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Designing Awareness Tools for Psychological Well-Being in Collaborative Work Environments

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Abstract. The work practices and tools supporting them are rapidly shifting to hybrid, making computer-supported collaboration more and more salient. Because of the novelty of this modality and imposed pressure to perform, employee well-being is at risk. Awareness support can be an empowering solution when designed in line with human-centered values and well-being as an objective. This thesis investigates how awareness tools can support the psychological well-being of people working together by enabling self-reflection and self-regulation. First, it aims at consolidating knowledge about the roles of awareness support in hybrid contexts. Second, based on empirical research, the thesis strives to derive the design guidelines of awareness support tools that improve the well-being of the employee collaborators. Third, it explores the opportunities to bridge the experience-centeredness of UX and orientation on social practices of CSCW.

Doctoral research overview

Research motivation

How much of the data collected through collaborative technology is beneficial to office workers as end users of such systems? The working processes are rapidly shifting to hybrid modalities, accelerated by the globalization and response to the recent COVID-19 pandemic, therefore we are more and more dependent on collaborative technology for successful collaboration (Yang et al., 2022; Duckert et al., 2022). The data collected through collaborative technology may serve to provide awareness to the users (Gutwin and Greenberg, 2002) about the work environment, others, and self. However, with what goal are these technologies designed and which underlying values do they embed? The workplace is an environment where the tensions are present between different stakeholders. The shift to hybrid incited the organizations to impose workplace surveillance measures, e.g. productivity measurements. Hence, tensions are present between the workers claiming their rights to privacy against surveillance and organizations striving for productivity. Meanwhile, focus on employee experience research is gaining traction (Simsek Caglar et al., 2022). One of the central notions is well-being at work: fulfillment of psychological needs of an individual and meaningfulness of experiences (Mekler and Hornbæk, 2019). How can collaborative technology support not only collaboration but also our well-being in the newly normal hybrid settings? Awareness support, an element traditionally present in the collaborative technology which enables contextual information and facilitates its consolidation (Gutwin and Greenberg, 2002; Niemantsverdriet et al., 2019), can be such a solution. A recent systematic mapping study represented awareness in three dimensions: collaboration, workspace, and contextual (Mantau and Benitti, 2022). Awareness can be supported on different levels: through mirror, metacognitive, or coaching systems (Jermann et al., 2001). My research investigates how awareness tools can support the psychological well-being of people working together.

This research project is a part of a research block grant carried out in partnership with an industrial and governmental partners. This partnership is a unique opportunity to conduct research and test the developments in-situ in work scenarios.

Research questions

The main research question is as follows:

How can we improve collaborative experiences and collaborators' well-being through awareness tools in hybrid settings?

I aim to answer this main research question through the following sub-questions:

- RQ1 – How to achieve a comprehensive measurement of collaboration experience (what is the beneficial combination and triangulation of

subjective, objective, post hoc, real-time measurements, physiological and workplace sensing)?

- RQ2 – What are the ethical and cognitive implications of introducing collaboration experience measurement and awareness tool for the collaboration and collaborators?
- RQ3 – How might we design a collaboration awareness tool that can support collaborators' well-being?

Methodological approach

Designing for the workplace context implies consideration of multiple stakeholders (employees, managers) and systemic factors (organizational culture, domain, existing social practices, and ecologies (Korsgaard et al., 2022)). The presence of power dynamics puts psychological well-being of employees at risk, hence this environment demands special considerations.

First, I am exploring the meaningful indicators of collaboration through empirical research and literature review (RQ1). These indicators should be linked to metrics and measurements techniques. I thus study the prerequisites that make an indicator and related measurement suitable to be used in a collaborative work situation. As a first step towards this goal, I conducted an exploratory diary study and qualitatively analyzed the individual interviews after the diary distribution (study 1). Then, having chosen the measurements, I envision the ethical and cognitive implications of such experience measurement/awareness tool being introduced, using methods such as design fiction, design workshops, focus groups, questionnaires, vignette studies (RQ2). Finally, I aim to conceptualize and validate the awareness tool and monitor its adoption through the longitudinal user studies (RQ3).

Research to date

Study 1: Eliciting meaningful aspects of collaboration through a diary study

Awareness support has become a standard requirement for designing collaborative tools (Niemantsverdriet et al., 2019). However, the design choices are typically made in a top-down manner, without active decision-making from the users. Personal informatics approach (Li et al., 2010) enables collecting and reflecting on meaningful data. To address RQ1 and to gain insights about meaningful aspects of collaboration to be tracked, I have conducted an exploratory diary study building on personal informatics approach. In this study we explored the preparation stage of self-tracking (Li et al., 2010) by inviting 15 office workers to identify meaningful aspects of their collaboration experience and note them down in a notebook for two weeks. We conducted individual semi-structured interviews with participants to determine and reflect on metrics related to their collaboration experience (see the elicited elements in the Table I). The interview explored the

