recruitment and participants selection

The workshop aims to facilitate an interdisciplinary discussion on challenges of participatory design in healthcare by bringing together experts from various fields like HCI, CSCW, health informatics and involving groups of people with diverse backgrounds. The organizers plan to accept 10 submissions and invite approximately 15 people to the workshop. The call for position papers will be sent to various interdisciplinary mailing lists including ACM, HCI, (E)CSCW, health sciences, EUSSET email list, Research Network "Ageing in Europe" of the European Sociological Association, the German Network for Participatory Health Research (PartNet), Health Geography, feminist geography and all our research partners from our current research projects. In addition, our workshop website will promote the workshop and clearly present the most important information.

Acknowledgments

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Conducting Interdisciplinary Research with Vulnerable Populations in Computing: Challenges, Practices, and Lessons Learned

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Abstract. The need for interdisciplinary approaches has become a necessity in Computer Science (CS) research. This is particularly the case with research involving the design and development of technologies that can have a significant impact on the wellbeing of people who are deemed potentially vulnerable (e.g., those living with stigmatized conditions or identities). However, in most cases, interdisciplinary research collaborations in CS fail to include experts from key areas whose knowledge and perspectives could benefit the end users and make the technology design process more ethical. In response, we propose a workshop bringing together

researchers and practitioners from CS, Design, and the Social and Health Sciences to discuss the challenges, practices, and lessons learned regarding such interdisciplinary research collaborations in the context of technology design with and for vulnerable groups. The outcomes of the workshop would provide insights on how to conduct this type of research more effectively and ethically.

1   Background and Motivation

Interdisciplinary research is a type of collaborative practice where experts from different disciplines co-produce knowledge based on the integration of methodologies from different domains (Sonnenwald, 2007; Jirotka et al., 2013). For example, Internet-based studies exploring social networks and online group contents have documented how and when interdisciplinary collaboration with experts from the Social Sciences, Arts and Humanities could take place. Research in online forums, in particular, has adapted ethnographic methods traditionally used in Sociology and the medical sciences to study user behavior and online communication (e.g., Bauermeister et al. (2019); Mo and Coulson (2013)). This type of *nethnographic* approach has required teams to work closely with research experts in ethnography and anthropology. The expertise brought from other domains has allowed researchers to plan studies and analyze collected data from human-centred perspectives. Their findings, in turn, have been translated into social policy via using methodologies that lie beyond the traditional training and expertise of computer science experts.

Yet, in spite of the advantages of having a plurality of perspectives and expertise from various domains in interdisciplinary research, there is still a lack of understanding of how to conduct effective interdisciplinary research in Computer Science such as in the case of the analysis, design, development, and implementation of digital technology (Blandford et al., 2018). For instance, Bonenfant and Meurs (2020) found that "social science researchers interested in mining [online] data often depend on data analysts who lack any social science background". Moreover, research involving digital technology design for vulnerable groups may fail to foresee and prevent unethical and negative consequences or impacts of technology introduction or implementation. This is particularly the case with algorithm-based technology which is often created, studied, tested, and deployed by experts and practitioners working in rather isolated domain circles composed by experts in artificial intelligence (AI) and machine learning (Bird et al., 2009). Consequently, technology design studies involving vulnerable populations (e.g., people living with chronic illnesses or living with a stigmatized condition such as being a prisoner or sex worker) may require additional work and overseeing by experts from legal and ethical-centered domains that could help make sure that the research agenda prioritizes the well-being, as well as the values, needs, and interests of the research-target

populations. For instance, Maestre et al. (2023, 2021) found that people living with the Human Immunodeficiency Virus (HIV) often felt further stigmatized when using digital interventions to improve medication adherence. The design of these interventions often employed stigmatizing language and imagery that made users feel as if they were being tracked to avoid the spreading of the virus (Maestre et al., 2023, 2021; Claisse et al., 2022).

Additionally, collaborations between Computer Science and Social Sciences tend to be "less structured, compartmentalized, and routinized, but more fluid, flexible, and open-ended" (Korn et al., 2017). Researchers from different domains may also work in different institutions located in different geographic locations (e.g., European researchers working with colleagues in regions or with population in the Global South). The lack of co-location with other researchers may complicate the carrying out of sensitive research tasks such as interacting with participants remotely, having access to and sharing sensitive digital data, etc. Thus, multi-disciplinary research may require much more careful planning of research goals and tasks, sharing of resources, as well as regarding the communication between members of a cooperative research team (Sonnenwald, 2007; Velden et al., 2014). A lack of appropriate planning and structure (physical and/or digital) in interdisciplinary research collaborations could cause misunderstandings and disruption in the achievement of common research goals, outcomes, and optimal ways in which new knowledge and outcomes should be disseminated and implemented across domains. Furthermore, such disruptions could involve other stakeholders as well such as study participants and members of gate keeping organizations and charities. In this sense, we argue that a discussion about the experiences and lessons learned in interdisciplinary technology design research endeavours is needed to further understand opportunities and challenges. There is still a lack of a guidelines on best practices that could provide recommendations on how to work with research colleagues in other disciplines in the context of technology design for vulnerable groups. Thus, we propose to organize a workshop that would gather a fairly diverse group of researchers and practitioners who have done technology design work with or for vulnerable groups. The outcome of the workshop will be the co-creation of materials (e.g., physical or virtual posters) as well as a post-workshop article or written piece on the workshop website that would summarize key insights derived from the workshop discussion and outputs.

