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Public School Boundaries and Society

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Abstract. Public school districts play a pivotal role in the functioning of education systems around the world and society in general. Often the public school system relies on a proximity-based assignment to pair residences with neighborhood schools. Housing developments and increase in population generate a continuous need for more school space and redrawing the school attendance zone boundaries, known as rezoning. Rezoning implies debates and agreement over resource allocation in public deliberations held by school authority and community members. Unfortunately these debates are known to be highly contentious. My dissertation seeks to understand if we can improve the state of practice in public school boundary assignments, methodologies, and impact. Specifically, I try to (i)understand if the traditional process of in person deliberation can benefit from total or partial improvement through online participation, (ii) enhance the state of practice with interdisciplinary research from human computing interaction, geographical information systems, and education policies to decrease the complexity and abundance of information, connections, and judgement this process entails, (iii) understand if transparency of data backed decisions can remove bias and rebuild trust in this particular context.

Introduction

Traditionally, rezoning was mainly associated with voting districts for governments, as with rapid growth in population, rezoning become a revolving

process and perpetual constant in school districts as well. In this case, it entails changing the attendance assignment of a neighborhood from one public school to another. It is initiated by the public school officials often because of overcrowded classrooms and seeks concurrence during a public hearing. Often school districts are dealing with one or more rezoning processes per academic year, reverberating sometimes in the need for one student/family to change schools every other year or so. The constraints in time, space, and availability of constituents corroborates with highly computational calculations on vast and complex data not many can understand (Kueng et al. (2019)). Because of their impact and limitations, public school rezoning deliberations often become highly contentious, dividing the communities apart and eroding trust in public school officials (Svrluga (2013)). My dissertation attempts to answer and help with the following questions:

- **RQ1.** Can an online platform assist with information dissemination and deliberations in the process of school boundary changes?
- **RQ2.** Can technology help decrease the level of complexity and computations needed to optimize school building capacity utilization, so participating community members can easily understand the information?
- **RQ3.** Can data-backed decision transparency increase understanding of holistic opportunities and constraints with a role in school rezoning efforts?
- **RQ4.** Can the ability of on-line deliberations shift the status of practice, raise awareness, and create the premises to rebuild community trust in the particular context of public school rezoning?

Completed Work

As a parent, teacher, and researcher I tinkered early on with the idea of concrete ways this process can be aided by readily available technology given that an overwhelming majority of people have access to a smart phone.

The first stage of my research began with involvement in the public school rezoning processes. In order to access complex data regarding rezoning deliberations, the university signed non-disclosure agreements and collaborated with public school systems.

To answer **RQ1**, I started with hundreds of articles, a comprehensive survey of the literature of education policy papers, and computational methods for geographical clustering. As part of a team, I took part in live rezoning efforts, conducted field work, and many interviews between 2017-2021 with school planners, educators, and community members. The key finding was the inability to identify a software tool to suffice in computing all complex data processing and constraint clustering planners needed, resulting in the majority of the work being done manually. The status of school rezoning practice did not keep up with digital technology advancements. The process is highly reliant on printouts, posters, and projectors. The debates were only held in person, in an overcrowded cafeteria during a school night, with planners, parents, and children coming from a long day at work or school, and heading back home, with less sleep,

to another day in school or at work. Attending these meetings would be even more difficult for single parents, these with a second job or shift job, those going to school at night, or traveling out of town.
Things are even more cumbersome: computing a best scenario for building utilization requires intricate calculations and in-depth interdisciplinary knowledge. There are many constrains that need to be mitigated. Planners were required to carry all this work hand or non-education specific GIS software. We have witnessed the same struggle, in all analyzed counties (regardless of the socio-economic composition or geographical location). Our findings are captured in a 21 single column paper, not yet submitted for publication. The work aims to be a survey of the state of practice in entitled: "Redrawing public school boundaries: Traditional practices, the gap, and possible recommendations".

We have built an on-line interface [1] through participatory design and conducted pilot testing. Subsequently we deployed the interface in live rezoning processes seeking qualitative and quantitative data points, representative of the population within the studied area. The technical algorithm was developed and published by our team (Biswas et al. (2019)), yet the ability to conduct statistical quantitative community testing was slow to follow. After a 5 year effort, it was clear that the unique underlying social challenges are worth mentioning. Despite answering "yes" to **RQ1** and **RQ2**, for which were able to develop a technical tool able to compute extensive troves of complex data, manipulated with ease, and offered at no charge to all public schools around the university, school districts were reluctant to adopt or propose it during their live rezoning. Even school systems that presented the on-line tool to the community received massive uproar from an upset community.

No matter how much more transparent the school districts were trying to be, there would always be a group of vocal parents vehemently opposing the changes. At this point in time, lab studies produced highly promising results, yet were unable to get a chance at fair testing due to what was predicted to be a chronically eroded communal trust.

While documenting along the way, I continued working with public school officials to improve, test, and optimize the interface while trying to capture a full rezoning process. Despite having a mature interface, lack of mass adoption shifted our focus on a participatory dilemma and **RQ3** and **RQ4** surfaced.

We settled on a qualitative analysis to attempt answering **RQ3**. The fall of 2020 allowed the premises for a convenience testing user study. Here we had 12 participants accounting for over 14 hours of interview transcripts. The subjects were previously exposed to traditional public school rezoning in one or more capacities (parents, community members at large, school board officials, planners, teachers, principals, facility personnel). The interviews captured their first time exposure to the on-line tool, their reactions, understanding, process of intuitively learning, and their ability to complete a fictional rezoning decision within one hour or so. The findings of this exercise were highly positive, enlightening and reinforced the strong "yes" to **RQ1** and **RQ2**, yet surfaced

[1] https://redistrict.cs.vt.edu/lcps-2021/ay8s0t2p/edit/

social aspects that resulted in constraints initially overlooked by our team. Examples include the high polarization of previous participation in the surveys, raised participant awareness of the narrow space school planning officials work in due to so many restrictions, and community uneasiness with transparency. This helped answer, at least in part **RQ3**, through qualitative investigation. The findings are captured in a 7 page paper already submitted this year to an HCI conference.

Future Work

Given the research's maturity, we are seeking ways to test the work against statistically significant sample of people for a particular region. We think that including the technology advancements in this area of has the ability to positively impact over 50 million children and their families. However this research remains highly specialized and its unique challenges are not readily evident. We would highly benefit from an open discussion and input of a variate audience during the ECSCW Doctoral Consortium. Ideas generated during this time could be implemented during current school districts, supporting a life rezoning, especially in the context of COVID-19 social distancing. We are hoping to measure the community reactions and trust over the next year and produce a scientific argument to refute or support **RQ4**.

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Hubert Dariusz Zając (2022): It takes a village to raise an AI system - realising AI potential in healthcare. In: Proceedings of the 20th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing on the Design of Cooperation Technologies - Doctoral Colloquium, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.48340/ecscw2022_dc02

It takes a village to raise an AI system - realising AI potential in healthcare

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Doctoral research overview

The leading question of my PhD is: *How to sustainably realise AI potential in healthcare?* Sustainability here is "the capacity to endure" (Lago et al. (2015)) that specifically considers the relation between social and technical dimensions. I aim to use the AI4XRAY project to investigate the many ways, we can transform AI from a concept that fires the imagination, to a tool or a method that has a real and enduring impact on the collaborative medical work. In order to achieve that, I frame my research with four questions that can be answered within the context and the timeline of the AI4XRAY project. The answers will provide a concrete contribution to the understanding of sustainable AI realisation in healthcare. The four research questions are:

1. *What are the challenges faced during real-world use of AI-based medical systems and how can we mitigate them?* I posed this question at the beginning of my PhD after an initial literature analysis revealed no existing compilations of qualitative accounts of medical AI-based systems usage in real-world settings.

2. *How do domain experts and data scientists negotiate ground truth?* This question took shape after following a highly collaborative process of

negotiation, mutual learning, and co-design of ground truth for the final AI-based system.

3. *What are the work practices of radiologists and clinicians using x-rays in Denmark, Kenya, and Thailand?* And *What are the opportunities for AI to support the work of radiologists and clinicians in chest x-ray assessment in Denmark, Kenya, and Thailand?* This question exploits the core advantage and challenge of the AI4XRAY project, namely creating AI-based software for the diverse collaborative work paradigms of radiologists and clinicians from different countries, cultures, and economies.

The methodological approach I use to answer the above questions is rooted in Participatory Design (PD) (Kensing and Blomberg (2004)), Ethnography, Grounded Theory (Strauss and Corbin (1994)) and Abductive Grounded Theory (Rahmani and Leifels (2018)). The Participatory Design principles guide my work within the project. I am engaging with diverse groups of stakeholders and our development team during all the stages of software development to boost their agency over the outcome, deepen understanding of each others work practices and needs, and eventually co-create a solution. I use ethnographic methods like situated observations and qualitative interviews to help understand the complexity of work in the medical domain. It is crucial for me as a researcher and part of the AI4XRAY group to experience first-hand the collaborative work of medical professionals, learn about different types of knowledge, and dependencies existing in different medical settings. At last, to analyse collected data, I rely on Grounded Theory when exploring new topics and processing recorded materials from a new area. On the other hand, when analysing data from an already established domain, I use existing theories to inform my analysis following the Abductive Grounded Theory practice.

Current progress

During the first year of my PhD, I focused on three activities. A systematic review of qualitative evaluations of medical AI implementations in the real world, learning about work practices around chest x-ray handling in Danish hospitals, and participating in the collaborative work of ground truth design. In the following, I elaborate on each of these activities.

Systematic review

We completed a manuscript of a systematic review and submitted it to one of the major HCI journals. The motivation behind the review was to learn about real-world challenges faced when using AI-based systems in complex settings of collaborative medical work. There was no previous compilation of articles of such scope.
Based on the analysis of the included studies, we introduced several grounded

concepts to ease comparison and discussion of AI-related phenomena, which is one of the difficulties afflicting AI development (Girardin and Lathia (2017); Yang et al. (2019); Kayacik et al. (2019)). Among others, we focused on:

1. study outcome to explain the difference between evaluations of systems at various stages of development;

2. development approach - cohesive and discrete - to highlight the different ways an AI model can be developed and incorporated in medical software;

3. a conceptual framework of ten activities of AI medical development to provide a basis for comparison and discussion of AI development process;

4. intended use of medical AI to provide understandable categories capturing the breadth of medical AI applications.

We categorised reported challenges and provided an overview of their origins and consequences. Based on the described categories we synthesised three sociotechnical challenges unique to medical AI that directly affect the work of HCI and CSCW researchers. Solving the right problem, designing the right solution, and balancing authority and accountability. To solve these challenges, we proposed three recommendations:

1. employing existing conceptual frameworks within the targeted domain to deepen our understanding and gain new viewpoints following advises of Blomberg (1993);

2. embracing and exercising HCI methods and practices throughout the entirety of the AI development process;

3. expanding the design space and moving outside of the beaten track, following the discussion by Bjørn and Boulus-Rødje (2015).

Investigating work practices

Belated by the global pandemic of COVID-19, we started ethnographic work at the main hospital in Denmark in the late spring of 2021. The primary focus of that work was to understand the collaborative work that involved the use of chest x-rays and explore which areas of work could benefit from AI support. We aimed to develop an understanding of the work practice of radiologists and ordering clinicians in Denmark to subsequently challenge it and compare through an ethnographic study in collaborating hospitals in Kenya and Thailand.
Due to the specificity of the AI4RAY project, we started from the work of radiologists. We observed five highly specialised thoracic radiologists and three resident radiologists over the course of a week. Each of the observations was extended with a semi-structured qualitative interview. Every consecutive interview was informed by previous observations and interviews. Additionally, we observed

the process of taking x-rays and interviewed three radiographers from the same hospital.
However, had we focused only on radiologists and stopped the activities at that point, we would have observed only a section of the work involving the handling of chest x-rays. We established contact with six clinicians from the same hospital who ordered the highest number of x-rays within a month. All of them worked at one of the following three departments: heart medicine department, thoracic surgery department, intensive care department. We conducted qualitative interviews, informed by the previous activities, to understand the early stages of "x-ray life" and collaboration between the different medical professionals through the medium of x-ray or otherwise.
We learned that the work at the main hospital is highly specialised and doctors employed at that hospital are experts in their domain. It is specialised to such an extent that most of the ordering clinicians we interviewed complete their assessment of taken chest x-rays and take action without waiting for an evaluation from the radiology department. It resulted in the majority of the x-rays becoming a mundane and unwanted part of practice on the radiologists' side. To understand better the relation between specialisation, chest x-rays, and collaboration, we intend to repeat similar work at regional hospitals. This work is currently in progress.