following topics: (a) the entry points into the selected elements of collaboration, (b) the meaningful elements and the narratives that inspired them, (c) implications of tracking such as privacy and the impact of such practice on the participants and their collaborations. The data codebook deductively builds on the collaboration elements identified by Anderson and West (1998), Patel et al. (2012), Marek et al. (2014). The other themes were identified deductively following the interview questions but inductively coded regarding their content. This research contributes new insights into employees' motivations and proposed metrics for tracking collaboration, encompassing personal, social, and organizational aspects of collecting and sharing this data. Even on the low-scale, the study revealed how diverse the perceptions of the participants are. This highlights the benefits of co-design to better understand the people's values and support their needs prior to the tracking (or to awareness support implementation). This research was published and presented as a Late-Breaking Work at NordiCHI'22 (Lushnikova et al., 2022). My first full paper is currently under revision.

Group	Subgroup	Examples of collaboration aspects elicited in the study
Task-orientation	Contribution to task	Speaking time during a meeting, N of mistakes found by a teammate
	Outcome of the task	N of projects successfully finished, KPI (N of articles published), result quality
	Productivity/Efficiency	Flow, focus on planned tasks, improvements, meeting efficiency, N of meetings useless/relevant, N of people in a meeting
Relation-orientation	Interdependency of collaborators	Learning from each other, trust to delegate, reciprocity of help
	Values, norms, attitudes	Impact of hierarchy, transparency, discrimination, inequalities, the required level of diplomacy
Individual-orientation	Emotions and feelings	Mood, emotions, hormones, level of tiredness, frustration, regret, feeling overwhelmed, stress/physical state, level of fun, N of laughs, impact of personality, awkwardness
	Psychological needs	Feeling useless, belonging, feeling in sync, connectedness, level of competence, level of autonomy
Time-orientation		Deadlines respected, scheduling, time spent efficiently, time pressure, time spent collaborating/availability for collaboration, time overlap, time spent preparing a meeting, (a)synchronicity of work
Space-orientation		Space connection (door open/closed), space structure, impact of space (informal collaboration versus focused work)

Table I. Meaningful collaboration aspects elicited in the study 1.

Study 2: A systematic literature review of methods used for measuring collaboration in the context of awareness support tools

As a second and main contribution to RQ1, I am conducting a systematic literature review. Recent systematic literature reviews on the topic of awareness support in collaborative systems (Lopez and Guerrero, 2017; Canché and Pino, 2021; Mantau and Barreto Vavassori Benitti, 2022) focus rather on the ubiquitous mechanisms for providing awareness, approaches to evaluate awareness or techniques to elicit requirements for collaboration systems. My SLR would contribute to understanding the (novel) roles of awareness support in hybrid work and the design values surrounding the solutions. The research questions for this study are the following:

1. What are the indicators of collaboration used in the awareness tools?
2. What are the opportunities and challenges arising from hybrid work contexts (Neumayr et al., 2022) with regards to awareness tools?
3. What type of feedback (Jermann et al., 2001) is provided to the collaborators (e.g., mirroring, metacognitive) and under which form?
4. How does the feedback provided to the stakeholders, in particular the collaborators, impact their perceived well-being?
5. Are specific design values (Friedman et al., 2019) (e.g., human welfare, privacy, trust) explicitly mentioned in the reviewed studies?

The search sources of this review will include the research papers published in the past 10 years and published on IEEE Digital Library, ACM Digital Library and Springer Link as the most representative databases for the research community.

To complement the academic findings of this SLR and address RQ1 in a more comprehensive manner, I will conduct a benchmark of the awareness support tools currently available on the market.

Next steps

The next steps of my research will focus on a series of empirical studies and research-through-design (Dalsgaard, 2010) explorations addressing RQ2 and RQ3. While presented in a sequential order, some studies will be conducted in parallel. They will focus on the data visualization aspect of the awareness tool design and its impact on the experience, the co-design of the awareness tool, and longitudinal observation of the implemented awareness tool (e.g., in the co-working spaces).

Study 3: Longitudinal studies of awareness tools use

To address RQ3, I confront the implementation of an awareness tool with the group work setting. I intend to use the tools commercially available on the market

(e.g., Speaker Coach by Microsoft or Read.ai available as an application for video conferencing tools). I will conduct observations in a group work setting with two between-subject conditions in a series of group work meetings. In the first condition, the group will use the collaboration awareness tool. After the session, the participants will report their collaboration experiences through created questionnaires which will capture their self-reported experience with the tool (e.g., usefulness, acceptance, meaningfulness). I will conduct a focus group with the participants to elicit their individual and group perception of their collaboration experiences and the awareness tool intervention. I will control for the purpose of the group work meeting and the organization roles (employee, manager) of the participants. In the second condition (control), the group will work without the awareness tool. Data collection process is identical. As a follow-up to this study, I would use the same experimental design but confront the users with the imagined collaboration awareness tool implemented through the Wizard of Oz method; I would draw on the results from first step and on the SLR study to select the metrics for the tool.