2   Key Topics

The main topics to be covered in the workshop are as follows:

- **Finding research collaborators outside Computer Science:** This topic would focus on methods and best practices to search, identify, and invite researchers from other domains as well as community gatekeepers and voluntary organisations to a Computer Science research project. We plan to

emphasize participation of professionals and practitioners from core fields of the CSCW community involved in a socio-technical agenda (e.g., social work).

- **Collaborative research planning, design, and execution:** This topic would involve methods and best practices to improve communication of goals, planning and tasks among researchers from different fields during the entire study process.

- **Sharing of research outcomes across different disciplines:** This topic would cover the ways in which the outcomes of interdisciplinary research projects could be translated and used across different domains so that they are still valid and relevant to different audiences.

- **Ethical considerations:** This topic would cover the ethical underpinnings of interdisciplinary research involving digital technology design for vulnerable groups, and cultivating best practice and responsible design sensibilities.

3 Workshop Organizers (in alphabetical order)

Caroline (Caro) Claisse, PhD is a Lecturer in Human-Computer Interaction (HCI) and Interaction Design at Open Lab, Newcastle University. She is a designer by background inspired by Feminist, Social Justice and More-than-Human research. In her current work, she takes a design-led and co-creative approach to engage voluntary organisations and marginalised groups in research to inform the design of digital technologies and services that support personalised care and community wellbeing.

Abigail Durrant, PhD is a Professor of Interaction Design and Co-Director of Open Lab, Centre for Digital Citizens, and Northern Health Futures Hub at Newcastle University, predominantly working in the interdisciplinary and cross-sector field of HCI. Abi practices RtD using participatory and co-creative methods, for supporting dialogue, equitable engagement and digital inclusion. In her most recent collaborations, she critically engages with regional infrastructural programmes of digital transformation in health and care (e.g. about involvement in research on health data interactions).

Deborah Jones, PhD is a Professor in the Department of Criminology, Sociology, and Social Policy at Swansea University. Professor Jones is also the head of the School of Social Sciences. Throughout her research, she has focused on developing methodologies that are both inclusive and creative and has endeavoured to make academic research accessible to the community through a series of public education activities. In particular she has focused on the regulation of the sex industry co-leading The Student Sex Work Project. She has also explored how Higher Education can support desistance from offending.

Juan Fernando Maestre, PhD is a Lecturer (Assistant Professor) in the Department of Computer Science at Swansea University. His research applies novel participatory design methods to recruit and conduct research both in person

and remotely with vulnerable populations such as people living with stigmatized conditions and/or identities. He strives for a successful integration of novel research methods in order to design and assess the impact of technology-based interventions that support stigmatized, marginalized, and vulnerable populations.

Angelika Strohmayer, PhD is an Assistant Professor and co-leader of the Design Feminisms Research Group at Northumbria University's School of Design. She is an interdisciplinary researcher, working closely with third sector organisations and other stakeholders to co-design digital and craft-based interventions in service delivery and advocacy work. Her research lies at various intersections of practice-led and theoretical research surrounding issues of feminist and social justice-orientations.

Sarah Wydall is a Professor in the Department of Criminology, Sociology, and Social Policy at Swansea University. Their research interests focus on gendered harms, particularly on domestic abuse in later life. Since 2010, they have led on fifteen research projects, covering domestic abuse perpetrators, children and young people, victims labelled 'high risk' and more recently the intersection of later life, gender, disability and sexual identity. They have also co-produced and evaluated a Virtual Reality intervention 'Through their eyes as a training tool for the police and other service providers.

Mark Warner, PhD is a Lecturer (Assistant Professor) in the Department of Computer Science at UCL. He is an HCI researcher working at the intersection of privacy, security, and safety. Prior work includes research on sensitive disclosures within dating apps, drawing on user-centred research methods to engage with stigmatised users to better understand their lived experiences of disclosure within these apps. More recently, he has been involved in research analysing privacy mechanisms in FemTech apps and was involved in an interdisciplinary project exploring the use of data-driven systems to support the UK's response to the COVID-19 pandemic.

4 Workshop Outline

4.1 Prior to the Workshop: Website and Participants

- **Workshop website:** The organizers will create a website to share all the information about the workshop (e.g., dates, structure, activities, schedule) and call for participation with detailed instructions for preparing and submitting an expression of interest. The organizers will also disseminate the call for participation to the workshop via relevant email lists, professional and student networks, as well as via word of mouth.

- **Participants:** We will aim to recruit participants who are either PhD students, researchers, professionals, or practitioners who have worked in interdisciplinary research collaborations involving digital technology with and/or for vulnerable groups. Those interested in being part of the workshop will be required to fill out and submit their expression of interest to join the

workshop via an online application form. The form will confirm their expression of interest to be a workshop participant. It will also ask for an abstract of about 300 words where the potential participant will describe their research background and prior experiences in interdisciplinary research (e.g., lessons learned, challenges, etc.) We will also ask participants to share one image with a short caption that illustrate an aspect of their work with vulnerable populations, to symbolise a challenge, a snapshot of their practice etc. The form will also gather expectations from the workshop. We will select between 10-15 participants participants from different disciplines who work with a variety of populations, methods, and topics.