Designing ground truth

I conducted participative observations of the collaborative work of radiologists and data scientists on designing ground truth. In order to obtain a high-quality medical dataset that can serve as the ground truth for an ML algorithm, our team requires a vast number of high-quality labels linked to radiology reports and chest x-rays. However, obtaining such labels provided by subject matter experts, in this case, radiologists, is a resource-intensive process (Fort (2016)). Moreover, it is often perceived as a necessity, and the articulation work that enables creating labelled datasets is considered banal and obvious by data practitioners (Feinberg (2017)). These viewpoints certainly add to the practice of not documenting work by data scientists (Zhang et al. (2020)), which may further result in making it invisible and impossible to inspect at the later stages of AI development (Muller et al. (2021)).
During the collaboration between radiologists and data scientists, they negotiated and designed a label structure that is currently used by subject matter experts to label a selection of x-rays that is going to be used as ground truth by the future AI. Moreover, we designed and implemented a custom tool for labelling of x-rays and radiological reports, as the number of specialised tools supporting such a process is very low (Chen et al. (2019)). The results of that collaboration will have a direct impact on the final capabilities of the future system and the way it will be used. However, the design decisions taken during this articulation work are severely underreported and underresearched (Muller et al. (2021)).

Future work

The next steps in my research include unpacking the collaborative process of creating a label structure. I will base this analysis on sensemaking (Weick and Sutcliffe (2005)) and focus on the tensions between the two groups, their goals, and motivations. I plan to expand on the labelling process suggested by Fort (2016), through investigation of the collaborative design process that took place before the act of labelling and its implications for the final system. I will analyse artefacts collected during that process - digital notes and memos from the meetings, email communication, audio recordings of the meetings. I will use the acquired knowledge to inform a series of qualitative interviews with team members working on the ground truth design. To assess the outcome of the collaboration between radiologists and data scientists, I am evaluating the labelling tool through qualitative interviews and observations of labelling performed by a group of external radiologists.
Subsequently, I am planning on deepening my understanding of work practices involving x-rays at Danish hospitals. Simultaneously with the development of the first versions of the AI model, I will shift from an ethnographic approach to participatory design to involve relevant stakeholders in the work on the system. I will introduce early prototypes to their clinical practice to evaluate our assumptions and provide an opportunity for collaborative work on future versions.
Equipped with the knowledge gathered in Danish hospitals, I plan to conduct ethnographic and participatory work in Kenya and Thailand. It is essential for the project to compare the Danish work practices with the ones of radiologists and ordering clinicians in Kenya and Thailand to search for similarities and differences that can result in different needs towards an AI-based prioritisation system. I plan to co-design with relevant stakeholders in the three focal countries to make sure their needs, goals, and concerns are voiced and taken into consideration in the new system.

Expected contributions

I plan for my PhD to contribute through a series of focused articles and studies to the broad question on how to sustainably realise AI potential in healthcare. The first contribution in the form of a systematic review is conceptualising the many sides of medical AI development and use. It enables HCI and CSCW researchers, data scientists, healthcare professionals, and medical team leaders to gain a unique outlook into commonly faced challenges during medical AI development and use, as well as recommendations on how to tackle them. The second contribution is bringing forward and unpacking the invisible work required to create medical datasets. Through disclosing tensions and motivations occurring during the collaborative process of ground truth design, I plan to directly contribute to the creation of more robust datasets and deepening understanding of the process that takes place before training an AI model. At last a comparison study of the work practices involving x-rays handling in Denmark, Kenya, and Thailand will provide

a unique insight into the collaborative work of medical professionals with x-ray examinations serving as the collaboration medium. This comparison will be further developed into a case study of varying needs towards AI prioritisation systems in radiology.

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Julia Seitz (2022): Designing User-Adaptive Video Meeting Systems . In: Proceedings of the 20th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing on the Design of Cooperation Technologies - Doctoral Colloquium, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.48340/ecscw2022_dc03

Designing User-Adaptive Video Meeting Systems

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Abstract. Video meetings are omnipresent in our daily life. Besides their widely acknowledged advantages, negative impacts in the form of the "ZOOM fatigue" phenomenon became increasingly observable. This feeling of exhaustion according to current knowledge is caused by a myriad of antecedents, where inappropriate or extensive use is recognized as a major driver for ZOOM fatigue. Currently proposed countermeasures are mostly related to changing user behavior and require action from the user. To shift the action from the user to the system, in my PhD project, I aim to design a user-adaptive video meeting system that automatically adapts based on the recognition of user's current state with biosignals. Thereby, I plan to contribute with descriptive and prescriptive knowledge on user-adaptive video meeting systems.

Motivation

Due to the ongoing pandemic and the related shift towards remote work, the amount of time spent in video meetings increased drastically and video meeting systems have become a key element in our daily work (Chew and Azizi, 2022). Experiences with this strong use of video meeting systems show that users experience a phenomena referred to as ZOOM fatigue (Bailenson, 2021; Fosslien and Duffy, 2020). ZOOM fatigue, the *"somatic and cognitive exhaustion that is*

caused by the intensive and/or inappropriate use of videoconferencing tools" (Riedl, 2021, p.5), thereby relates to symptoms such as headache, tiredness, or discomfort (Riedl, 2021). It leads to decreased well-being (e.g., digital burnout, incorrect edacious behavior, appearance dissatisfaction) and productivity (e.g., poor participation, engagement, task performance) (Bailenson, 2021; Fauville et al., 2021; Pikoos et al., 2021; Kuhn, 2022; Rogelberg, 2020; Yilmaz et al., 2020; Shockley et al., 2021; Sharma et al., 2021). In previous research, related concepts researched in the CSCW field are for instance exhaustion, low energy, technostress, social media or mental fatigue (Bullock et al., 2022; Riedl, 2021; Fauville et al., 2021). Literature suggests that it can be caused by a myriad of antecedents, which are either user-specific (personal characteristics, emotions, endured cognitive load), organization-specific (role in meeting, degree of interactivity, group belongingness), or technology-specific (nonverbal overload due to sending and receiving cues, constant self-view, decreased distance to screen) ((Bailenson, 2021; Bennett et al., 2021; Fauville et al., 2021; Kushner, 2021; Nesher Shoshan and Wehrt, 2021; Shockley et al., 2021), see Döring et al. (2022) for a review). To tackle ZOOM fatigue, diverse countermeasures are proposed in research and practice, such as biobreaks, reduced amount of meetings, or reduced stimuli on the screen (Bennett et al., 2021; Peper et al., 2021; Toney et al., 2021). However, these countermeasures are mainly related to the adaptation of behavior and must be initiated by the users themselves.

An interesting alternative to reducing ZOOM fatigue is to design the system itself intelligent. This system-centric adaptation can be realized by recognizing corresponding user states via biosignals, which according to first evidences, is also possible for ZOOM fatigue (Patel, 2021). Following the principles of physio-adaptive systems (Fairclough, 2009), this information about the user can be used to cover the advantages of individuation by responding proactively and implicitly (Aarts, 2004; Hancock et al., 2005). Physio-adaptive systems rely on the biocybernetic loop and build upon the collection of biosignals, which are then analyzed to recognize the current state (Pope et al., 1995). Afterward, the system adapts based on the recognized state (Allanson and Fairclough, 2004; Riedl and Léger, 2016) and positively impacts well-being and performance (Gilleade et al., 2005; Rani et al., 2005; Pope and Palsson, 2001). I thus want to research and leverage existing knowledge on ZOOM fatigue and its predicted antecedents, as well as insights on the possibility to measure ZOOM fatigue and its antecedents by biosignals, to explore the design of adaptive video meeting systems that aim to reduce the user's fatigue through intelligent adaptations.

Research Questions

To achieve my research goal, I identified existing research gaps which lead to my research questions (RQ). I articulate my overall RQ as the following: *How to design user-adaptive video meeting systems that combat selected antecedents and*

ultimately ZOOM *fatigue based on biosignals?* Therefore, my overall PhD project is organized in the two major streams of recognition and adaptation:

1. Recognition Stream: In this stream I focus on recognizing user states via biosignals, especially eye-tracking and electrocardiogram (ECG) signals. To the best of my knowledge, no systematic overview on existing publicly available datasets exists that measure cognitive load, an antecedent to fatigue, or fatigue itself based on biosignals as a basis for training classifiers using machine learning. I aim to first create such an overview and subsequently train classifiers using biosignals captured in the available datasets. In case available data does not cover my requirements, it may be required to collect a new dataset. Afterward, I aim to evaluate the trained classifiers in the context of video meetings to explore their applicability and performance. This can be summarized in the following RQ:

   Can a classifier for cognitive load and ultimately ZOOM *fatigue be successfully trained using biosignals in virtual meeting context?*

2. Adaptation Stream: Here I want to understand the current state-of-the-art on adaptations in video meeting systems. As to the best of my knowledge no overview on the adaptability of these systems exists, I plan to close this gap by creating a literature review including a conceptual framework. Subsequently, I plan to contribute with a dedicated design proposal for a user-adaptive video meeting system that aims to decrease ZOOM fatigue and selected antecedents such as cognitive load. As a starting point, I observe and afterwards aim to decrease the suggested impact of the self-view feature provided by contemporary video meeting tools on cognitive load and distraction as antecedents to fatigue based on selected biosignals and afterwards pursue with other features (Bailenson, 2021; Horn and Behrend, 2017). This can be summarized in the following RQ:

   Which features of video meeting systems can be designed adaptive? How to design adaptive video meeting systems to reduce ZOOM *fatigue and selected antecedents?*

Methodology

To answer these RQ, I will leverage design science research (DSR) (Vaishnavi and Kuechler, 2004). DSR aims to deliver design knowledge and follows a cyclic approach to deliver an artifact which solves a real-world problem. Following Vaishnavi and Kuechler (2004), each cycle consists of five phases: problem awareness, suggestion, development, evaluation and conclusion. To achieve problem awareness, I gain insights from existing literature, by following the methodology of a systematic literature review, and an observation study of gaze patterns and user states while being confronted with different forms of self-view. Additionally, with regards to the recognition stream, I will collect and explore

existing biosignal datasets and corresponding classifiers. In the suggestion and development phase, I plan to leverage biosignals and classifiers trained according to the machine learning lifecycle as the foundation for the planned adaptation. Subsequently, I will conduct experimental studies in the evaluation phase to analyze whether the adaptation is perceived timely, accurate and intuitive without unwanted consequences (Fairclough and Gilleade, 2012). Subsequent cycles include additional adaptation features.

Findings

To motivate my topic from a user's perspective, I already conducted a systematic review on collaboration technology's impact on affective and cognitive states, which identified that using biosignals are an underrepresented modality and adaptive or intervening features mostly focus on joint attention or emotion support.

In the recognition stream, I conducted a systematic review and identified 34 publicly available biosignal datasets and their classifiers for identifying cognitive load, an antecedent leading to fatigue, which I rated based on comparison criteria for reference datasets. Based on these findings, I develop a machine learning model leveraging ECG data to classify cognitive load.

In the adaptation stream, I explored potential features to focus on when designing user-adaptive video meeting systems. Specifically, I identified the self-view feature as my focus for a first DSR cycle due to its impact on ZOOM fatigue (Bailenson, 2021). In the problem awareness phase, I leveraged insights from literature and data. Thus, besides reviewing existing studies on the impact of self-view and underlying psychological theories in the online and offline world (i.e., self-presentation, self-awareness, attention-restoration theory) (Duval and Wicklund, 1972; Kaplan, 1995; Kuhn, 2022; Vohs et al., 2005), I used data from a field study of a colleague involving virtual meetings conducted in triads to gain initial insights on differences in gaze patterns regarding the self-view. Differences in the share of fixation duration per area of interest (i.e., content, pictures of others and own self-view) were visible depending on the role in the meeting (presenter/listener/conversation participant) and between the both groups which performed different tasks. Within the groups, between person differences varying between 0.8 to 13 percent of total fixation duration during listening on the self-view were observable. This suggests that offline mirror gaze patterns and related differences in self-view traits might be applicable to the online domain as well (Barnier and Collison, 2019; Potthoff and Schienle, 2021).

