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A Constructive-Critical Approach to the Changing Workplace and its Technologies

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Abstract. Implementation of technical systems into work practices can result in shifting the balance of power in terms of what is visible and what is hidden (Suchman 1994; Star & Strauss 1999) and in fundamentally changing the nature of work itself (Bannon 1994). Sometimes these changes can have unpredictable and even adverse effects on the stakeholders involved (Clement & Wagner 1995). ECSCW as a venue has not shied away from pointing out that there is politics to sociomaterial processes we observe and study (Bannon & Bødker 1997; Bjørn and Balka 2007). As work computerization begins to involve the digitization of work practices, however, more thorny political questions emerge. The workplace changes when the spheres of private life and work are blurred as sensors are attached to the employee in the workplace for tracking movement (Gorm & Shklovski 2016; Møller et al. 2017), when the workplace as a fixed physical location is dissolved as in the case of turning homes into "pop-up co-working places" (Rossitto et al. 2017), in the "sharing economy" (Zade & O'Neil 2016), in online labor platforms such as Amazon Mechanical Turk (Irani and Silberman 2013), or when workplace data-collection is management- rather than worker-centric resulting in employee exploitation (Dombrowski 2017). The challenge for CSCW research is to study the changing workplace and affect the nature of collaborative work with the aim of improving the design of computational systems, while attending to and perhaps improving the *conditions for work*.

New questions for CSCW-studies?

The early successes of computerization have given way to increasing digitization of work that has resulted in changing and at times unstable conditions for work. Whether through workplace movement tracking (Møller et al. 2017) or systems to account for invisible work (Bossen & Foss 2016; Stisen & Verdezoto 2017), the relationship between the workplace and the employee is constantly re-negotiated with employees having less influence regarding the various potential kinds of outcomes.

Workplace tracking requires greater data collection so that the work carried out takes on the new dimension of data production as a necessary process (Møller & Vikkelsø 2012). For example, as medical systems require high quality medical data, clerks have had the scope of their work expanded without any changes in pay or benefits (Pine et al. 2016). Where tracking might benefit employers to subtly pressure employees into untenable work-practices, the lack of tracking can enable different kinds of injustices towards the most vulnerable and marginalized (Dombrowski et al. 2017).

The discussion at the CSCW 2017 panel on Social Justice and Design (Fox et al. 2017) brought up the question of whether CSCW research has always been on the side of management, focused on extracting greater value from employees rather than working towards better and more just conditions of work (Irani 2017). How do we, as researchers, determine when we are working towards actual progress and social change and when we are shoring up a system that is fundamentally broken for workers and marginalized groups? How do we balance critique of increasingly precarious and difficult work conditions with pragmatic approaches to action?

In this panel, we argue that a key challenge for CSCW researchers is to ensure that our scholarship results in computational systems development that productively integrates critical perspectives on data-driven work practices and the conditions of work, hence *constructive-critical*.

Concrete examples

ECSCW has always been at the forefront of asking the hard questions and pointing to the difficult issues that are worth study (Clement & Wagner 1995; Bannon & Bødker 1997; Bannon, Schmidt & Wagner 2011) and it is time to ask such questions again. In complex research sites where labour politics, technology, and work practices intertwine, a focus on the artefacts and their uses can suddenly become the safe option, allowing researchers to gloss over the injustices enabled by the technical systems and enacted by the employees they may observe. When studying the use of computational systems, we might consider not only how to ensure that complex tasks are eased and carried out with efficiency, but also the human costs that such increases in efficiency may produce.

The goal of this panel is to discuss the possibilities of studying the political implications of technologies in the workplace and address what it means to build systems aimed to interrupt and underscore the politics of new digital labour practices. ECSCW can and should become the central venue for a conversation about how to make workplace and other technologies to support not only collaboration and efficient work practices but also "a life worth living" (Dreyfuss 2017). The panel consists of researchers whose work has encountered and explored the politics of the changing workplace.