4.2   During the Workshop: Schedule, Format, and Materials

- **Schedule:** We propose a half-day workshop. As suggested in Table I, the workshop will last about 4 hours. In the first part, participants will be grouped in small groups with one co-organizer. Participants will give quick introductions to each other and the co-organizer will take notes and update a virtual board (i.e., Miro or Mural) containing the participants' profiles with key points about their research and past experiences. In the second part, participants will re-group again into small groups organized by the main topics described earlier in section 2. A workshop co-organizer will be leading the discussion in each group. During the small group sessions, each group will prepare a poster using markers and post-it notes (for those in person) or via using a virtual board (for those joining via Zoom) to capture key insights and conclusions. Finally, each group will present their poster to the rest of the workshop participants. We will close the workshop with conclusions and a brief discussion of directions for future work.

Duration	Activity
30 mins.	Welcome and introductions.
1 hour	Small group presentations and discussions on participants' experiences.
30 mins.	Coffee break and networking.
1 hour	Topic-based group sessions: discussion on highlight topics.
30 mins.	Group poster presentations.
15 mins.	Conclusions, impact & future work.

Table I. Workshop Schedule.

- **Format:** This will be a hybrid workshop. Participants will be able to join the workshop either in person or via Zoom in order to maximize opportunities for participation. At least two co-organizers will be present in person during the

entire duration of the workshop. The rest would participate remotely leading and moderating the workshop activities. Online participants will be projected using a projector screen located in the workshop room, or via a laptop in each discussion group. Careful consideration will be given to turn-taking and balancing contributions from those participating online and in-person.

- **Materials and equipment:** We will request the conference organizers to provide us with a projector and a big screen (for the projector) as well as wireless Internet connectivity. The workshop co-organizers and online participants will be asked to use their own computers or laptops to present and/or participate.

4.3   After the Workshop

Notes taken by the workshop organizers and resulting posters from the group sessions will be used to facilitate the writing of an article submission for publication. This article will reflect upon the main outputs and insights from the workshop and will be collaboratively produced by workshop organizers and interested participants.

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Multispecies Urbanism: Blueprint on the Methodological Future of Inclusive Smart City Design

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Abstract. The incorporation of digital infrastructure has become increasingly important in Smart Cities. Inclusive Smart City design requires an intersectional approach that engages human and non-human actors. While in academia inclusive design and socio-technical methods are emerging, Smart City practitioners lack universally accessible collections of methods applicable for diverse target groups. This workshop examines creative, qualitative and participatory methods with practitioners and researchers for inclusive design of Smart Cities that consider the needs and preferences of vulnerable target groups such as older adults, wildlife, and nature. A participatory approach is applied, taking into account the multidisciplinary complex work context of practitioners, e.g., representatives of municipalities. This workshop is the third of a series of workshops against this theme and closes the circle of different relevant stakeholders (researchers, vulnerable target groups, practitioners), resulting into a collection of inclusive, participatory methods which are made accessible to Smart City practitioners in an online toolbox.

1 Introduction

The United Nations has established 17 sustainability goals to reach climate neutrality by 2050[1], and Smart Cities are the prevailing mode municipalities are employing to reach this goal. However, many stakeholders are omitted from decision-making about the adoption of systems, structures, and other designs. This workshop is designed to gather the perspectives of practitioners in care, government, and the environment to work towards Sustainability Goals 10-Reducing Inequalities in and among countries and 11- Smart Cities and Communities, which "Make cities and human settlements inclusive, safe, resilient, and sustainable" (SDG 11) (Takaoka et al., 2023). In this workshop, we will focus on the experiences of practitioners in order to improve digital infrastructures in multispecies Smart City design.

1.1 Motivation: The evolution of Smart City design

Despite attempts to establish a generally valid definition of the term 'Smart City', it still functions as an umbrella term (Dameri et al., 2013; Toli and Murtagh, 2020; Winkowska et al., 2019). The traditional Smart City concept aims to improve quality of life of human citizens through a technocratic lens (Jiang et al., 2020; Kitchin, 2014; Kitchin et al., 2017). Recent Smart City research take a holistic approach (Edwards et al., 2023; Jiang et al., 2020; Tomitsch et al., 2021), recognizing fauna and flora as vulnerable target groups themselves. The overall dynamic embedding of stakeholders in urban socio-technical structures is key to designing a healthy ecosystem 'city' (Maller, 2018). Bottom-up approaches, offering "true participation" (Arnstein, 1969) where possible and useful have the potential to face these needs and challenges (Ertl et al., 2021; Scheepmaker et al., 2022). To give vulnerable groups a voice in shaping their urban environment,

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[1]   https://sdgs.un.org/goals

creative, qualitative, and participatory methods are needed (Takaoka et al., 2023). The purpose of this workshop is to collect and explore such methods and discuss their adaptability for different vulnerable target groups (human and non-human actors or their representatives).