Next Steps

As I am still in an early stage of my PhD project, my next step is to focus my research direction with regards to recognition of ZOOM fatigue and selected antecedents and adaptation features of video meeting systems. To answer my

outlined RQ, I take the following steps: As the sample size in my observation presented in the findings was fairly small and only one specific setting was observed, I am currently designing an experimental observation study to further investigate the gaze patterns on the self-view feature. I plan to run this study with a larger sample size (approx. 30 participants) and additional control variables (e.g., self-esteem) to strengthen my previous insights. Also, I plan to evaluate the trained classifier to ensure its applicability in the video meeting context. I will combine this evaluation with my experimental observation study on the user's self-view as I aim to simultaneously record ECG data and cognitive load in the conducted sessions. Afterward, the subjective state information can be compared with the prediction of the classifier. This is done to decide whether classifier and gaze patterns are capable of recognizing the user state sufficiently to ensure a well-designed adaptation logic or whether other mechanisms (e.g., differentiation based on task/meeting characteristics) need to be used instead. Based on this, I will, subsequently, proceed in the next step of the DSR cycle addressing the design of the adaptation feature, which will be evaluated afterwards. The user interface design of the adaptation and a combination of both will be explored in an additional cycle. In parallel, I plan to work on the systematic review of adaptability in video meeting systems.

Expected Contributions

In this research project, I expect to make several contributions. First, I would like to contribute by providing a systematic review of video meeting system features to better understand the system's adaptation possibilities. Second, in the recognition stream, I contribute with a state-of-the-art overview on existing publicly available datasets and classifiers for antecedents of ZOOM fatigue. Furthermore, I aim to contribute with a biosignal-based classifier for antecedents and ZOOM fatigue. Besides, I aim to contribute with the results of an experimental study on gaze patterns on the self-view during video meetings, based on the presented observation, and thereby use objective instead of subjective measurement methods in the literature stream on ZOOM fatigue. Fourth, I plan to use these results for designing biosignal-based adaptations of video-meeting systems. The goal is to continuously measure user states while collaborating and dynamically adapt features such as the self-view option. Thereby, I aim to contribute with prescriptive knowledge for user-adaptive video meeting systems.

Overall, the expected results should help to decrease ZOOM fatigue during video meetings by adapting the system to the users' needs. Thereby I aim to contribute to more human-centered digital work environments able to reduce zoom fatigue in a post-pandemic world.

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Julian Mosen (2022): The Structure of Social Documents: Visualising Digital Traces of Collaborative Work. In: 20th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing on the Design of Cooperation Technologies - Doctoral Colloquium (ISSN 2510-2591), DOI: 10.48340/ecscw2022_dc04

The Structure of Social Documents: Visualising Digital Traces of Collaborative Work

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Abstract. Social documents are user-generated digital artefacts, created for collaboration and communication among employees. Typical examples are wiki articles or blog posts including comments and attachments, which are stored and interacted with in enterprise collaboration systems. These documents are highly networked and contain a huge amount of meta data about who created or contributed new information. They provide a valuable data source for the reconstruction of user interactions and can be transformed into detailed descriptions of patterns and practices of digital work. The analysis of such rich stories will help to develop a better understanding how digital collaboration takes place in organisations. Unfortunately, existing research on social documents as traces of digital work is very limited. Assembling the single traces to rich stories requires knowledge about components, possible compositions, relations and emerging structures of social documents. These characteristics are less explored and limit the use of social documents for further studies on collaborative activities. The proposed dissertation aims to contribute to this problem through an in-depth investigation of the structures of social documents by developing and applying methods and tools for visualising the network and graph characteristics of real data to uncover patterns and common characteristics of digital work.

Motivation and Problem Statement

The increasing relevance of digital work and digital collaboration has been recently confirmed by the Corona pandemic in 2020 and 2021, when the German government forced companies to offer remote work to their employees. Even long before the pandemic, the research fields of *Information Systems* (IS) and *Computer Supported Cooperative Work* (CSCW) investigated how employees are technically supported to enable working together (Greif, 1988; Schmidt & Bannon, 2013) and how collaboration is digitally carried out by employees in practice.

Lately, the emergence of *enterprise social software* (ESS) and *enterprise social networks* (ESN) changed things and resulted in a redesign and transformation of groupware and collaboration systems to complex information infrastructures providing integrated collaboration platforms (Williams & Schubert, 2018) with social features originating from Web 2.0. The seamless integration of new applications, such as wikis, blogs or message boards, has led to new work practices and provided new opportunities for capturing, sharing or combining information and coordinating joint work (Nitschke & Williams, 2018; Schwade & Schubert, 2017). The use of these applications leaves abundant types of *digital traces of work* in the system. Shared files and wiki articles with version histories, blog and board posts with comments and recommendations are just a few of the heterogeneous data that remain in the systems as evidence for user interactions. Each of these digital traces contains a large amount of metadata with information about who created or modified the content at what time. Accordingly, individual user actions can be reconstructed by assembling the single traces in the right order. Their transformation into rich stories of user interactions and the analysis in context with appropriate methods, such as *trace ethnography* (Geiger & Ribes, 2011), seems to be a promising approach to gain valuable insights about the way people communicate and collaborate in organisations.

Unfortunately, there are few studies that examine the traces of digital collaboration in enterprises. Common limitations of existing studies are the focus on either homogeneous data, single types of applications, small user groups, limited timeframes and specific types of activities (Bean & Hott, 2005; Holtzblatt et al., 2010; Millen et al., 2005; Nagel & Schwade, 2020; Richter & Riemer, 2013). These limitations are mostly based on one of the following challenges: (1) Since broad user observations are very time-consuming and very expensive it makes sense to look at user-generated data. As this data is stored in company-internal systems located behind corporate firewalls with limited access to employees only, the data access is quite difficult. (2) The digital traces are often stored in a distributed manner. Each integrated application of a collaboration system can have its individual data stores, data bases and data interfaces. As a result, the data collection requires additional efforts, methods and tools. (3) Digital traces are heterogeneous data, having individual data structures depending on the type of content (Østerlund

et al., 2020). Collaboration is not limited to single documents, but can take place across different types of applications or systems (Schubert & Glitsch, 2016). Work can start in one place, for example two people editing a wiki article, and continue anywhere else, such as a discussion in a related message board. Consequently, the analysis of richer cases from practice requires a detailed understanding of the data structures and characteristics of each application and its content types.

The challenges of previous studies are addressed in this study as follows: To examine richer and more complex forms of collaboration, a large infrastructure with hundreds of users and heterogenous types of integrated applications serves as data source. Having full technical access to the databases of the academic collaboration platform *UniConnect*[1], with more than 4000 users (researchers, employees and students) from 35 universities and research institutions, allows to look at user-generated content that is reused and combined across multiple applications. To make use of the heterogenous traces it is essential to have a common model to analyse and compare different types of content. A fundamental type of digital trace for the planned project is conceptualised with the term *social document* (Hausmann & Williams, 2015), which describes user-generated digital artefacts, that are explicitly intended to be interacted with, can be shared and collaboratively developed, and composed of individual components (Hausmann & Williams, 2016). The concept of a social document covers a wide range of digital traces and offers a starting point for analysing the structures, that emerge when users work and interact with each other in the system. A social document consists of several components, such as a wiki article with comments and attachments. At the same time, it can be highly connected by referencing or being referenced from related documents.

Research Questions

The overarching research question addressed by the dissertation is *how and what insights can be gained about collaborative activities in enterprise collaboration platforms from analysing and interpreting social documents, their structures and their visualisation as digital traces work.*

To answer the research question and to achieve the goal of the thesis, there are four *research questions* (RQ).

- RQ1: Which terminologies are used in the context of social documents in practice and research and how can they be harmonised?
- RQ2: How are social documents structured internally and how are they integrated into their context?

[1] UniConnect is based on HCL Connections, on one of the market leading software products for enterprise collaboration (https://uct.de/uniconnect)

- RQ3: How can the general structure, individual instances and related user interactions of social documents be visualised?
- RQ4: How and what insights into collaborative activities can be gained from the visualisation of social documents?

Each research question is related to a *research objective* (RO) and helps to develop the *research artefacts* (RA). RO1 is to harmonise the terminology on social documents by analysing existing theories and concepts and reviewing common terminology from market leading enterprise collaboration systems. By merging and harmonising the inconsistent terminologies a taxonomy for social documents results as research artefact RA1.

Based on the findings from RO1, a model for the generic structure of social documents is developed (RO2) by reviewing existing models from previous research and analysing their applicability to social documents. Secondly, an observation of the functional and the technical implementation of social documents is carried out for market leading collaboration systems. By merging the findings, an ontology is derived that provides a generic description of structures, relations, dependencies and constraints for social documents and their components. The formalised ontology constitutes the second research artefact RA2.

RO3 is to develop a novel visualisation, that allows to represent internal structures and relations between social documents. This will be evaluated with real data from available collaboration systems. The resulting research artifact RA3 is a method for the graph-based visualisation of social documents.

The last research objective RO4 aims at gaining new insights into collaborative activities. The model from RO2 and the visualisation from RO3 are applied to a large, heterogeneous set of real data from an enterprise collaboration system (UniConnect) on a broader scale. A set of tools is developed to automatically extract social documents from the collaboration system and generate their graph-based visualisations for a larger number. The results are used to study and explore the characteristics of different types of user interactions. The research artefact RA4 is a catalogue of visualisations for real social documents including rich descriptions of the patterns and practices, hidden in those digital traces of work.

Methodological Approach

The research design is guided by the *Design Science Research Methodology* (DSRM) from Peffers et al. (2007). The research process described by DSRM and its cyclical structure provide guidance for the development and evaluation of the expected research artefacts. The cyclical alternation between development and evaluation is used to structure the work on the level of each individual research objective, but also at the higher level for the evaluation and quality assurance of each research artifact against each other. The research methods are based on desk

research and secondary research. For the research objectives RO1 and RO2, a literature analysis and several system analyses are conducted. RO3 is based on prototyping of different visualisations. Research objective RO4 makes use of database reverse engineering and quantitative data collection from existing enterprise collaboration platforms.

Important prerequisites for the success of the project are access to collaboration systems used in practice, data sources for social documents and sufficient computing and storage resources for the implementation. The access to an enterprise collaboration system is provided through the University Competence Center for Collaboration Technologies (UCT)[2]. Necessary computational resources and storage capacities are ensured by the Socio-Physical Advanced Research Cloud Infrastructure (SPARCI)[3].

Findings to Date

Regarding RQ1 and RQ2, a first literature analysis on structural descriptions of user generated Enterprise 2.0 content was conducted and a reverse engineering of the implementation of social documents in a leading enterprise collaboration system was carried out. The findings from literature and reverse engineering then were used to develop the *Social Document Ontology* (SocDOnt), an ontological description of social documents.

One important result of the literature analysis was the existence of an ontology from research on the Semantic Web. Passant et al. (2010) developed the ontology *Semantically-Interlinked Online Communities* (SIOC) and its extension SIOCT to enable interoperability and exchange of user generated content in Web 2.0 applications. A first application of SIOC for data exchange in enterprise systems was described by Lee et al. (2008), who mapped concepts from SIOC to *collaborative work environments* in BSCW, Business Collaborator and NetWeaver. The authors identified that there is a lack of important concepts for a more detailed description. This observation is consistent with those made after our reverse engineering of the technical implementation of social documents in HCL Connections (formerly IBM Connections). We identified more than ten additional concepts that are necessary to overcome the limitations of SIOC in recent collaboration systems. The new concepts have been captured in the *Social Document Ontology* (SocDOnt), which reuses existing concepts from SIOC and

[2] The UCT is a joint research cooperation between the University of Koblenz and the HCL Technologies Germany GmbH (https://uct.de/)

[3] The Socio-Physical Advanced Research Cloud Infrastructure (SPARCI) is a research cloud infrastructure funded by the Deutsche Forschungsgemeinschaft (DFG) (https://gepris.dfg.de/gepris/projekt/432399058)

SIOCT and introduces new concepts that are necessary for a more detailed description of social documents (Williams et al., 2020).

