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Worst Case Practices Teaching us the Bright Side: Making Meaning out of the Dark Side of Assistive Technologies on the Shop Floor

Sebastian Egger-Lampl[1], Cornelia Gerdenitsch[1], Thomas Meneweger[2], Torkil Clemmensen[3], Thomas Ludwig[4], Myriam Lewkowicz[5]

[1]AIT Austrian Institute of Technology, [2]University of Salzburg, [3]Copenhagen Business School, [4]University of Siegen, [5]Troyes University of Technology
[1]*{firstname.lastname}@ait.ac.at,* [2]*thomas.meneweger@sbg.ac.at,*
[3]*tc.digi@cbs.dk,* [4]*thomas.ludwig@uni-siegen.de,* [5]*myriam.lewkowicz@utt.fr*

Abstract. Digitization, which often claims the vision to support and assist employees with suitable technologies, is immanent in nowadays industry sector. This claim implies the challenge to not only design technologies appropriately, but also to consider that such implementations of assistive technologies do transform and shape existing work practices. Within this workshop we welcome researchers from a diverse range of disciplines to submit concepts or design ideas of *worst practices* related to assistive technologies for the shop floor. These *worst practices* may either be related to previous experiences and projects of the workshop participants or related to three areas of tensions we describe in this proposal. By discussing *worst practices* of assistive technologies, we aim to make central aspects of assistance visible and discussable. Within the workshop, attendees should discuss these *worst practices* and then jointly work on *best practices* designs and prototypes.

Designing assistive technologies for workers[1]

Working on the shop floor becomes increasingly challenging and demanding for human workers, as more and more automated and connected systems are deployed (Ludwig, Kotthaus, Stein, Pipek, & Wulf, 2018). At the same time, production environments are increasingly implementing digital technologies aiming to assist employees within their everyday work. The assistive support of these systems is targeted towards coping with the increasing complexity of industrial work environments and does not only focus on the support of people with disabilities through technology. These assistive technologies include any technology that aims to support employees within their working tasks (cf. Flemisch et al., 2012). For instance, workers can be supported with a robot, an exoskeleton, (mobile) information and communication technologies, or mixed reality applications.

These technologies have the potential to assist workers, but also do shape everyday work practices (Wurhofer, Meneweger, Fuchsberger, & Tscheligi, 2018). Designing successful assistive technologies implies first to meet user needs, which can be ensured by adopting a user-centered design approach (Norman, 2013). But, in this workshop, we focus on another important aspect: We claim that designers should also be aware of, or reflect on, how assistive technologies shape work practices, which brings some challenges for the design of these technologies. By focusing on the topic of assistive technologies for the shop floor, we build upon last year's ECSCW 2018 workshop on "CSCW and the new Wave of Digitalization" (Ludwig et al., 2018) and dig deeper into the area of digitization in the industry sector.

Within the last year we conducted a number of contextual inquiries (Holtzblatt & Beyer, 2014) that took place in industrial manufacturing and / or assembly lines in order to understand users' working practices. Through the course of these inquiries, three major areas of tensions appeared to be highly relevant (and frequent in appearance): i) routines and interruptions of work flows ii) the workers (subjective) tacit knowledge in quality assurance, and iii) individual and standardized workplace setup. These were by far not the only issues we discovered, however they are particular in the sense that each of it can positively or negatively influence work practices with respect to supporting or obstructing the worker in the execution of his daily work. We also witnessed that due to this dual-faced characteristic, these areas are particularly complex to address and therefore often left out in being tackled by novel technological solutions. Hence,

[1] Whereas, the term assistive technologies is often associated with supporting people with disabilities through technology, we consider assistive technologies as support to any kind of workers for coping with increasingly complex and demanding industrial work practices.

we deem them of utmost interest to be tackled in a collaborative scientific workshop effort.

Utmost helpful or utmost obstructing: Three areas of tension in industrial work practices.

In this section, we briefly describe three areas of tension, which emerged within contextual inquiries with workers on the shop floor.

Work flow: routines and interruptions

Experienced workers have established routines to be effective and efficient within their workflow (de Carvalho et al., 2018). In general, individuals are seeking for routine; it is described as a preference for predictability and structuring which decreases cognitive load (Neuberg & Newsom, 1993). For instance, workers who have established routines have to attend to fewer information. On the other hand, repetitive work can also result in a feeling of monotony and in a consequence, increases production errors. Interrupting repetitive work to avoid fatigue or inattention can be helpful here (see also job rotation concepts), but on the other hand also be perceived as distracting (cf. digital distractions; Baethge & Rigotti, 2013; Jett & George, 2003).