1.2 Objective: Methods for Multispecies Urbanism

This workshop plan is in line with our overall objective to integrate vulnerable citizens (human and non-human actors) in Smart City design and gather different practitioner perspectives on methods to support this, building a Caring Community-based platform (Aal et al., 2023) that offers these methods in an online toolbox and possible ways of adaptation for multiple target groups. This aligns with CSCW's focus on how collaborative work and coordination can be arranged and supported by computer systems. Those methods can support building an inclusive co-located community for knowledge sharing against the background of methodological framing in design. This is the third and final workshop of a series (Ertl et al., 2021; Scheepmaker et al., 2022) to collect (vulnerable) stakeholder perspectives and methods to include vulnerable target groups in design processes of multispecies Smart City environments.

In this workshop, we'll integrate insights from smart city practitioners, previously collected in related workshops, to explore their relevance to computational multi-species urbanism. We'll explore methodologies, discuss applicability and develop case studies. We'll also create a Caring Community network for those interested in multispecies urbanism, and start building an online toolkit. This effort will follow five satellite workshops in three countries, targeting groups such as caretakers, biologists, social workers and urban planners, using existing networks for recruitment. The series will conclude with a final workshop for researchers to develop and share methodologies for engaging with vulnerable populations.

2 Inclusive Smart City Design: Understanding Multispecies Habitats

Human-centric Smart City approaches highlight the collaborative and inclusive character of urban places and focus on the needs of humans and their wellbeing (Cingolani et al., 2022). Co-creation with diverse groups of citizens can ensure that Smart City applications are inclusive and "do not reproduce social or economic biases"[2]. This requires methods and tools in Smart City processes which empower diverse vulnerable or marginalized groups of citizens, for instance people with migrant background, to (actively) participate in them. While in the field of HCI, diverse groups of citizens are increasingly involved in design processes and

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[2]   https://digital-strategy.ec.europa.eu/en/news/berlin-declaration-digital-society-and-value-based-digital-government

the set of methods is growing, yet Smart City practitioners still struggle to empower citizens beyond the 'usual suspects' to participate (Burton, 2004; Ertl et al., 2021; Grinko et al., 2021; May, 2007).

In our proposal we want to focus on 'multispecies urbanism' which broadens the human-centered perspective to include the myriad of non-human species that share urban spaces with us. These can include animals, plants, fungi and even micro-organisms. Recognizing the importance of these non-human entities can lead to more sustainable, resilient, just and vibrant urban environments which can better cope with current and future climatic conditions (Pineda-Pinto et al., 2023). The concept of 'Multispecies urbanism' extends the CSCW perspective beyond human-human interaction to consider interactions between humans and non-human entities. This is a novel area where CSCW can contribute to understanding and designing for complex ecosystems of cooperative interactions among multiple species.

In the light of climate change (Lee et al., 2023), the role of flora is becoming more important than ever. Urbanizing and climate changes have a large impact on cities and put pressure on the quality of life and wellbeing of citizens. It also forms a danger for the flora in cities, for instance by increased risks of floods, droughts and heat waves (Hattum et al., 2016) whereby nature itself can be described as vulnerable. A decrease in flora amplifies the consequences of climate change. Here, a transition is needed in urban design to create cities which are climate adaptive and protect their flora to promote biodiversity, ecological balance, and co-existence (Takaoka et al., 2023). This endeavour must incorporate the achievement of individual goals of all human and non-human stakeholders.

Considering wildlife in urban design focuses on creating urban environments that prioritize their well-being and coexistence (with human actors) (Apfelbeck et al., 2020; Edwards et al., 2023). These designs include elements such as: wildlife-friendly overpasses/corridors and underground wildlife tunnels (Albers et al., 2015)), connecting natural habitats (Edwards et al., 2023; Apfelbeck et al., 2020), green roofs and strategically placed vegetation to provide shelter, nesting spaces, food sources and safe pathways (Mayrand and Clergeau, 2018), while also improving air quality and reducing urban heat (Liu et al., 2021; Arnstein, 1969), urban ponds that regulate water levels to create both aquatic and terrestrial habitats (Oertli and Parris, 2019), while floating gardens and solar-powered aeration systems can also be integrated to increase biodiversity (Liu et al., 2023; Burton, 2004), housing/nesting boxes (Mancini et al., 2023; Meier et al., 2020; Lee et al., 2023), connected (community) gardens (Edwards et al., 2023; Dameri et al., 2013), sensor-based animal-centric technology to collect animal data and inform about them, while such data can thus be integrated back into design processes for the protection of relevant species as well as minimizing human-animal conflicts (Grinko et al., 2021; Nandutu et al., 2022; Weise et al., 2019; Edwards et al., 2023) and animal-centered design frameworks that consider the ecological goals of animals in design and actively promote animal welfare (Webber et al., 2022). Interdisciplinary lenses in participatory design processes and evaluations after implementation are fundamental to design such elements on the needs of all:

animals, nature and humans (Apfelbeck et al., 2020), ensuring equitable environments.