Addressing RQ3, a graph based visualisation for social documents was developed and evaluated with multiple data sets from UniConnect (Mosen et al., 2020). Based on concepts from graph theory, a method for the graphical visualisation of social documents was implemented and allowed to compute first representations for different types of social documents and identify their characteristic structures. The knowledge about characteristic structures for each content types is a precondition for identifying the details and differences, that emerge through individual work practices.

Recently, the SocDOnt is evaluated for the description of further types of user generated content. An important content type is chat messages and related concepts, that can be found in systems for enterprise messaging and chat systems, such as Microsoft Teams, Skype, Mattermost or Slack. Like social documents, chat messages invite for interactions, are highly interconnected by referencing or embedding other documents, including tags, recommendations or having attachments.

Expected Contributions

The overall research aim is to provide a theoretical and practical contribution to the study of social documents and its interpretation as traces for digital work. The ontology-based specification of social documents addresses the limitations of existing ontologies by introducing missing concepts related to enterprise collaboration systems. For the present work, the ontology provides a precise description of the components and relations of social documents, which is the theoretical foundation for the visualisation of social documents. The implementation of a visual representation provides a new method for visualising digital traces of collaboration and can be used to retrospectively reconstruct user interactions and work practices.

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Food does not teleport: Exploring work practice on food delivery platforms through ethnographic inquiry

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Introduction

I can tap a few buttons on my phone and a prepared meal appears at my doorway within 20 minutes. Since food does not teleport, the food must have gotten there in another way. My PhD project investigates how.

While the practice of restaurant-to-door delivery is not novel in itself, one key aspect of modern food delivery is: the platform infrastructures and the way they are deployed. Rather than aggregating restaurant menus and phone numbers, companies are now providing digital infrastructures for the delivery to be completed (Hirschberg, 2019). Thus, they also provide work for a fleet of loosely knit workers through so-called algorithmic management (Lee et al., 2015).

It has now been three years since I was walking down a central hill in my home city and was struck by a guy who came wobbling up on his bicycle; blue jacket, blue square bag and a smartphone mounted to his handlebars. Within three months, I had conducted a pilot study where I worked as a courier myself and interviewed a few workers. Since that first step, I have worked as a food delivery

worker in two different countries and conducted ethnographic interviews with more than a dozen.

In the following, I start by presenting my case and my ethnographic approach to it. I then present my overall research questions, and three empirical questions that contour my research. I end by presenting my next steps and expected contributions.

Case and approach

I study work practice on food delivery platforms from the workers' perspective. To focus my research, I currently mostly study Wolt, a Helsinki-based company founded in 2014 that owns and manages a food delivery platform connecting fast food customers and restaurants with their "courier partners" who deliver the food. While Wolt is as of primo 2022 present in more than 250 cities and 40 countries spread across Europe and Asia, I have, thus far, decided to focus on how the platform works in a Nordic setting by conducting field work in Aarhus, Denmark and Helsinki, Finland.

Methodologically, my PhD project relies on multi-sited ethnographic inquiry and thus extends a long tradition of ethnographic work studies conducted within CSCW (See for instance (Blomberg & Karasti, 2013)). In practice, I signed up as courier almost three years ago and began to work part-time on the platform. Concurrently with this participant observation I have conducted ethnographic interviews with couriers in Aarhus and Helsinki during my two field studies. During my first six-month field work in Aarhus, I worked part-time as a courier myself. In this process, I talked to many couriers while working and conducted long interviews with eight of them. This approach allowed to capture the work process and algorithmic management as it unfolded in my local context.

During my 3-month stay in Helsinki I situated myself with several food delivery workers, by moving into shared student housing in the Northern part of Helsinki where I was the only non-Asian resident. This allowed me to experience the life of some of these workers, and provided plenty of room to both share my research results with them and hear their concerns. These formal and informal interviews were complemented by ride-alongs with three couriers working by car which gave me real-time insight into the work practice as it was conducted by these workers. Finally, I spent days working from a McDonald's in the city centre and got acquainted with several of the workers who had this spot as their "hub" while working for the platform. To deepen my findings, I interviewed nine couriers focusing on themes that had emerged during the initial part of the study.

Given the highly politicized context around these platforms, I find it relevant to state that I am not affiliated with any company, nor any union. I believe deeper insight into the processes that go into developing the platforms, and a better understanding of union history could be fruitful. Such studies could reveal further

details of both the technical composition of the platforms as well as the substantiate the divergence of visions for the future of work amongst unionists. However, my job in this project is to granularly engage with the workers' perspective.

Research questions

Given the exploratory nature of my research as well as the rapidly evolving field, the research questions for my PhD have been subject to continual adjustments. However, the overarching questions encapsulating my work are: How does algorithmic management structure work practices? How does it unfold in different settings from the workers' perspective? In the following section I present three questions that structure and specify my current work. I present these alongside my preliminary findings pertaining to each question. My work until now has been focused on the first question, whereas the latter two play a key role in my current work.

RQ1: How is work practice structured on Wolt in Aarhus?

The research question above structured the first stages of my research, as I began my field work on the platform. While I have consulted other studies on food delivery and algorithmic management since (eg. (Seetharaman et al., 2021; Veen et al., 2020)), the initial part of my PhD was inspired by grounded theory (Charmaz, 2014), and I thus sought to approach the field with limited preconceptions. Through participant observation I came to understand how delivery bags and orders were dispatched, how workers signed up for the platform, and sought to understand each of the steps in the work practice. In this process, I began engaging with the literature around algorithmic management conceptualised as "Software algorithms that assume managerial functions and surrounding institutional devices that support algorithms in practice" (Lee et al., 2015). However, the algorithmic management on the platform appeared milder, or more lenient, than I had anticipated after reading other papers: I experienced no financial repercussions or penalties when I was late or spilled food, I continuously had the opportunity to contact a human supporter whenever there was an issue coming, Wolt was paying me more than similar jobs in Denmark and – finally – I did not experience any sanctions if I chose not to accept certain orders. Building on the vocabulary from Möhlmann and Zalmanson's specification of algorithmic management for IS (Möhlmann & Zalmanson, 2017), I co-wrote an article where we proposed the notion 'lenient algorithmic management' (Kusk & Bossen, 2022). With this, we wanted to convey that the algorithmic management in this context appeared milder than it was portrayed in other studies. We contend that a spectral understanding algorithmic management will prove useful going forward. Further, we displayed how the

lenience in algorithmic management and the unsupervised nature of the work allowed for multiple expressions of agency by the workers.

RQ2: How is work negotiated by workers on food delivery platforms?

The strategies workers engaged in to optimise their work had already come to my attention in Aarhus, but became a primary focus as I moved my study to Helsinki. While focusing on the agency of workers on the platform, I discovered that there were in fact constant negotiations going on between the workers and the platform. Some workers would, based on the information they received from the dispatching algorithm, only accept a small fraction of orders offered to them and the company, in turn, would make more or less information available on this pop-up. I am currently going through my data to identify and describe these negotiations in detail. In doing this, I am building on Strauss and colleagues' empirical work studies in hospitals that, while not negligent of grand circumstances and contexts, focus on the negotiations that occur in various "arcs of work" that are enacted through constant interactions (Strauss, 1985).

RQ3: How is scheduling done on food delivery platforms?

Another one of my current research questions ties to workers' scheduling practices. Given that workers on the Wolt platform currently can choose themselves when they want to go online and offline, I found that each of the workers' I talked to had different plans for when they worked. Some preferred busy evenings; others preferred to work in the light of day; yet others prioritised having the opportunity to take six vacations per year to meet with their children living in another country. Similarly to my work on RQ2 I am going through my data to identify the scheduling practices, describe them in detail and connect them to current discussions on, for instance, flexi-time (Sheail, 2018).

Next steps and expected contribution

In the next part of my PhD, I will focus on analysing my data with the above-mentioned questions in mind. In this process I hope to integrate deeper with previous work on work practice that has been widespread within the CSCW in general and ECSCW in particular. Further, I plan to have a final field study in a context outside of the Nordic region. Here, I plan to follow the Wolt platform to a - from my Scandinavian perspective - remote location such as Kazakhstan or Japan. While the pragmatics of this field study are yet to be finalised, I expect it to contribute with nuance and insights to the research questions above as well as present new questions and answers tying to standardisation and globalisation.

I hope and expect that my research will provide a workers' perspective of how food does not teleport, but rather is subject to a novel work practice with algorithms at the centre. In turn, this should lead to a better understanding of platform work and algorithmic management which are both pressing and controversial topics central to discussions around the future of work. Finally, at a more general level, I hope my work furthers discussions on how algorithms are permeating modern life – including life in the workplace.

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Destabilising Data in Nordic Asylum Decision-making

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Abstract. Asylum decision-making is a complex collaborative work domain. The probability of receiving asylum for individuals from the same country of origin varies significantly across states. Research in this area has been conducted in different disciplines, such as legal studies, social sciences and data science. It remains fragmented and applies discrete methodologies that are rarely integrated. I will combine qualitative work/domain expertise and participatory dialogue with computational decision modelling to answer two questions: 1) What factors shape the production of national asylum decisions? and 2) Why do asylum outcomes across similar cases differ so much from one another? I aim to map a set of interdisciplinary methodological and conceptual tools for engaging asylum decision-making data that can lead to the discovery of possible missing data and "counter datasets." In a preliminary study, I investigated gender-related categories of an open dataset of 9.075 Danish asylum case summaries using data science methods and applying an archival perspective. The analytical insights will be used to facilitate the grounded sensemaking of data together with different groups of practitioners.

1 Studying Asylum Decision-making by Destabilising Data

Asylum decision-making is a highly complex collaborative work domain. The probability of receiving asylum for individuals from the same country of origin varies significantly across states. For example, in 2018 Somali applicants had an 8% chance of receiving asylum in the first instance in Denmark, against 34% in Norway, and 48% in Sweden. Research in this area has been approached from different disciplines, such as legal studies, social sciences and data science, yet it remains fragmented. Discrete methodologies are applied that are rarely integrated (Noll et al. (2007)) and fail to describe and support the complex collaborative work domain sufficiently.

Artificial Intelligence for example has been used in various countries to develop computational models to uncover the influence of extra-legal factors on decision outcomes (e.g. gender factors, adjudicators' level of experience), yet have often fallen short to be sufficiently representative to adequately support the decision process (Schmidt and Bannon (2013)). Instead of developing yet another machine learning algorithm, my interest lies in destabilising the data that is used as a basis for computational decision models and finding novel ways to engage with it. Data can be destabilised by employing interdisciplinary methods and exposing its localised and biased nature (D'Ignazio and Klein (2020)), as well as confronting the data with the perspectives of its subjects.

Inspired by recent work (Menendez-Blanco et al. (2017), Ismail and Kumar (2018), Møller et al. (2021), Aragon et al. (2022)), I aim to combine qualitative work/domain expertise and participatory dialogue with computational decision modelling to answer the following two questions: 1) What factors shape the production of national asylum decisions? and 2) Why do asylum outcomes across similar cases differ so much from one another? I plan to map a set of interdisciplinary methodological and conceptual tools for engaging asylum decision-making data that can lead to the discovery of possible missing data and "counter datasets." (D'Ignazio and Klein (2020)) and ultimately to a more nuanced understanding of this complex collaborative work domain.

My methodological approach combines quantitative computational analysis with qualitative methods. Computational analysis is used to assess the relative importance of different features of asylum cases and develop predictive models of asylum outcomes. Qualitative analysis of legal documents and participatory methods enable grounded and critical sense-making of data together with practitioners and policy makers.

Star and Strauss (2004) and later Bechmann (2019) and Møller et al. (2021) write about giving voice to silenced perspectives and suggest grounded sensemaking of data together with the data subjects to correct the underlying power imbalance which data subjects face. I aim to build on this approach and confront the data about asylum decision-making with its subjects and data workers.