Airi Lampinen: 'Flexible' forms of work may detach professional activities from traditional office premises and enable performing them anytime or anywhere (Gordon, 2002). As an example of grassroots efforts to organize nomadic work, we might consider Hoffice (Home + Office), a co-working methodology and network that encourages people to open up their homes as pop-up workplaces, with the help of online platforms. The goal here is to bring about the comforts of a structured place and time for work and to nurture a sense of community in the midst of isolating professional lives. Yet, the purported freedom of working from anywhere has been questioned (Gregg, 2013), and recent research illustrates how reasons for engaging in nomadic work range from choice to opportunity and obligation (de Carvalho et al., 2017). Examining grassroots efforts like Hoffice can reveal visions about desirable conditions for work while also highlighting the significant challenges in pursuing them without sustained structural support.

Six Silberman: Currently employed at Industriegewerkschaft Metall, the German Metalworkers' Union, Silberman's job is to organize German crowd workers. He was the lead writer of the "Frankfurt Paper on Platform-Based Work" (crowdwork-igmetall.de), a declaration of principles for fair working conditions and labor-management cooperation in online labor platforms drafted collaboratively by unionists and researchers in seven countries. Silberman also supports the ongoing evolution of the "Crowdsourcing Code of Conduct" (crowdsourcing-code.de), a self-regulation initiative developed by German platform companies, and is responsible for the next version of FairCrowdWork.org, a site that rates labor platform working conditions. Silberman uses design fiction to explore how information systems could be part of more democratic organizational and political-economic configurations. His fiction includes work on how GROUP and CSCW researchers could collaborate with "platform cooperativists" to increase democratic participation in the governance of online platforms (Silberman 2016a, 2016b) and work on future directions for reputation systems (Silberman 2017).

Lynn Dombrowski: Dombrowski's work tackles the difficult questions of computerization of low-wage work, precarity, and social justice (Dombrowski et al. 2017; Dombrowski et al. 2016). She points out that while low wage occupations in retail, hospitality, and custodial services are often inundated by technology in the workplace, these sites are often dismissed as non-technical by CSCW. Yet, such work practices are just as regulated, shaped, and controlled by technology (*e.g.,* computerized work scheduling systems that control their time; keycards that track workers' location and movement; timekeeping systems that document their work hours). In this context, employers often use technologies to their advantage at the expense of vulnerable populations. The question of what is the role of computational systems in the management and manipulation of work conditions looms large.

Naja L. Holten Møller: Møller's work highlights how conditions of the traditional workplace are changing for employees across architectural design and healthcare. Here, sensor technologies warrant a change and are an interesting case to discuss in terms of how to balance stakeholder interests. Møller demonstrates the complexity of decisions that designers must make when data tracking in search of workflows is explored as a tool for architectural design of hospitals (Møller et al. 2017); thus, requiring of healthcare practitioners that they take on extra work when agreeing to produce data in and through their daily work. Data from tracking are interpreted to get a better understanding of workflows at the expense of privacy in work. Can sensors attached to the employee for a short period of time be considered 'fairly repaid' (Vertesi and Dourish 2011) when the purpose is to design a better future workplace? The central question is, how do we balance agendas of data tracking of employees in work against the development of new 'tools' for things such as architectural design. How do we support employees in boundary management (Palen and Dourish 2003) in this particular case?

Irina Shklovski: Computational systems in the workplace have been called upon not only to support work as practice but also to hold that practice to account. As Light, Shklovski and Powell (2017) point out: "Higher efficiency, more distraction and greater streamlining may mean fewer cracks through which people can fall in the short-term, but it also silences the critical chorus who would bring other ideas to try." In other words, striving for workplaces made efficient through technological means may result in obvious short-term gains with significant long-term drawbacks. Having every move made visible or quantified for the sake of easing collaborative output or using gamification to ensure particular levels of performance on rote tasks can come at the expense of a sense of dignity (Margalit 2009). In 1987, Robert Kraut asked whether "technology can be introduced into the workplace to exploit its usefulness without exploiting its users" and the question still stands (Kraut 1987).