To support multispecies urbanism, urban planning should adopt a 'multispecies justice' approach that considers human and non-human communities equally in decisions about novel ecosystems (Pineda-Pinto et al., 2023). Key recommendations include recognising their value, inclusive governance, avoiding unjust gentrification outcomes, and improving public perceptions of these wild spaces in cities. Incorporating perspectives from critical geography and indigenous knowledge helps translating theory into practical planning approaches to create ecologically sustainable and just cities (Fieuw et al., 2022). Current methods lack methods that combine social and ecological views from a multispecies angle. As urbanization grows, this approach is vital for shaping inclusive urban policies and designs, aiming for just and sustainable cities for all inhabitants. Practitioners play a key role in urban and governmental design and decision processes of future Smart Cities (Kempin Reuter, 2019).

Similar to researchers, they struggle to protect vulnerable target groups (human and non-human) in their cities (see for instance (Albers et al., 2015; Burton, 2004; May, 2007)). They partially have method collections to involve vulnerable agents in Smart City initiatives (see e.g., (Werkvormen ABC, Werkvormen.info, 2023; Werkvormen, EnergieParticipatie: 2023, 2023)), offering context-specific practical tools and methods. Figure 2 shows 'Beleidsmixer', a framework developed in the Netherlands, including different tools for municipalities and water departments to stimulate climate adaption strategies and to co-create such with citizens. Those method and tool collections are often presented in their respective countries language and shared on local websites or in local communities, which makes it challenging for researchers, academics or other practitioners to get access to them or to build upon previous methods. To our knowledge, there is no universally accessible collection of methods for Smart City practitioners with a focus on vulnerable target groups.

We argue for the development of a comprehensive collection of inclusive Smart City methodologies, emphasising the need to incorporate the experiences and practices of different practitioners. Our workshop will evaluate methods from different countries and engage Smart City practitioners in a co-creation process to 1) identify and collect existing methods and 2) understand their implementation challenges and effectiveness. The latter is especially relevant when we aim to go beyond the state-of-the-art method collections: There are already several methods in and outside academia to empower and protect vulnerable target groups in Smart Cities, however, practitioners (and researchers) struggle to implement them (Albers et al., 2015). Challenges for implementation are i.e., a low political standing of climate adaptive measures (Albers et al., 2015) or inclusive citizen participation (Lorenzo Squintani, 2022). We previously argued that next to the methods, a Caring Community is needed to be able to truly empower vulnerable target groups in Smart Cities (Ertl et al., 2021; Scheepmaker et al., 2022). This

workshop will explore how to establish such a community to enhance the empowerment of vulnerable groups in Smart Cities.

Figure 1. Example of method collection 'Beleidsmixer' from practitioners in The Netherlands.

3 Inclusive Future Cities: Workshop Goals & Structure

We will outline the objectives, structure and activities of the workshop before, during and after the conference, concluding with a visual timeline of all activities (Figure 2).

3.1 Objectives

This workshop will synthesise findings from satellite workshops in Germany, the Netherlands and Norway, and will bring together practitioners from different sectors (e.g. municipal representatives, caretakers, social workers, biologists and urban planners) to discuss inclusive smart city design practices. Recognising that Smart City practitioners do not typically attend research-focused conferences, this event aims to bridge this gap by focusing on methods and challenges related to the inclusion of vulnerable groups in areas such as migration, support needs, and urban planning. The results of the satellite workshops will be presented on a Miro board used during the main workshop to feed and inform the discussions and reflect the experiences from practitioners with researchers from diverse fields. The overall objectives are:

- to share creative, qualitative, and participatory methods from diverse vulnerable settings and to discuss the challenges and opportunities of

involving vulnerable groups through the use of such methods with practitioners and researchers,

- explore the methods presented (visualised in Miro) and reflect on them both in the homogeneous groups of practitioners (satellite workshops) and with researchers from different fields (conference workshop) against the background of the different vulnerable target groups and for adaptation in different disciplines/vulnerable settings,

- to bridge the gap between methods developed by researchers and experiences from practitioners, resulting in a collection of methods from researchers and practitioners and

- to build an active and sustainable Caring Community against the backdrop of this get together and foster it in the future through post workshop goals.

3.2   Workshop planning during the ECSCW conference

The workshop will be a hybrid event, hosting both on-site and remote participants for half a day. On-site participation will be encouraged for deeper dialogue, but will not be mandatory, recognising the shift towards online events and climate change considerations. We will use Miro as a collaborative platform to share results from the satellite workshops and to document the outcomes of the workshop. The session will focus on evaluating the applicability of the shared methods across disciplines and for vulnerable groups, addressing their potential and limitations. The aim is to compile a collection of interdisciplinary methods from practitioners (primarily in satellite workshops) and researchers (in the main workshop) for future application testing. For a hybrid realisation, a projector, two screens, a microphone, a room camera and a room speaker are required.

3.3   Application procedure

To ensure easy access to the workshop only motivation letters are demanded for application via Google Form which additionally pre-collects all methods and further details to ensure efficient and time-saving work during the workshop. We will tailor the workshop based on access requirements (i.e. captioning), please let us know if you require any services to support your participation. We aim to have a maximum of thirteen participants. The essence of motivation from the accepted submissions will be posted in Miro before the workshop for asynchronous viewing considering time constraints. Likewise, the method presented in the letter of motivation, which corresponds to personal experience in dealing with the respective vulnerable target group.

3.4   Post workshop plans

We aim to develop a publicly accessible online toolkit for multispecies urbanism, containing collected methods, examples and a network of practitioners. In addition, we plan to expand this toolkit and network to foster an active Caring Community.