The following sections outline an initial analysis of Danish asylum case data from an archival perspective (Thylstrup et al. (2021)). Drawing from data science methods, qualitative analysis of legal documents and taking an archival perspective, with this preliminary study I aimed to study, how gender-related categories are presented in the Danish asylum case summaries, as a way of destabilising asylum data. I first investigated the construction of the category of gender-related persecution by the United Nations Refugee Agency (UNHCR) through a collection of topics, such as homosexuality and female genital mutilation. Based on these topics, I analysed an open dataset of 9.075 asylum case summaries, handled by the Danish Refugee Appeals Board and conducted a topic analysis to determine how the formal category of gender-related persecution was transformed in a national context. This study resulted in analytical insights that can be used as material to engage with stakeholders and to study the practices of asylum decision-making in Denmark.

2 An Archival Perspective as an Entry Point to Studying Asylum Decision-Making

Increasingly, data in asylum decision-making is saved to databases (both national and international) that come to form an archive, a long standing interest of CSCW Ackerman et al. (2013). Following Foucault's notion of power, an archive can be an empirical manifestation functioning as a tool for data collection and production, but also an analytical concept or a lens (Foucault (1972)). Power from this perspective is 'generative' and archives are distinctly uncertain spaces of knowledge production (Thylstrup (2022)). Taking an archival perspective thus also means paying close attention to power structures that shape archives D'Ignazio and Klein (2020) and thus become scrutable (Thylstrup (2022)).

I deconstruct the empirical gender-related categories archived as part of the collaboration across the Danish national authorities and the Danish Refugee Appeals Board. Deconstructing categories is an example of destabilising data in the sense that it brings to the fore topics that are omitted and articulated in the empirical categories. While *practices* of categorization and classification are a long-term interest of CSCW (Suchman (1993), Bowker and Star (1999), Møller and Bjørn (2011), Boyd and Crawford (2012), Pine and Liboiron (2015)), an archival perspective seeks to increase sensitivity towards understandings context and power relationships structuring datasets. My interest is to establish the empirical gender-related categories as a link between the categorization practices that take place on a national level and the international political context that shape it.

3 Gender-related Persecution in International Asylum Law

While international law - notably the 1951 Refugee Convention - establishes a common definition of who counts as a refugee, states adapt and transform this category through both their national law and decision-making. States therefore operate different institutional and procedural frameworks for asylum decision-making. This process results in loosely coordinated but still diverging practices across states.

The 1951 UN Refugee Convention describes a refugee as:

> owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country. (Article 1 A (2) Refugee Convention, UNHCR (1951))

Unlike some later human rights conventions, gender or sexual orientation is not a category explicitly listed in this definition. Since the 1980s, however, national asylum authorities have gradually come to recognise that gender may form the basis of an asylum claim, for instance where women face repercussions for transgressing social mores or sexual minorities face widespread persecution in the societies in which they live.

In 2002, the UNHCR issued a guideline on gender-related persecution (UNHCR (2002), which is illuminating in terms of elaborating upon and qualifying the types of cases which belong within the category of gender-related persecution. As such, the UNHCR guideline may be read as constructing a category for seeking asylum. Topics that are included in that category are homosexuality, female genital mutilation etc. In the ensuing analysis, I systematically extract these topics, query the case summaries on this basis and analyse their occurrence in the empirical categories applied by the Danish Refugee Appeals Board.

4 Using NLP Methods to Interrogate Categories

The object of this analysis is the publicly available dataset by the Danish Refugee Appeals Board (https://fln.dk/praksis). The data consists of summaries of asylum decisions by the Refugee Appeals Board in Denmark between 2004 and 2021. The Refugee Appeals Board is the second institution to assess applications for asylum in Denmark. Only cases rejected by the Danish Immigration Service, the first instance in the process, are automatically referred to the Refugee Appeals Board.

I perform the analysis of the topic of gender-related persecution in steps:

	Gender-related persecution	LGBT	Sexual conditions	Marital conditions	Other gender-related persecution	Total
Homosexuality	9%	89%	12%	1%	1%	**269**
Rape	17%	12%	21%	30%	19%	**262**
Female genital mutilation	8%	0%	2%	17%	65%	**177**
Forced marriage	7%	0%	5%	41%	14%	**143**
Human trafficking	6%	1%	1%	1%	11%	**48**
Forced abortion	1%	1%	3%	10%	2%	**41**
Bisexuality	0%	15%	1%	0%	0%	**39**
Forced prostitution	4%	2%	2%	1%	5%	**35**
Transgenderism	0%	2%	0%	1%	0%	**6**
Forced sterilisation	1%	0%	0%	0%	1%	**6**
Transvestism	0%	0%	0%	0%	0%	**0**
Total	303	211	366	474	175	

Figure 1. This Figure shows the 11 topics extracted from the UNHCR guideline on gender-related persecution (rows) and the five empirical gender-related categories in the public dataset of the Danish Refugee Appeals Board (columns). It illustrates the prevalence of different topics in the categories. The percentages indicate the proportion of overall cases in the category that are tagged with the topic. One case can be tagged with several topics and some cases are not tagged with one of the extracted topics at all. Thus, the percentages of the categories (in the columns) don't add up to 100%. The darker the cell shading, the bigger the proportion of cases in that particular category that mention a particular topic.

1. I conducted initial exploratory analysis of asylum motives in the data and the UNHCR definition of gender-related persecution. I then selected the categories in the Danish dataset that match the definition given by the UNHCR. These are the empirical categories:

   - gender-related persecution
   - LGBT
   - sexual conditions
   - marital conditions
   - other gender-related persecution

   Following the UNHCR guideline, claims based on sexual orientation contain a gender element, and include topics related to the umbrella term LGBT. I therefore included the categories "LGBT" and "Sexual conditions" in my analysis.

2. I then systematically extracted topics from the UNHCR guideline on gender-related persecution, that are explicitly stated as claims related to gender. Table 4 provides a list of the extracted topics in the first column.

3. Finally, I conducted a topic analysis by querying the case summaries for words related to the extracted topics, see Figure 1. Table I lists the queried terms for each topic. I employed manual stemming of the query words to reduce words to their basic form or stem. This technique is often applied in NLP to account for different forms of words in a text. When selecting

keywords to represent the topics, I aimed to stay as close to the wording of the topic as possible. Each case that contains any of these terms, is counted as one occurrence. That means a case can contain several topics. I then calculated the percentage composition of each category to illustrate which topics constitute a category.

Topic	**Queried terms**
Homosexuality	homoseks, lesbisk
Human trafficking	menneskehandel, traffick
Female genital mutilation	omskåret, omskæring
Forced marriage	tvangsgift
Forced prostitution	prostitution
Rape	voldt
Transgenderism	transkøn
Forced abortion	abort
Forced sterilisation	sterilis
Bisexuality	biseks
Transvestism	transvest

Table I. List of topics extracted from the 2002 UN guideline on gender-related persecution, as well as the terms that represent a topic in a case.

5 Destabilising Data on Gender for Understanding Practice

An overall theme for my research is the destabilisation of data. The central premise of this research is to not take data as a given, but to trace its origin and the processes of interpretation that shaped it. Figure 1 showcases one example of how I work with destabilising of data through topic analysis. The topic analysis is reorganising knowledge and in this sense links to a long-term debate of CSCW on knowledge production (Ackerman et al. (2013)). I illustrate how data science techniques can be useful for reorganising and probing data for omitted and articulated topics in asylum case summaries. Figure 1 shows how categories are composed of topics. Some topics are dispersed over several categories (e.g. human trafficking, rape or forced prostitution), while others are mainly located in one category (e.g. homosexuality). Some of these topics are more articulated than others by almost being turned into their own homogeneous category, as is the case with the category of LGBT, of which 89% of cases are about homosexuality. Other topics, such as female genital mutilation are omitted and therefore rendered invisible by being placed in a residual category. Residual categories cover the cases that do not fit into "pure" categories (Bowker and Star (1999)). One thus expects a

wide scope of topics to be included in that category. However, the empirical residual category in the Danish asylum case data *other gender-related persecution* is dominated by the topic of female genital mutilation. The destabilising of data in this case is exemplified by showing how topics are transformed into categories or not as a result of the work practices underlying asylum decision-making.

I plan to use the initial insights into the data of Danish asylum case data as a basis for participatory sensemaking of the dataset together with various stakeholders of the asylum decision-making process in Denmark. The tables shown in my research description can be seen as a starting point for the design of data artefacts that can be used to facilitate a participatory dialogue.

An obvious next step is to trace the effects of omitted topics, for example, female genital mutilation: Is the recognition rate of asylum lower for this particular group? What does it mean to connect this insight to practice by taking a participatory approach? How can a participation-inspired NLP unfold in a complex, collaborative work domain such as asylum, where we as scholars act as intermediaries between interests of stakeholders with differential power?

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Large-scale Visualisations in Support of Strategic Decisions

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Abstract. Digitalisation of organisational processes requires decision makers to evaluate information generated by newly-adopted digital technology. Making business decisions that involve digital modelling and the impact of visualising model-derived alternatives on strategic decision-making has not been explored by neither management nor visualisation literature. Current visualisation research lacks studies evidently connecting data visualisation to decision-making in the corporate environment. This research addresses this gap by investigating information visualisation requirements when digital alternatives are shown in the context of multi-perspective distributed decision-making, where multiple stakeholders will have different information needs as well as evaluative and decision-making tasks. This study contributes to the visualisation research agenda by focusing on explicit visualisation support to management decision-making in organisations by: 1) exploring information and visualisation requirements for cross-functional stakeholders, 2) developing information visualisation principles to support collaborative distributed decision-making, 3) exploring visualisations as evolvable boundary objects.

Introduction

In R&D-driven organisations where large volumes of experimental data is produced, teams need new approaches to presenting algorithmic predictions to decision makers. The use of predictive modelling for product innovation allows

efficiency gains, shortening the product development cycle and much more (Becker et al., 2005; Bohanec et al., 2017; Fichman et al., 2014). However, trust and confidence to make a decision, as strategic as launching a product to market, based on a digital recommendation are not unconditional. Machine-generated recommendations need to be reviewed and analysed by people to narrow down best candidate selection and consequently make relevant business decisions. Management research studying strategic decision-making concerns information search, evaluation and selection of alternatives as steps of a decision-making process traditionally defined by Cyert and March (1992), Harrison (1975). However, a decision-making process that involves practice of generating and visualising predicted alternatives has not been explored in management studies. On the other hand, visualisation research is short of studies exploring decision makers' activities to claim that visualisations connect to and support business decisions. This PhD research addresses this gap and investigates three aspects of decision-making with digital modelling and visualisations.

First, it explores information visualisation requirements for strategic decision-making by different stakeholders. Visualisations are used for making sense of data and information. Their purpose is to represent, select, transform and present data in a visual form to facilitate its exploration and understanding (Keim et al., 2008; Kirk, 2016, p.19; Lurie and Mason, 2007). Only recently, visualisation research started to explore various aspects of human cognition and decision-making as a task (Dimara et al, 2018; Luo, 2019; Padilla et al., 2018; Patterson et al., 2014; Perdana et al., 2019), but visualisation is not explicitly linked to decision-making (Dimara et al., 2022).

Second, this research focuses on developing information visualisation principles to support distributed decision-making. Collaborative strategic decision-making with digital modelling takes place around shared cognitive and digital artefacts that must provide information relevant to stakeholders with different managerial expertise. The task of deciding about what action to take on digital recommendations becomes a shared decision-making space for these stakeholders. In this space, interactions occur between people; people and a digital modelling interface; and, people and digital output. Thus, decisions result from a process that propagates representations of information about computer-generated recommendations and the business context through the cognitive system of human actors and digital tools.

The third contribution stems from the previous two and explores a view of visualisations as evolvable boundary objects that can provide meaningful visual renderings of digital predictions to distributed stakeholders.

Research question

Looking into a field problem as an opportunity to create knowledge, the following Research Question is posed:

RQ: How can data visualisations help distributed decision makers understand multi-dimensional data and results of predictive modelling?