In the factory context where variability of products to be assembled increases (due to the aimed decrease in lot size) there is the demand to disrupt established routines. The question arises about how technology can help by disrupting routines without creating a feeling of distraction. Another question that comes up is about how to design technologies that helps to create routines in a constantly changing work context.

Quality assurance: worker's tacit knowledge

There is a wide field of applications of technologies for quality assurance. After a product has been assembled, a machine has been set-up, or a maintenance task has been done, workers are often required to make a quality check of their working task. When experienced workers are asked about how do they do this quality check, they often report something like a sense, or a feeling, or knowing that their work task has been done successfully; they describe their tacit knowledge (Hao, Zhao, Yan, & Wang, 2017).

When products change a lot, even experienced workers cannot check the quality of their working processes adequately at any time. Technologies that are equipped with sensors can support here. However, they may be expensive, and will take away a perceived unique competence of workers. Technologies can also assist workers to apply the needed quality check. The challenge is about how to

design technologies that support workers to develop tacit knowledge instead of taking over quality assurance tasks and replace the worker.

Workstation setup: individual vs. standardized

The freedom to personalise the working environment lowers fluctuation intentions and increases job satisfaction (Wells, 2000). As part of our studies, participants told us that when production cycle times are tight, they prefer to set up the workplace to meet their personal (=employees') needs so that they can act most effectively. Personalisation is therefore necessary for a smooth and efficient workflow. On the other hand, there is a demand for standardizing workstations to enable a flexible use. When designing technologies, the question now arises as to how far this individualization can be allowed while at the same time meeting the requirements of standardization.

Workshop activity and goals: worst and best practices

Submissions to this workshop should preferably focus on one of these three areas of tensions described above and report on *worst practices* in these contexts. Contributions should describe either observations of worst case impacts of technological interventions / systems or design fiction of worst case implementations that inhibit rather than support workers in their daily duties. We also welcome reporting on *worst practices* related to other areas or issues related to assistive technologies for workers.
The aim of the workshop is to jointly work on the best-case side for designing, and developing *best practices*. In the course of the workshop, we will – based on the presented *worst practices* – discuss central aspects of *best practices* of assistance for workers on the shop floor, and then jointly prototype interactive artifacts representing these *best practices*.

To recruit participants, we will distribute a call for *worst practices* competition. Therefore, we aim for at least two submissions for each of the areas of tensions. Following a presentation of the worst case contributions, teams should then work on these 'competing' *best practice* artefacts with rapid prototyping methods. With this approach we expect ideas for both good and *best practices*.

Organizers

Sebastian Egger-Lampl is scientist at AIT Austrian Institute of Technology GmbH, working on Technology Experience and QoE evaluation in the domains of human-to-human mediated interaction, interactive technologies in productive

contexts and online video as well as on behavioural aspects and social collaboration strategies of technology use. Since 2010 he has participated in standardization activities of the ETSI STQ and ITU-T SG 12 where he successfully acted as an editor for two new standards on Web QoE, namely ITU-T G.1031 and ITU-T P.1501. He is author of numerous conference and journal papers and acts as reviewer and TPC member for international conferences and journals such as IEEE ICME and IEEE Transactions on Image Processing.

Cornelia Gerdenitsch, is scientist at AIT Austrian Institute of Technology GmbH. Cornelia holds a master degree in Psychology from the University of Graz and a PhD in Social Science (Work and Organizational Psychology) from the University of Vienna. In her research she is interested in investigating effects of the digital transformation of work and on human behavior. At AIT, she is part of the Technology Experience group.

Thomas Meneweger is a research fellow and PhD student at the Center for Human-Computer Interaction, University of Salzburg and holds a master's degree in sociology. Within his dissertation he explores workers' experiences and work practices in increasingly automated and interconnected work and production environments (e.g., semiconductor factory, assembly lines, truck driving) by means of ethnographic approaches (observations and interviews).

Thomas Ludwig is an Assistant Professor of Cyber-Physiscal Systems at the University of Siegen (Germany). His research focuses on the human-centered design of cyber-physical systems as well as the impact of digitalization on work structures and practices. The application domains range from industrial contexts and the ICT support for workers at the machines to crisis management and the collaboration between emergency services and volunteers. He is a member of EUSSET and has published a variety of renowned publications in the field of CSCW and HCI, such as JCSCW, TOCHI, IJHCS, ECSCW and CHI.