ECSCW workshop activity (main workshop, on-site & online)	Time frame
Welcome words & pre-workshop gathering (getting to know each other on-site & online)	08:30 - 09:00
Exploration of satellite workshop results and individual note taking (in Miro)	09:00 - 10:00
Morning break	10:00 - 10:30
Sub-group discussion and documentation (in Miro)	10:30 - 11:30
Small-group presentations & large group discussion	11:30 - 12:15
Coffee break	12:15 - 12:30
Closing discussion	12:30 - 13:00

Figure 2. Time (UTC) and activity schedule for the conference workshop.

4   Organizers

Tanja Aal is a PhD student in Information Systems, esp. IT for the Ageing Society, at the University of Siegen. Her research focuses on vulnerable human and non-human actors, (digital) participation and inclusion and on the use of ICT, its potentials, benefits and limitations against this background.

Laura Scheepmaker is a PostDoc researcher at the Smart Cities research group at Saxion University for Applied Sciences in the Netherlands. Their work focuses on developing design methods aimed at fostering inclusive citizen participation in Smart City initiatives by collaborating with Smart City professionals to implement those methods in practice.

Alicia Julia Wilson Takaoka is a PostDoc at Norwegian University of Science and Technology (NTNU) in informatics and software engineering. Alicia holds a PhD from University of Hawai'i at Mānoa and is part of ACM-Women Europe, Chair of ACM Women Trondheim, and EUGAIN: Gender Balance in Informatics. Alicia's research focuses on the Gender-Climate Change-ICT Nexus and mental health and computing education.

Doug Schuler is Professor Emeritus of the Evergreen State College Washington State, US. Coming from a background of computer science, software engineering, AI research and collaborative work he has been working in the field of democratizing technology for 35 years. He was a longtime activist for Social Responsibility and a founder of the Seattle Community Network.

Alan H. Borning is a renowned American Computer Scientist recognized for his contributions to Human-Computer Interaction. Specifically, his work emphasizes designing with human values in mind. He develops systems that promote civic participation and deliberation and creates tools that simplify the use of public transportation.

Claudia Müller is a professor in Business Informatics, esp. IT for the Ageing Society at the University of Siegen. Her expertise is in Participatory Design and Community Informatics for older adults, vulnerable user groups, and intergenerational settings, aiming at co-production of socio-technical systems strengthening autonomy, empowerment, social and digital participation and digital sovereignty.

Konstantin Aal is a PostDoc at the Chair for Information Systems and New Media at the University of Siegen. He is part of *come IN*, a project on computer clubs for children and adults including refugees. His research circles around social media usage by political activists in conflict areas such as Palestine, Iran, Tunisia and Syria.

5   Call for Participation

This half-day workshop will explore creative, qualitative, and participatory methods for the inclusion of vulnerable human and non-human groups (wildlife, nature) in Smart City design.

We seek motivation letters where potential participants share one method each related to the workshop theme. Letters of motivation should be submitted via Google Form by Mai 10th, 2024. At least one author of accepted letters must register for the main workshop (attendance onsite or hybrid) and at least one day of the conference (attendance onsite).

This hands-on hybrid workshop, which is the third in a series of workshops and whose orientation is based on all previous measures, will facilitate the exchange of methods and knowledge, the building of skills in the use of the methods presented, and the collaborative design of an active Caring Community using a user-centered evaluated spectrum of methods for inclusive Smart City design processes that give voice to the most vulnerable groups. With this focus, we lean on CSCW-related studies that design and support collaborative work and coordination on the basis of computer-supported systems.

The workshop-related Miro board will share the essence of the accepted letters and diverse methods to inform all participants before the workshop and give therefore more space for deep dialogue, exploration and adaptation of methods in the workshop.

We invite researchers interested in the theme but also professionally active or experienced with at least one of the vulnerable target groups (human and/or non-human actors) and/or their practitioners. Motivation letters can be uploaded in the Google Form sharing your motivation, professional background, method used and experiences linked to that. For more details and future collaboration see our Caring Community platform.

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Infrastructure and Creativity: Can they co-exist?

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Abstract. With this workshop, we aim to provide a forum for participants populated by researchers, artists, and practitioners to share their experiences with creativity in infrastructures and infrastructures in creativity. The goal is to learn from different approaches and perspectives. We focus on reflecting on key issues based on CSCW (Computer Supported Cooperative Work), PD (Participatory Design), and IxD (Interaction Design) concepts and approaches regarding facilitating creativity. It should act as a seed for further exchange of ideas and cross-community fertilization. After briefly introducing state-of-the-art creativity and infrastructures, different approaches connected with supporting practices of being creative in given infrastructures and re/shaping infrastructures to facilitate creativity in processes will be examined and evaluated in group discussions by informing the presented practices with theories and concepts from CSCW, PD, IxD and creativity research.

Proposal

Problem-solving and solution-finding are intrinsically linked to creativity. Creativity is defined as the ability or power to create, and links back to the Latin word creare "to make, produce, [...]" (*creative | Etymology of creative by etymonline*, no date). Creativity encompasses a wide range of activities, from artistic expression to problem-solving in various domains, and it plays a pivotal role in human innovation and progress (Tellioglu, 2023).