This study along with the SLR will allow me to assess different types of collaborative data which can be used in awareness tools.

Study 4: Psychological ownership of collaborative data: implications for collecting and sharing

In this empirical study I plan to address RQ2, namely the implications for collaboration experience measurement and awareness tool implementation. I will draw on the concept of psychological ownership (Dawkins et al., 2017) applied to the collaborative data. Psychological ownership (PO) refers to the sense of ownership, a cognitive and emotional state of a person towards a target, which can be tangible like an object or a person, or intangible like a concept (data), organization or community. Design of awareness tools implies collection (in a manual or semi-automated fashion, or through sensors already integrated in the technology) and sharing (visualisation, embodiment, wearables etc.) of the data. Communities like CSCW and personal informatics already study attitudes of people towards sharing their data and implications for designing awareness tools (e.g., Markopoulos (2009); Häkkinen et al. (2020)). However, the concept of psychological ownership could add explanatory power, provide opportunities for generalizing results and inform design decision-making by explaining reluctance/willingness regarding sharing different types of data, with different groups of stakeholders. The research questions are the following:

1. How do data characteristics influence the sense of PO?
2. How do PO and interpersonal relations interact with the attitude and responsibility towards data (sharing, consulting, tracking)?
3. How can PO impact attitude towards different modes of data collection (manual, automatic)?

4. In what cases can PO be an enabler or barrier to sharing the data?

I plan to collect the data in a form of a questionnaire combined with vignettes. The questionnaire content will be based on the findings from the previous studies. Conducting the study on a large-scale will allow me to verify the validity of the results.

Study 5: Exploration of value tensions through speculative design

Using a speculative design approach (Bleecker et al., 2022), I aim to explore the value tensions surrounding an awareness tool implementation in the workplace (addressing RQ2). The experience monitoring and data sharing presents a challenge that can be both beneficial for the direct users and detrimental to their privacy and autonomy. When value tensions are left unaddressed, consequences can include lack of appropriation by the groups who are at a disadvantage or even system sabotage. In the preparatory step, I identify the stakeholders, their values, and value tensions that can arise between those, using the methods rooted in Value Sensitive Design (Friedman et al., 2019; Miller et al., 2007). In the next step, the design fiction based on the value tensions is created with user experience designers as participants. The resulting fiction artifacts will be both showcased to trigger critical reflections, and deployed in a relevant context to obtain contextual feedback from target users. This study will bring about the question of the accountability of the designers and allow reflection on the consequences of design choices.

Expected contributions

The contribution of my thesis is three-fold. First, it aims at consolidating knowledge about the roles of awareness support in hybrid work contexts. Second, the insights gathered through the studies will be used to derive implications for practice, under the form of design guidelines for awareness tools that improve the well-being of the collaborators. Finally, it explores the opportunities to bridge the practices of UX (and the inherent relative individual considerations around psychological needs and well-being) and CSCW (level of social practices).

Personal background

After a Bachelor's degree in Psychology from Saint Petersburg State University (Russia), I worked for five years in the IT industry for international companies such as Uber and Wrike, a SaaS company that creates collaborative project management software. I wore different hats, from a support specialist to a project manager to a data analyst. This richness of experience allowed me to build on my soft skills, such as empathy, problem-solving, and communication with different stakeholders, and hard skills, such as data analysis and visualization.

To reorient my career to the user experience field and leverage my background in psychology, I obtained a Master's degree in Cognitive science and ergonomics from the University of Bordeaux, France. I concluded my Master's studies with a research internship at the HCI research group of the University of Luxembourg. I designed and executed a mixed-method user study that applied Self-Determination Theory to the UX evaluation of digital museum interfaces. The resulting paper is currently under revision.

Attendance expectations

Participation in the doctoral colloquium of ECSCW is a valuable opportunity to receive feedback from the community, DC chairs and peers, regarding my approach and methodology, challenge my assumptions and enrich my perspectives. This is especially relevant since I join the CSCW community with a psychology and UX background. Specifically, I will welcome feedback on the methods and research questions outlined for the current and planned studies, and reflections on bridging UX and CSCW perspectives. I will be equally curious to learn from others about their experience conducting longitudinal studies, which allows witnessing how social technology adoption unfolds and ensuring the ecological validity of the contributions.

My educational and professional background will benefit my peers during the DC. My knowledge of psychological theories, experimental design, and data analysis approaches (quantitative and qualitative) can be helpful for those seeking feedback in planning and conducting studies. Furthermore, my experience with UX methods can benefit those specifically interested in conducting user studies, including living lab deployment. At my university, I regularly participate in the interdisciplinary doctoral consortia of our research team and my doctoral training unit. Therefore I am capable of providing feedback to my peers who come from different backgrounds. Finally, I will be ready to bring to the table my experience in IT and research to reflect together about the academia-industry partnership and its implications for research.

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