Research objectives:

(1) Explore new digital information requirements of senior decision-makers needed for strategic decisions
(2) Convert these requirements to a feasible approach of visualising the results of predictive modelling
(3) Develop an approach through implementing a set of prototype visualisations and validating it with decision makers in a series of iterative improvements.

I draw on the concept of Boundary Objects to develop principles of visualisation designs for distributed digital decision-making. Boundary objects can be tangible artefacts or abstract concepts which represent different meanings depending on the perspective, motivations, and requirements of different stakeholders (Star and Griesemer, 1989). Their 'within-practice' and 'across-practice' positioning can be shared throughout different contexts (Carlile, 2002; Start, 1989). Their 'shared surface referents' provide a common platform for collaboration that allows stakeholders maintain their distinctive perspectives, positions and practices (Winter and Butler, 2011). Their 'interpretive flexibility' (Pawlowski and Robey, 2004; Start, 1989) and malleability make them impactful when boundary objects enable 'complex networks of actors to cooperate at a nexus of multiple social worlds' (Winter and Butler, 2011). Exploring multidimensional visualisations for decision-making as boundary objects is expected to provide observations and insights to feed into principles of creating visualisations that help stakeholders understand results of predictive modelling. So that, designed for different levels of decision-making, such visualisations can be articulated for different collaborative within- and cross-functional business communities, and at the same time, should be able to reflect their priorities, practices, and support confidence. For example, visualising the results of digital modelling for a sustainable product alternative should be flexible and evolvable for managers from R&D, supply chain and marketing to make pertinent decisions.

Methodological approach

Single Case Study

An FMCG manufacturing company is used as a case study to explore principles of creating visualisations for collaborative digital decision-making. Defined as 'an in-depth inquiry into a specific and complex phenomenon set within its real-world context' (Yin, 2013), a single case study allows close examination of facts, evidence and information within a specific setting (Yin, 1994, p.40). This research is an exploratory case study from a product development setting.

Action Design Research (ADR)

This PhD research follows the action design research method used for generating actionable knowledge through creating and testing IT artefacts that emerge from 'design, use and ongoing refinement in context' (Sein et al., 2011). Since strategic decisions are made in the context of business situations, the ADR method is well-suited to merge theory, practice and research interventions in the proposed setting. Following the method, each version of an artifact will be evaluated by drawing on relationships between interative assessments of the artifact (visualisation as a boundary object) and theoretical knowledge, as shown in Figure 1.

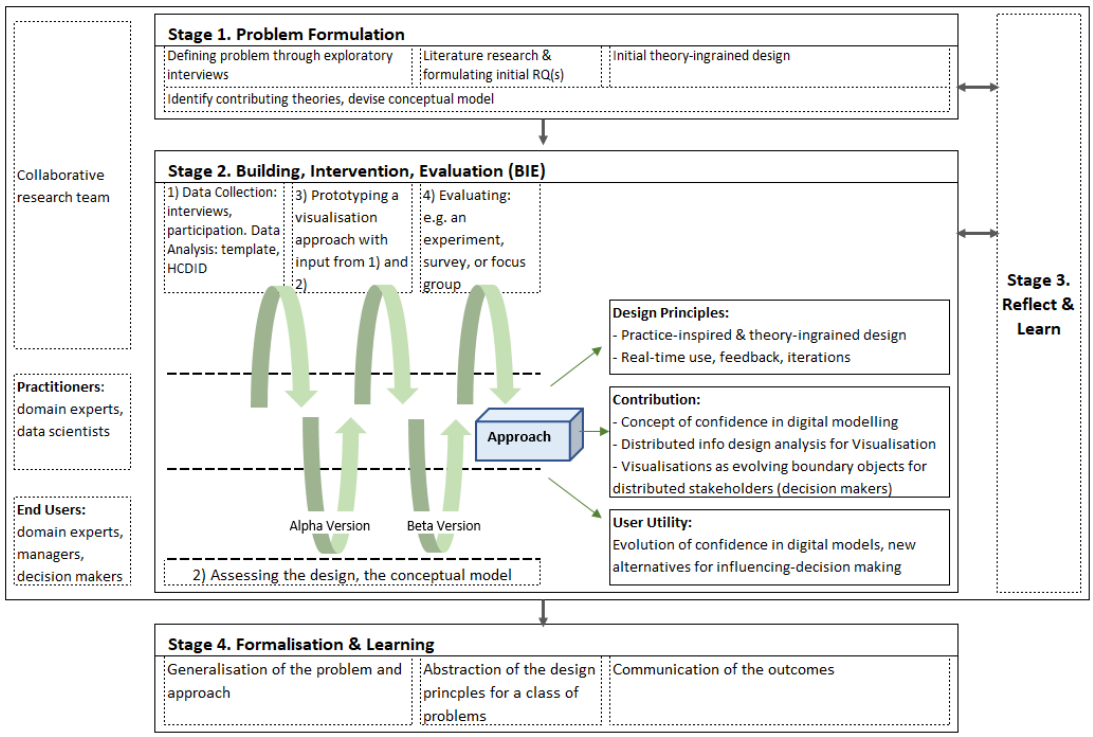


Figure 1. ADR Organisation-Dominant BIE, adapted from Sein et al. (2011)

Data Collection and Analysis

The use of semi-structured and unstructured interviews was selected as a primary data collection technique because it is best suitable for an intensive qualitative study (Healey & Rawlinson, 1993). The objectives of the interviews were to 1) investigate the decision-making process with digital modelling, and 2) capture requirements for information visualisation.

Collected data was organised using the human-centred distributed information design (HCDID) methodology. The HCDID is based on the theory of Distributed Cognition (Hutchins, 1995; Zhang and Norman, 1994) and offers an approach requiring multiple levels of analysis (Zhang et al., 2002). According to the HCDID, the unit of analysis is a system composed of human and artificial agents, and their relations distributed across time and space (Zhang et al., 2002). The distributed information analysis was used to determine which aspects of digital recommendations are relevant to and what data and information visualisation are required by distributed stakeholders. This kind of analysis provides a framework for studying different perspectives of distributed interactions taking place in the digital decision-making process, and cognitive issues involved in designing information representations for a complex distributed, collaborative environment, such as new product development.

Work and findings to date

Interviews and Distributed Information Analysis

The research started with semi-structured interviews within the case study company. Interviewing has allowed engaging with key practitioners and users across relevant departments and teams. Eleven interviews have been conducted with a) data scientists, informaticians and modelers responsible for building predictive modeling capabilities; b) R&D project team leaders and managers directly involved in product development; and c) global decision makers responsible for the strategic direction and implementation.

I used the HCDID methodology to carry out a distributed information and visualisation requirements analysis. Four key components of the analysis are: user, function, task and representation.

Users

Three types of users have been identified. First, a digital team of data scientists, statisticians, informaticians and modelers. Second, direct users of the digital modelling output, who are technical domain experts with different levels of experience. These users are expected to understand what predictive models

represent, but they do not know how a digital modeling algorithm generates recommendations. To use a digital modelling workflow, direct users need to be upskilled and trained. The third group comprises of non-technical domain expert (e.g. business managers), who are unlikely to be direct users of the workflow, however they form a cross-functional decision-making team who decide on actions with regards to the implementation of digital predictions. A relevant design of the visual representation of the modelling output is essential for different types of users.

Distributed functional analysis

The digital team is responsible for building predictive model capabilities, testing the models, workflow building and working with domain experts on using digital tools in their daily activities. The primary function of the digital modelling workflow is to support technical domain experts in R&D to develop products. The users will provide input into the digital modelling interface as a benchmark against which it will run the models and recommend best possible options given multiple input parameters and modelling objectives. Computer-generated recommendations need to be interpreted and validated by the experts. Then, successful candidate(s) can be presented to the cross-functional decision-making team as a product recommendation for manufacture and launch in the marketplace. This final recommendation must provide information relevant to all stakeholders with different functional expertise.

Distributed task

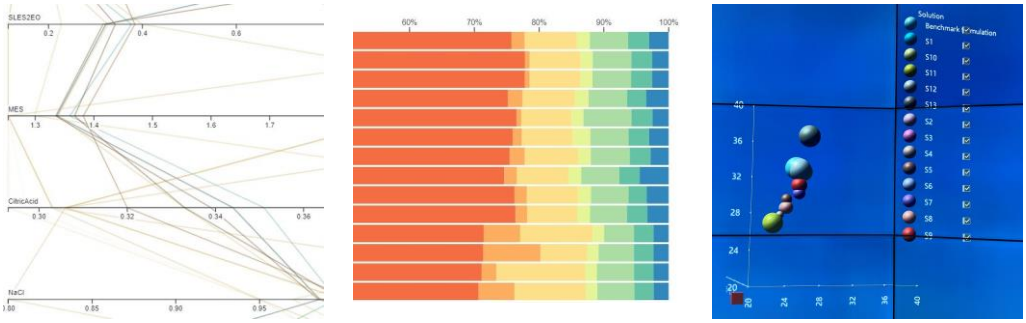
As the digital modelling workflow is designed to generate product recommendations, each prediction has technical, raw material, performance and cost information per recommended alternative. For the distributed task analysis, I explored decision-making tasks of each stakeholder group involved in the process.

Distributed representational analysis

Representational analysis for the 'digital team' group is out of scope in this research. For technical domain experts: each recommendation needs to display product physical properties, attributes, parity/significant differences from the standard, and several business metrics. This group of stakeholders should be able to evaluate alternatives with a high degree of data granularity on a technical level. For the cross-functional stakeholder groups, data visualisations need to answer their key questions of concern at business/managerial level, rather than details of each predicted recommendation at technical levels.

The above analysis has been used to prototype initial visualisation designs based on data output from the digital modelling workflow. The design prototypes are intended to function as a Boundary Object representing a meaning to different stakeholder groups. The prototyping has been done using the D3-Data Driven Documents approach (Bostock et al., 2011) to create interactive 2D visualisations

and the DXR package (Sicat et al., 2019) for Unity to create immersive 3D visualisations, see Figure 2.



a) b) c)

Figure 2. Interactive visualisations built with D3.js (a, b) and DXR for CAVE2 (c).

Next steps

Next steps will involve experimentation and validation involving users (decision makers):

(1) Validating prototypes with stakeholders through iterations
(2) Testing the utility of the boundary object for the users
(3) Developing research findings into a research paper

Expected contributions

This PhD study contributes to visualisation research by focusing on information visualisation support for decision-making, an area that has received little explicit awareness in the visualisation research publications (Dimara et al., 2021; Dwyer et al., 2018). My contribution to knowledge is three-fold: 1) exploring information and visualisation requirements of distributed stakeholders, 2) developing information visualisation principles to support distributed decision-making in a corporate innovation environment, 3) exploring visualisations as evolvable boundary objects.

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Pelin Gunay (2022): Exploring interaction patterns of public seating as a triangulation element encouraging social interaction. In: 20th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing on the Design of Cooperation Technologies - Doctoral Colloquium (ISSN 2510-2591), DOI: 10.48340/ecscw2022_dc08

Exploring interaction patterns of public seating as a triangulation element encouraging social interaction

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Abstract. Design and programming of triangulation elements are formative actors in crafting the dynamics of interpersonal interactions in public settings. With the proliferation of technology, new placemaking strategies, along with an approach of the city as a playground illustrate an expansion in the variety of interaction dynamics in public spaces (Hespanhol & Dalsgaard, 2015). This Ph.D. research questions the role of design as an interaction initiator between citizens in public settings through seating elements. The objective is to explore the interaction design space of '21st cc triangulation elements' and emergent social interaction patterns through the lens of embodiment. A corpus is developed and analysed using methods adopted from grounded theory. Analysed data provided further information to generate design concepts for prototyping and testing interactive seating elements.

Interactions in Public Spaces

Public spaces can be a form of a stage, whether acting is done consciously or not-all occupants play a part in generating a performance (Waal, 2014). These become areas of recognizing the other, defining and differentiating self, where audience and performers meet, demonstrating a continuous relation of 'to see and be seen'. The initial starting point of this study stems from investigating how the interaction between strangers in public spaces forms and the role of mediator furniture forming that interaction. Looking at the user's perception and behavioral habits of interacting with strangers through tertiary elements within public spaces required exploration of concepts from the fields of interaction design, urban design, and media architecture.