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Ryan Kirkbride (2017): Cooperative Live Coding of Electronic Music with Troop. In: Proceedings of 15th European Conference on Computer-Supported Cooperative Work - Exploratory Papers, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2017_p4

Cooperative Live Coding of Electronic Music with Troop

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Abstract. Live coding is the process of generating audio or visuals using algorithms that are written, and re-written, live in front of an audience. In a typical performance the live coder will project their screen and share their code and creative processes with the audience. When playing together, a group of live coders will often share resources over a network, such as a tempo clock or lines of code, but rarely do they work together on the same material concurrently. Troop is an interactive text editor that allows multiple users to edit a text buffer simultaneously, evaluate portions of code, and create a shared and cooperative musical experience.

Collaborative Live Coding Environments

An ensemble of live coders work on separate laptops but share resources over a network, such as timing systems, to better coordinate their performance. This can be quite an arduous task when done manually and many groups will opt to use a program that specifically facilitates collaboration and synchronization. Such tools tend not to be programming languages themselves but software that has been developed to improve the communication between multiple computers that are using an existing Live Coding language. A good example of this is the browser-based system EXTRAMUROS, which allocates each connected performer a small text box on a web page into which they can each write code (Ogborn, 2014). These text boxes are visible and can be edited by any other connected performer during a performance. EXTRAMUROS is “language-neutral”, which means it can be used with any language that has an interpreter that allows commands to be "piped" into it. This improves the accessibility of cooperative performance to a wider range of Live Coding practitioners. Another browser-based tool for collaborative Live Coding is GABBER, which is an extension to the live coding library, GIBBER (Roberts et al, 2015). It combines a chat-room interface with shared text buffers similar to EXTRAMUROS, but the code in each user's text buffer is only executed on that user's machine. Rohrhuber et al. (2007) developed an interface within the SuperCollider environment similar to that of a chat-room that allows performers to share small blocks of code called "codelets". In contrast to EXTRAMUROS and GABBER, the "codelets" are shared with, but not executed on, each connected machine. Performers either use the "codelets" or modify them and re-submit them to the chat-room interface. Rohrhuber has since gone on to develop another popular SuperCollider extension called THE REPUBLIC that allows performers to access and modify each other's code without the chat-room style interface (de Campo and Rohrhuber, 2011). The "textual performance environment" LOLC also focusses on a conversational style of communication by allowing performers to share shorthand musical patterns, which are then played or transformed and re-shared by other performers, aiming to facilitate methods of practice common to both improvisation and composition (Freeman and Van Troyer, 2011). As opposed to sending text between performers, IMPROMPTU SPACES uses a tuple-space that acts as a "remote bulletin board" for posting and retrieving information across a network (Sorenson, 2010). This creates a shared and distributed memory that is accessible to each connected client and allows users to manipulate global variables such as tempo while avoiding any read or write clashes.

Concurrent Collaboration with Troop

Multiple Live Coders working on individual portions of code will usually have their work on separate screens. If audience members are unable to see all of the code due to the lack of space or projectors, for example, then this can result in a non-optimal audience experience. The live coding system, EXTRAMUROS, addresses this by allocating each connected performer a text box on a single web page so that the audience can see all the active coding that is occurring and performers can quickly and easily share or modify each other's work. There is still a degree of separation in the workflow, however, and modifications of other performers' work have to be requested and accepted as opposed to being an integral part of the shared creative process. Single shared text buffers have seen much mainstream success recently, most notably in Google Docs, and this has prompted me to create a similar tool for concurrent Live Coding collaboration called TROOP.

Where the previously discussed live coding environments allowed users to share portions of code that have already been written, TROOP shares keystroke data between connected clients to *build* code together. Each user is allocated a different coloured font to differentiate the contributions made so that each user can leave traces of their own coloured code throughout the shared text buffer, which is demonstrated in Figure 1. Editing someone else's code interweaves their colours and thought processes, creating a temporary visual testament to the cooperative process until the code is changed once more.

Figure 1. A screenshot of the Troop interface with three connected users.