Myriam Lewkowicz is Full Professor of Informatics at Troyes University of Technology (France), where she heads the teaching program ''Management of Information Systems'', and the pluridisciplinary research team Tech-CICO. Her interdisciplinary research involves defining digital technologies to support existing collective practices or to design new collective activities. She is part of the CONNECT project, which is a major initiative in France (funded by the Public Bank of Investment) to accompany Air Liquide in their evolution towards the Industry 4.0. In 2017 she was elected next chair of the European Society for Socially Embedded Technologies (EUSSET).

Torkil Clemmensen is professor at Department of Digitalization, Copenhagen Business School, Denmark. His research interest is in Human-Computer Interaction, in particular psychology as a science of design. The focus of his research is on cultural psychological perspectives on usability and user experience. As chair of International Federation of Information Processing (IFIP), TC Human-Computer Interaction's Working Group 13.6 on Human Work

Interaction Design (HWID) 2008-2014, and currently vice-chair, he co-organizes a series of international workshops and working conferences on work analysis and usability/user experiences in organizational, human, social and cultural contexts. He contributes to key conferences and journals within Human-Computer Interaction, Design, and Information Systems.

Website

Information about the background of the workshop, the call for papers, the structure of the workshop and short CVs of the organizers can be found at: https://worstcasepractices.tech-experience.at .

Pre-Workshop Plans

Prior to the workshop, the submitted papers will be discussed among the organizers to select an appropriate set of papers that will be accepted. Papers will be selected on the basis of their quality, compliance with the workshop themes, and the extent (and diversity) of their backgrounds. The accepted papers, then, will be circulated to prepare the attendees for discussions at the workshop. Beyond the themes highlighted in this proposal, other themes for the workshop emerging from the position papers will be posted on the website. A key discussant, identified among the workshop attendees, will be assigned to each position paper to facilitate interaction and engagement in the workshop. The participants will prepare a six to eight minutes presentation (depending on the number of participants) to create a dynamic and inspiring workshop atmosphere.

Workshop Structure

The workshop is planned as a full day event divided into two sessions and will involve additional online activities organized both before and after the workshop. In the first half of the workshop, participants briefly present their *worst practice contributions* and the discussants will initiate short discussions by asking 2-3 questions. By doing so, we aim to reveal and discuss central aspects of assistance for workers on the shop floor and provide a basis for the afternoon prototyping and design sessions. The second half of the workshop consists of brainstorming and creative thinking sessions, where we we will jointly work on *best practice* design ideas and prototypes. The following schedule is envisioned for the workshop:

09:00 AM	Welcome and introduction to the workshop and participants
09:15 AM	Short presentation and discussion of position-papers (Pt. I)

10:30 AM	Mid-morning break
11:00 AM	Short presentation and discussion of position-papers (Pt. II)
12:00 PM	Wrap-up of emerging topics
12:30 PM	Lunch break
01:30 PM	Brainstorming and creative thinking session in smaller groups
03:30 PM	Mid-afternoon break
04:00 PM	Presentation and discussion of brainstorming session
04:30 PM	Drafting an agenda for future research
05:00 PM	End of workshop & wrap-up

Post-Workshop Plans

We will take the workshop as an opportunity to explore future collaboration, e.g., a mailing list and/or collaborative research projects. We further plan to consider extended versions of selected contributions for a special issue in the CSCW journal.

Call for Paper

This workshop focuses on assistive technologies on the shop floor, claiming to support and assist employees in production environments. By discussing *worst practices* of assistive technologies that bear the potential to transform and shape workers' practices, we aim to discuss central aspects of assistance and – based on that – develop design ideas and prototypes of *best practices* assistance systems for the shop floor

We invite designers, researchers and industry practitioners interested in participating to submit a 2-4-page position paper (following the EUSSET exploratory papers template – available as Latex, MS Word or RTF). Authors should send submissions to worstcasepractices@tech-experience.at in .pdf format not later than 8 April 2019. Position papers will be reviewed by the organizers based on relevance to the workshop and the potential for stimulating discussions on the research agenda to be developed during the workshop. More information is available at: https://worstcasepractices.tech-experience.at

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