This study positions the work of one of the prominent urban design researchers, William Whyte, to its foundation and builds upon the approach of embodied interaction design. Whyte (1988) developed his work around the actual use of plazas evaluating the street elements within, such as chairs, ledges, and benches. He approached studying interaction in public spaces by focusing on street elements and furniture as well as their environmental positioning. His studies about the street elements in urban settings led him to develop the term 'triangulation' (Whyte, 1980). He defined triangulation elements as unexpected things that externally stimulate strangers to interact by offering common ground to initiate contact.

The design and programming of triangulation elements within public spaces can alter and shape the interaction dynamics in place (Waal, 2014). This can either ease or hinder the emergence of social interaction with strangers. Exploring various ways of developing social interaction within public spaces through street furniture as triangulation elements is the focus of this study, especially regarding the range of embodied responses and (un)predictability of the system.

Street Elements and Triangulation

The meaning of 'triangulation element' within the context of this study can be defined as a connection point in the form of street furniture that possibly triggers synchronous interaction between co-located people. The etymology of the word derives from triangulare. As can be inferred, at least three components are required, one of which acts as a mediator of interaction initiator between people.

People notice each other in public spaces; sometimes the act of seeing and watching others might even evolve into developing mutual trust in time. It is also possible to build "Public Familiarity" through consistent encounters with strangers until the place or other becomes recognizable and meaningful (Blokland, 2006). Sites of triangulation create nodes within the space, where citizens realize the

other's presence by sometimes solely 'looking' at each other and sometimes conversing.

Although the persistent occurrence of spontaneous interactions within public spaces plays a fundamental role in creating neighborhood development, some studies show that citizens clearly avoid interaction with strangers (Wekker, 2017). Observing citizen engagement in modern and post-modern public spaces, sociologist Zygmunt Bauman points out the lack of voluntary interactions in urban settings. He introduces the concept of "Mis-meetings - a management of meetings with strangers so that no actual meeting takes place, in place of a meeting" which is a descriptive quality of modern and post-modern urban spaces (Bauman, 2000). Individuals make their lack of interest clear to the 'strangers' through certain indicators and body signals.

Within this context, William Whyte's triangulation elements destabilize the notion of mismeetings. There is a vast array of 'triangulation elements' within public spaces created by various actors; citizens, artists, designers, marketing teams, and government agencies. Revisiting the term in the context of 21st-century public spaces brings about some fundamental differences. Field studies of Whyte (1980) outlined key triangulation elements like sculptures, entertainers, street musicians, and art installations in the plazas of New York around the 1960s, as demonstrated in Figure 1. They acted as a surprise element amongst the mundane everyday life, leading to the gathering of strangers around a common attention point.

Figure 1. Entertainers (left) & Dubuffet's stainless steel "Rag Lady"(right). Original Images from Whyte, 1980

With the proliferation of new technologies and responsive installations, public spaces are being developed and metamorphosed into something different from what was before and is now. As innovative means of communication within the cities are emerging, with a glance around in urban spaces now, we can observe tools facilitating this interaction incorporating more dynamic and digital elements demonstrated in Figure2.

Figure 2. Piano Staircase (left) & Chatterbox (right)

Methodology

This research aims to explore and understand the potential role of design in creating tangible social interaction within public spaces. It is important to define which aspect of design the study will evaluate its findings. To do this, it is required to unpack the keyword 'tangible social interaction'. Hornecker and Buur define tangible interaction as "encompass[ing] a broad range of systems and interfaces relying on embodied interaction, tangible manipulation and physical representation (of data), embeddedness in real space and digitally augmenting physical spaces" (2006, p.1). Building on their focus on the embedded nature of the interaction, this study expands it towards its social nature and positioning of it. 'Tangible social interaction' should be formed from at least two actors and a triangulation element, developing a triadic relation as demonstrated in Figure 3. Each user would need to interact with an external stimulus (a triangulation element) and with each other through it is the focus of attention.

For the start of the study, a corpus collection of triangulation elements was acquired to define and clarify the term. The examples were collected from various resources, academic research papers, social media accounts, blogs, and online research. This collection was gathered to depict what triangulation elements are according to its original definition. The corpus consisted of around 100 examples that are then analysed and categorised to re-evaluate the original definition and how it has evolved.

Adopting methods used in grounded theory methodology to observe and analyse triangulation elements, the development of the corpus played a vital role. The initial analysis started with affinity diagramming, which went through iterative changes as new examples were added to the corpus. All examples fall within the scope of synchronous face-to-face interactions; those that did not meet this criterion were removed from the corpus, which is then grouped in Table I.

Table I. Initial grouping

Type of features	**Realization stage**	**Scale of the concept**
Group1. Physical Elements	Group3. Conceptual Work	Group5. Small scale
Group2. Digital Elements	Group4. Realized Project	Group6. Large scale

Memos were written for each example to generate a code list for analysis, also feeding in from the literature review. After an initial examination, examples that fall within groups 3 and 6 (Conceptual Work and Large Scale) were removed from the collection. Analysis and re-evaluation of the codes (Table II) lead to filtering the corpus by the principal object used in the intervention. This provided a more straightforward path for comparison and, thus, the formation of concepts and subcategorization shown in Table III.

Table II. Initial Code List

public participation	smell	digital display	hands
collective	touch	sound & audio	Competition
input	sight	proximity	Cooperation
output	taste	motor	Dialogic
artefact	hear	DIY	interactive
product	single user	light	predictive (feedback)
device	co-use	pressure	unpredictive response
installation	multi-user	location	sudden
Ad	Public space	biomorph	gradual (phase by phase)
Social Awareness	Parks	IOT	Independent
Fun	playground	vibration	Co-dependent
Artists	museum / galleries	body	Interdependent
Designers	trigger	mechanical	Dependent
PR / Ad agencies	feedback	computing	tangible
Individual interventions	flexible	vibration	intangible
Grassroots	rigid	positioning	smart city
Government	single object	GPS	social city
Anonymous	group of objects	bluetooth	hybrid city
		beacon	redescription

It is still an ongoing process as it depends on gathering of data and giving rise to theories by digging and reconstructing that collected data by alternating between macro and micro level analysis (Corbin & Strauss, 2008). Constant comparisons of

similarities and differences, even within codes reveal different dimensions and properties which leads to a more grounded analysis.

Table III. Subcategorization

Category	**Subcategory**
Intervention Creators	Reflection of various ideologies
	Various public participation level (openness for participation)
Interaction Participants	Change in the number of people interacting lead to the change in the feedback
	Change in the number of people interacting lead to the change in use scenarios
	Various manipulation mediums are applicable in one
	Individual unit vs. group placement of the object
Communication & Exchange Type	Indirect / direct communication between participants
	User-triangulation element interaction
Feedback & Response Type	Time plays a role in changing feedback
	Feedback is same and static
	Flexibility in the use and acquired response
	Communication with the surroundings and the environment

It is crucial to note that the unit of analysis is not solely the interaction between the main user and the triangulation object, but also the interaction of all users within themselves and the mediator. The findings of the analysis will provide input to development of prototypes to be evaluated in field studies. These in situ prototype tests will provide a space to observe and evaluate the dependent, interdependent and independent relations derived from ongoing analysis.

Findings and Future Work

The initial insights revealed intriguing questions about the relationship between emerged interaction patterns and the use of the participant's body and movement. Figure 4 below shows examples falling under the category of interaction participants. Starting with the individual use in the center moving outwards, examples begin to incorporate unexpected feedbacks involving full body active movements. Individual use does not provide such a range of response to the actions of the user as co-use and multi-use scenarios does.

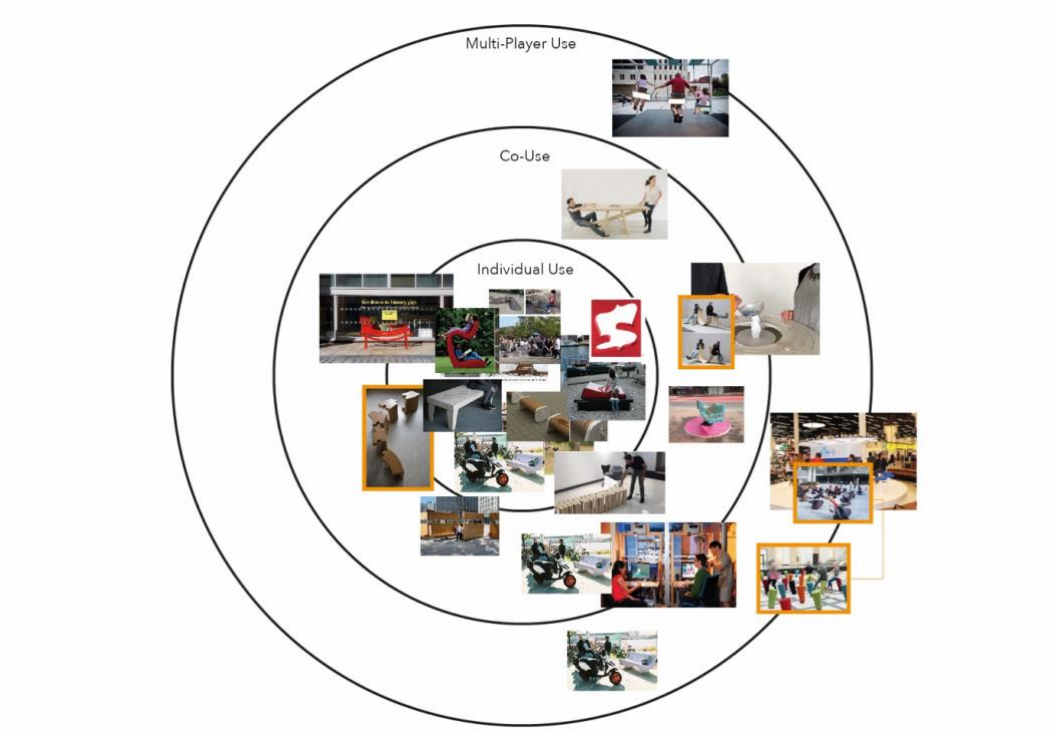

Figure 4. Interaction Participants

After an initial analysis and evaluation of codes, the corpus was filtered by the main objects used- table, bench, swing. The objects were selected to be mundane everyday object that is a part of everyone's daily life. The original static state of these objects should be easily accessible and can be found in almost any public space, reflecting a body response that is familiar.

The selection criteria of these objects were derived especially from embodied design, as a search for examples that reflect a range of object-body relationships. This stems from a place of similar interest in exploring normative vs. unexpected body actions demonstrated in "Embodied Technology: Unraveling Bodily Action with Normative Types" (Boer et al., 2021). Demonstrating a similar selection criterion with the work mentioned, the key issue is to reflect on the different body responses in various usage scenarios. The collected triangulation examples are to display an everyday action in an unfamiliar way; either enhanced or displaced with other partial or full-body movements.

The examples and literature review yields to an understanding that ambiguity and surprise factor provided by different bodily responses would require less dependency on personal motivation to initiate social interaction with another. A question emerged as inferred from the examples, how using various body responses as an input for a triangulation element to function as a social ice breaker leads to a range of interaction patterns with the other and the triangulation element itself.

In order to evaluate and map out the terrain of interaction patterns, a selection of prototypes will be developed demonstrating a range of bodily feedback. Special attention will be given how different parts of body are involved in feedback generation and the relational emerged interaction patterns.

Future work will involve the development of various prototypes building on the conceptual findings. Design outputs will provide opportunities to observe and evaluate emergent interaction dynamics. The inquiry will be based around the developed interaction patterns; exploring the relationship between the involvement of active/passive body movements and their various use as input and/or output.

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Riyaz Sheikh (2022): Exploring shaping and reshaping of work In: 20th European Conference on Computer-Supported Cooperative Work: The International Venue on Practice-centred Computing on the Design of Cooperation Technologies - Doctoral Colloquium (ISSN 2510-2591), DOI: 10.48340/ecscw2022_dc09 Exploring shaping and reshaping of work

Exploring shaping and reshaping of work

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Abstract. Continuous technological development dominates the discourse around the nature of established and new work practices. It conceptualizes, decides, and designs the present and future of work and workers to conform to the cutting-edge globalized market. Without disavowing the potential and influence of the emerging technologies, this paper documents the intention to explore work practices from the worker's perspective, particularly considering the economic aspects of their labor, reacting to how the technologies shape work and how it is performed *in situ*, and how workers interact and collaborate to conduct the work.
The discussed research intends to use ethnographic and participatory research methods. It aims to contribute to the related CSCW and HCI discussions by recentering epistemology of technology-determined work around the worker by recognizing the economic positioning of their labor.