In this workshop, we want to investigate issues at the intersection between infrastructures and creativity. This is an area that has received little attention in the E/CSCW community, but it is critical for example, in the context of digitalization processes and design for sustainability.

Infrastructures are the backbone of human activities and include buildings, roads, energy, communication networks, and institutions among others. As Lee and Schmidt (2018) point out, the term infrastructure has been explored widely in the literature surrounding CSCW, Information Systems and Science and Technology studies, and does not fit one universal definition. We welcome various interpretations and conceptualizations of the term infrastructure. Further, we broadly define infrastructure according to Bowker et al. (2010) as "pervasive enabling resources in network form". These resources can include social, organizational, and technical or material components. In CSCW, the concept of infrastructure is often used to understand and analyze information systems in the context they are applied to.

Information systems are believed to be a special type of infrastructure that needs to support work-oriented infrastructures (Pipek and Wulf, 2009). They have a unique versatility, meaning they can be used for many different purposes in many work environments, and are reflexive, i.e., IS designers and users are part of the same infrastructure as well as that improvements to the infrastructure are developed from within it. Hanseth and Lundberg (2001) use the example of implementing information systems in healthcare, to point out that the users hold expert knowledge about this infrastructure and should therefore be the primary designers of the system. Users will further add to the existing infrastructure by improving or replacing any of its components.

This highlights the importance of users in the design and development and design in-use of infrastructures. The efforts related to pre-infrastructure activities (e.g., design and development) and design activities in-use (e.g., adaptation, tailoring, re-design, maintenance) are often referred to as infrastructuring (Pipek and Wulf, 2009).

Debates about creativity and design processes encompass a wide range of topics, reflecting the evolving nature of design and its impact on society, technology, and culture, like ethical design and responsibility (Arista *et al.*, 2021), inclusive and accessible design (Henry, 2021), sustainable and eco-friendly

design (Lofthouse, 2016), AI and automated design (Shneiderman, 2016), etc. But also, speculative design as a creative and forward-looking approach to design that explores and provokes questions about possible futures, often challenging existing assumptions and norms (Dunne and Raby, 2013). For this workshop, it is crucial to consider creativity as something that is required to make the system work (e.g., routine work processes but also workarounds) and creativity as something that is wanted as an outcome of a process (e.g., in design processes to maintain innovation in a work environment).

Current societal challenges – climate change, aging populations, inclusive education – require creative solutions. However, the infrastructures that permeate every aspect of work and life are often difficult to change. An infrastructure developed over years and decades becomes hard to change as it gets older. An old IT platform will make it impossible to transform an organization digitally with new and better solutions. Even for new infrastructures, their complexity might make it difficult to conceive creative adaptation.

In a healthcare context, the infrastructure consists of a range of systems, health professionals, institutions, and established practices (Ellingsen, Hertzum and Melby, 2022). Many healthcare organizations therefore struggle to adopt and integrate IS, in particular generic systems. Such projects are often associated with a misfit between the existing infrastructure and the new system. Which in many cases results in creative solutions like workarounds or shadow systems to overcome daily tasks (Ringdal and Farshchian, 2023). This raises the question of whether such creative solutions can improve the digital infrastructure and how they are dealt with.

To summarize, infrastructures require creativity from the people working within them to address challenges and problems that are not facilitated by the infrastructure, and infrastructures require creativity as part of their design process. Many approaches have been proposed, especially in Interaction Design, to promote co-design of creative solutions through, e.g., design thinking, brainstorming, and other creative processes. But often, the proposed solutions are not feasible because they do not consider the constraints and opportunities given by existing infrastructures.

Workshop Goals

In this workshop, we aim to bring together people working with creativity in infrastructures and infrastructures in creativity. The goal is to learn from different approaches and perspectives. We aim to provide a forum for participants, populated by researchers and practitioners with different perspectives to share their experiences with processes connected to creativity in existing infrastructures or by considering the creativity aspects of the practices supported by them. It

should act as a seed for further exchange of ideas and cross-community fertilization.

We focus on reflecting on key issues based on CSCW (Computer Supported Cooperative Work), PD (Participatory Design) and IxD (Interaction Design) concepts and approaches regarding engagement, participation, and consensus-making in (technology-supported) co-creation processes. To this aim, we are looking for contributions that:

- Survey relevant developments in the area and thus contribute to the understanding of the identified challenges from multiple perspectives.
- Describe original empirical or theoretical work that sheds light on the workshop topic.
- Discuss similarities and differences in theoretical and methodological approaches in infrastructure and in creativity research.

We welcome participants willing to share their:

- Experiences of meeting a rigid infrastructure not susceptible to creative solutions.
- Investigations on digital infrastructures, change, and innovation.
- Success or failure stories of how to creatively transform an infrastructure.
- Case studies and best practices for cross-disciplinary (co-)design of creative solutions.
- Approaches to work creatively with infrastructures.
- Best practices to integrate into creative processes the opportunities and constraints set by existing infrastructures.
- Theoretical constructs to understand the relationship between infrastructure and creativity.