Research questions and positioning

The variegated nature of work - waged and non-waged, visible and invisible - is broadly studied in CSCW and HCI communities. It evolved as a polymorphous concept, recognizing purpose and circumstance as deciding factors to identify an activity as work(Schmidt,2011).

The discussed research work recognizes the economic aspect of work as the crucial characteristic exemplifying the purpose and circumstance of labor. This research recognizes economic aspects of labor as a lynchpin for the related purposes and circumstances while exploring work practices from the workers' perspective and focusing on their influence on how work is shaped technologically and performed *in situ?*

Above all, work is a socio-economic activity for workers. A proper economic assessment of labor adds value to their lives. Lack of such evaluation could deteriorate their agency in practice, pushing them and their efforts towards the brinks of invisibility. Amplifying economic gains is a prominent driving factor for workers in most work practices. This becomes particularly evident in setups involving workers from the unorganized sector, where workers have a higher dependency on the income from the labor or where the wages are loosely decided or not predecided. The purpose of work is thus economic at its core. Whereas acquiring new technologies and developing relevant skills to perform the work grows as an unavoidable necessity for the workers to achieve this purpose.

Obstructing this actuality, emerging assertive technologies prevail the discourse about the nature and future of established and new work practices, leading to the epistemology of technology-determined work. These technologies often originate (or are located) in dominating capitalistic setups and evolve to benefit the innholder. Assertive enough to change the elemental form of work, these technologies develop discourse either ignoring or not giving enough space for the workers' purpose or response to the re/shaping of work. The shaping of the work and worker thus becomes technology-determined.

I believe that considering the economic form of labor while exploring the tech driven shaping of labor brings work and workers to the center of the epistemology of technology-determined work.

Methodological approach

Aiming to explore socially asymmetric and pluralist societies, I am inclined to use ethnographic research methods. Also, I think, combining participatory design research methodologies with apt social theories might help unpack varied experiences.

Work to the date

I have explored arguably one of the newest forms of work - gig work (Graham 2019). I investigated the work organized around one of the prominent food delivery online platforms in India. The study was performed in Pune, India.

The empirical data collection lasted almost over a year, starting in May 2020, traversing the first wave of the pandemic, concluded during the early days of the second wave in April 2021. In this duration, four different types of qualitative data was collected. We started with conversational telephonic interviews and field visits. Field notes capture observations and interactions with 20+ food delivery workers from 4 different locations. Moving on to ride-along sessions capturing food delivery practice *in situ* in audio-video format, each accompanied with an in-depth conversational interview with the delivery worker. Lastly, the monthly income details of 46 food delivery workers were collected.
Using a portion of this data, I am drafting the first journal paper revealing the piecework nature of the studied work and the way workers find workarounds for the workflows imposed by the algorithmically managed food delivery platform. I aim to write two more conference papers using the video analysis of the ride-along sessions and the monthly income data.

Next steps

The own going project around the food delivery workers opens space to explore further the complex entanglements of economic intensions of workers and the manipulative vision of algorithmic technologies for implanting and conducting the work. Budling on it, I plan to explore the food delivery practice performed by emigrant workers in the European context. The assumption is that we would be able to draw some parallels with the study performed in the global south.

Next, the aim is to explore another work practice, preferably an established one, e.g., farming. If time permits, I would also like to look into invisible, emotional labor performed at home. The research questions explained above should be appropriate for each of these projects.

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Design, Implementation and Use of Welfare Technology: Moving Healthcare Activities into Homes

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Introduction

Population projections indicate a worldwide population ageing, with high-income countries leading the list (UN 2020). This poses a challenge for the delivery of healthcare services, both at a societal and economic dimension. In Norway, within the next 15 years, the population of children and young people with be overtaken by the elderly population. By 2060, the number of people over 70 years will have doubled. Particularly affected by this rapid ageing are rural areas within the municipalities of Norway (Syse et al. 2018).

The rise of life expectance comes in hand with an increase in years lived with disability (YLDs) (OECD 2017). A shift in primary care, especially for delivering healthcare services for patients with chronic illnesses, is proposed to address this demographic change (Bodenheimer et al. 2002). Under the Scandinavian term Welfare Technology, a range of technologies and strategies are put in place to support the delivery of healthcare services and improve the life quality for its users.

Welfare Technology

The term Welfare Technology (WT) origins from Denmark; in Norway, it was established in 2011. Welfare Technology is defined as technical assistance to increase safety and security, support inclusion and social well-being, support social participation, and support treatment and care for people with physical, psychological and social impairment (Helsedirektoratet 2012).

According to this definition by the Norwegian Directorate of Health, there is a wide variety of systems that would be classified as Welfare Technology. It is not always simple to draw the boundaries, and the definition of WT can be seen as ambiguous. Another way to approach this subject is to look at the context. A recently published book on WT defines three characteristics of WT: (i) WT takes place in the context of health, care, or welfare; (ii) WT allows to carry out services from a distance; and (iii) the target group is primarily the service recipient, i.e., patients and relative (Moser 2019).

Background

The landscape of Welfare Technology (WT) consists of a wide range of technologies, such as various sensors, the Internet of Things (IoT) or GPS. Even though WT often introduces and relies on innovative technical solutions, challenges within this area are rather of organizational than of technical nature. Hence, the introduction of WT and in turn the digital transformation of healthcare raises challenges of sociotechnical nature (Helsedirektoratet 2012). This also affects the work of care providers and the communication and collaboration with their patients (Pine et al. 2018).

The recipients of WT are a heterogeneous group, with different requirements and conditions. Co-morbidities are no exception, patients often have to manage many diseases simultaneously. They might have to work with different specialists on their conditions and sharing their patient record and reports across different providers can be problematic. Switching perspective, the service provider needs to coordinate and diffuse the WT systems for its patients. They also need to work together with different WT and healthcare service providers, leading to fragmentation of services.

Platforms support the process of bringing together supply and demand, or in this case patients and WT services. A characteristic of platform architecture is its ability to scale. Patients can add (or will be prescribed to) different WT services, which are coordinated centrally by a platform owner (Farshchian et al. 2017). The ability to scale relies also on the underlying infrastructure. The platformization of healthcare services supports the integration of WT services in the workflow of healthcare providers. A platform may be defined in a computational, architectural, figurative, or political meaning. Tiwana is defining a platform as “a software-based product or service that serves as a foundation on which outside parties can build complementary products or services” (Tiwana 2013).

A platform architecture aims to break silos by supporting embeddedness across the ecosystem and provide capacity for the expanding set of WT services. Standardization allows to cover a large area of application, while supporting the highly heterogeneous group of actors by allowing local adoption and customization. Ideally, a platform would attract communities of external developers to add value to the platform (Monteiro et al. 2013).

Research objectives

The aim of this PhD project is to investigate the design, implementation, and use of welfare technology and to unfold the implications of moving healthcare activities into the service user's home. This can be broken down into three research questions.

(1) How is Welfare Technology disseminated to and tailored for its users?
(2) How is moving healthcare work into patients' home affecting the work in healthcare?
(3) What role play IT artifacts when healthcare activities move into the homes of the service users?

Methodological approach

This interdisciplinary project is based on theories, concepts, and practices from the fields of Computer-Supported Cooperated Work (CSCW), Participatory Design (PD) and Information Systems (IS).

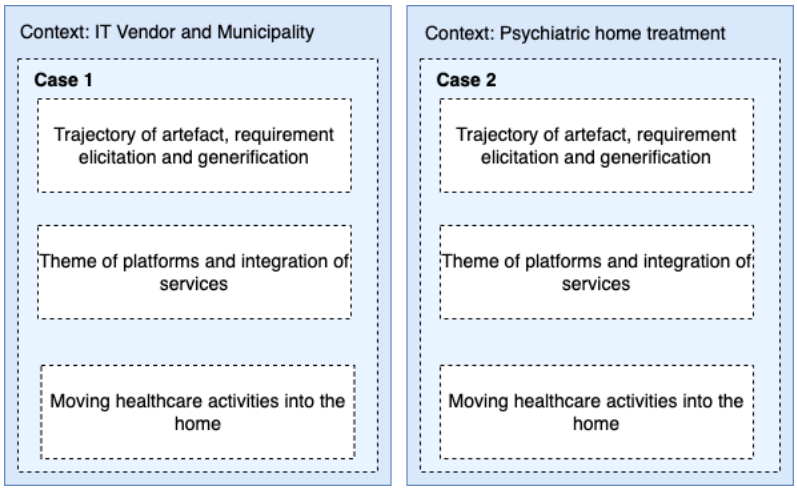

Figure 1. The PhD projects follows a multiple embedded case study design.

Methodologically, this research project is guided by a multiple, embedded case study design (Yin 2017). Data collection methods are mainly qualitative, depending on the case.

For case 1, I relied on semi-structured interviews, participant observations and documents. The site of study was a local company providing welfare technology and a large municipality. Case 2 followed an ethnographic approach, I conducted go-alongs (Kusenbach 2003) with two different mental health home treatment teams. The home treatment teams were situated in Berlin and Brandenburg, this allowed to see the difference between the work carried out in a city and a rural area.

The data analysis follows an interpretive approach following mainly the recommendations of Charmaz' grounded theory (Charmaz 2014). Data collection and analysis are carried out in an iterative way, allowing me to narrow down the analysis over time.

Work to date

The PhD is following an article-based format; hence I will present the work to date by shortly discussing the papers published so far. Until now three papers have been published. The following publications may be included in the final dissertation.

The first article (Hochwarter et al. 2019) published focused on case 2 and presents empirical data collected during a summer school visit at a hospital in Germany. The hospital introduced the in-patient equivalent treatment for psychiatric care (home treatment) as one of the first sites in Germany. When receiving home treatment, the patients are treated as in-patient cases, but stay at their homes and receive daily visits from the home treatment teams. The home treatment patients commonly have a severe, chronic disorder, that needs a different degree of attention. Home treatment is usually carried out over four to six weeks, often during a crisis, and stops when the patient is ready to continue regular treatment again. This paper gives a first empirical overview of case 2 and possible themes are identified for further research.

In the next paper (Hochwarter and A. Farshchian 2020), we are exploring the theme of scaling participation with the help of findings from case 1. The WT supplier we base our analysis on, positioned itself as a platform for their users and the content providers (clinical questionnaires). The company covers a diverse user base and manages to support their requirements with their product. We discuss their strategy of managed communities, inspired by Pollock and Williams [18], and the nature of participation. I presented the paper at the Participatory Design Conference 2020.

A systematic literature (Hochwarter 2021), was carried out in the beginning of the PhD and identifies sociotechnical challenges of distance monitoring. I group the findings in the themes of social, motivational, legal, and cultural challenges. The discussion also includes the collaborative nature of these systems.

Next steps

I have submitted a full paper to ECSCW, which is currently under review. The paper describes mental health home treatment (case 2), a service where patients with severe mental illnesses are visited by a multi-professional psychiatric care team at their homes. Based on ethnographic field work, we present three themes from the data analysis and coin the concept of Becoming a Guest, which is about the ambiguity of proximity and distance.

Having started the last year of this PhD, I currently work on a final paper to be included in the dissertation. The paper will be based on field work from case 1. The focus will be on platforms (Tiwana 2013) and what the concept of fluidity (de Laet and Mol 2000) can offer to the discussion of platforms. Further, I have started with the *Kappa*, which is the Norwegian term for the introductory chapter of the dissertation.

Expected contributions

My research aims to contribute to a better understanding of the intersection of technology and healthcare. The contribution will be two-fold. On the one hand, I aim to theoretically contribute to the discussion of systems in healthcare by advancing the perspective of the interaction of users and artefacts in healthcare (Berg 1999; Latour 2005). On the other hand, my research aims to describe implications for the design of systems in a complex environment in motion.

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