Three additional aims supplement this primary goal. By bringing the workshop participants together, we hope that cross-fertilization will ensue among their cases, concepts, and questions. Second, we will collaboratively reflect on what CSCW, PD, and IxD contribute to the study of co-creation practices in creativity and infrastructuring processes, by applying Design Thinking methodologies and how we, as individuals and a community, can facilitate the transfer of these contributions to practitioners. Third, we will discuss the interest in further collaboration and networking initiatives regarding the further development and implementation of creativity and infrastructuring frameworks and methodologies.

Activities

The workshop is structured as a full-day event. It will consist of diverse activities, with an emphasis on in-depth conversations and community building:

1. Introduction. The organizers opened the workshop by introducing the agenda and goals for the day. They then facilitate a round of meet-and-greet activities, giving each participant a moment to introduce themselves and their interest in the topic by using ice-breaking activities.
2. Panel discussions. The participants will be organized into thematic panels based on their position papers. Everyone will give a 6-minute presentation, followed by a collective discussion. The organizers will take shared notes to generate material to be worked on collaboratively.
3. Break-Out Groups. Participants will split into groups of 3-4 people to further explore shared interests through discussions to refine relevant themes and identify common challenges at the theoretical and methodological levels. For this activity, groups will be encouraged to focus their conversation on methodological issues. The goal is to identify key ideas and questions for discussion.
4. Summarizing. In this session, participants will be given a moment to review the collective notes taken during the day and to note down key insights and reflections. We will then go around the room to listen and respond to each other's thoughts.
5. Next Steps and Closing. The workshop will conclude with a shorter discussion around possible next steps to advance CSCW, PD, and IxD research around the challenges in processes of creativity and infrastructuring and to consider opportunities for further collaboration.

The organizers will proactively ensure that the workshop is an interactive event with clear outcomes.

Participants

The workshop can accommodate a maximum of 20 participants (including the organizers). This would ensure a highly interactive event with time for discussion and the sharing of multiple perspectives. Participants will be recruited from the CSCW, CHI, PD, IxD and artist communities. In addition to the general dissemination provided by ECSCW2024, the organizers will reach out to these communities through their extended research networks and by circulating a call for participation on relevant mailing lists, such as EUSSET, CSCW, CHI, and

through social media. Detailed information about the workshop will be made available on our workshop website.

Participation in the workshop requires the submission of a position paper. We encourage potential participants to explain their interest in the workshop and particularly welcome position papers that address one (or more) of the workshop themes outlined above. We encourage all participants to state their positions and list 2-3 questions they want to discuss in the workshop at the end of the position paper. Position papers are limited to two pages (excluding references) in the ECSCW paper format, available in Latex (Overleaf template), RTF, or MS Word format. The position paper shall be submitted in PDF format to michaela.schmidt@ntnu.no.

The submitted position papers will be reviewed by the organizers and accepted based on the relevance and development of their content. Suppose the number of people interested in attending the workshop exceeds its capacity. In that case, the organizers will prioritize submissions for rich presentations and discussions while seeking diversity among the participants. We expressly encourage both junior and senior researchers to submit position papers. To promote broader participation, particularly from artists and practitioners, we also offer the option of submitting alternative material of rough equivalence to a position paper (e.g., an experience report, an illustrating artifact, or an abridged implementation plan). The workshop is intended to bring together participants for a full day.

Organizers

The workshop is organized by several senior and junior researchers who have investigated creativity and infrastructuring activities or co-creation and participation methodologies and technologies for decades and are currently involved in research projects about the realization of several aspects of these areas.

Michaela Schmidt is a PhD student at the Department of Computer Science at the Norwegian University of Science and Technology (NTNU). Her research focuses on digitalization at the organizational frontline of public sector organizations.

Monica Divitini is a professor of Cooperation Technologies at the Norwegian University of Science and Technology (NTNU). Her research interests lie primarily in co-design and learning technologies. She has consolidated experience with the collaborative organization of international workshops. She was co-chair for the journal track of ECSCW2023.

Christine Hohenbüchler is a professor of Drawing and Visual Languages at the Faculty of Architecture at the TU Wien Institute of Art and Design and leads the Institute. The artistic practice and research are teamwork with her sister Irene Hohenbüchler. The focus is on social issues, (art in) public spaces, participatory work, and the idea of "multiple authorship" plays a central role.

Nora Ringdal is a PhD student at the Department of Computer Science at the Norwegian University of Science and Technology (NTNU). Her research focuses on socio-technical approaches to implementing information systems in the public sector, within healthcare.

Theresa Schütz is a PhD student at the Department of Architecture and Spatial Planning at the TU Wien at the Faculty of Art and Design, and she is part of the Doctoral College STE[A+]M. Her doctoral research focuses on how art-based common design practices create knowledge production with the aim of fostering transversal learning through arts in STEM education.

Hilda Tellioglu is an associate professor and head of Artifact- based Computing & User Research (ACUR) Unit at the TU Wien at the Faculty of Informatics, chair-elect of EUSSET, and scientific director of the Center for Technology and Society of the TU Wien. Her research focus covers the design and development of artifacts and their involvement in different settings, like homes, work, or public spaces, design thinking, co-design, user-centered design, and evaluation.

Additional Equipment

The workshop only requires standard equipment. In addition to a room with Wi-Fi and a projector, we will merely need flipchart-size paper, markers, pens, and Post-it notes.

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