Not only does TROOP allow live coders to work in a more interactive and cooperative way than was previously possible but it also minimises the amount of technical equipment required for performance as only one laptop needs to be connected to a projector and PA system. TROOP is written in Python and designed to work with the Python-based live coding language, FOXDOT, as its interpreter can easily be imported as a standard Python library (Kirkbride, 2016). It now also fully supports TIDALCYCLES, which is a pattern creating language embedded in the Haskell programming language (McLean, 2014). TROOP can also be considered language-neutral as it can be used with any application that accepts text being piped to it through the standard input from the terminal in a similar manner to EXTRAMUROS.

Troop is open source and is available at https://github.com/Qirky/Troop.

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Crowdsourcing community heuristic evaluations

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Abstract. Crowdsourcing is growing in both industry and academia, providing new ways to conduct work. However, these online working environments show similarities with the industrial revolution, were workers have few to no rights. Although crowdsourcing is a new phenomenon, online communities have quite some history. We find a resource in the literature on how to build online communities and applied them to crowdsourcing platforms. We have gathered and adjusted community heuristics to evaluate crowdsourcing platforms. To support the evaluation task, we have developed a system which we present as a demo: http://tinyurl.com/ecscwdemo

Introduction

Crowdsourcing allows everyone with internet access to work by contributing to open calls (tasks) in return for an often monetary compensation. Amazon's Mechanical Turk[1] (MTurk) provides hundreds of thousands of microtasks for workers to fulfil, but fail to support their workers adequately. Most crowdsourcing platforms do not fulfil their workers' technical and social needs (Gray, Suri, Ali, & Kulkarni, 2016). Researchers do a call to recognize the sociality of work and the shared identities produced through paid collaboration (Kittur, Nickerson, & Bernstein, 2013). Some researchers even claim that crowdsourcing platforms are ideally similar to open-source communities (Stewart, Huerta, & Sader, 2009). The social element seems to be an important intrinsic motivation for the continued use of crowdsourcing platforms (Brabham, 2010; Soliman & Tuunainen, 2015; Zheng, Li, & Hou, 2011). Without the platforms providing these tools, workers have shown to create their own tools for collaboration (Gray et al., 2016). To our knowledge, faircrowdwork.org[2] is the only platform that attempts to list and rank crowdsourcing, currently listing 11 platforms. From a past version of crowdsourcing.org, we know that there are almost three thousand crowdsourcing platforms (Crowdsourcing.org, 2016). Therefore, this demo explores an approach

[1] www.mturk.com

[2] www.faircrowd.work

to speed up the ranking, by crowdsourcing the evaluation of crowdsourcing platforms using community heuristics.

Related Work

Our system draws inspiration from Crowdcrit, a system designed to allow crowdworkers to give high quality critique on visual designs (Heer & Bostock, 2010). The system allows non-experts (crowdworkers) to give expert feedback on designers by choosing critique from a list of the most common critiques. Our demo uses crowdsourcing to evaluate the social aspect of crowdsourcing platform, thus using non-experts to perform a complex evaluation.

Our previous work has gathered and adjusted online community heuristics to evaluate crowdsourcing platforms. By having a vibrant, active community, crowdsourcing platforms can potential benefit in many ways: loyalty to and continued use of the platform, more collaboration and increased trust. The evaluation of the platforms is a labour intensive task, taking more than an hour per platform. Therefore, we split up these evaluations into smaller tasks which we crowdsource using our demo.

Demo

To test if the crowdsourcing of complex evaluations is possible, we build a simple survey-like platform using Python and Django. We recruited crowdworkers using Microworkers.com[3] which is a more user and worker friendly platform than the more popular MTurk.

The crowdworkers are asked to visit a crowdsourcing platform and fill in questions about the design and functionality of the platform. They are asked to create a profile to get access to the entire platform. The crowdworkers have to check a box, declaring they have visited the platform for around 5 minutes. The crowdworkers provide simple demographics; date of birth and gender. Then they can evaluate the community heuristic (Figure 1). The platform states the name of the heuristic followed by a statement about the heuristic e.g. “the purpose of the platform is clear”. Under the statement is extra information to guide the evaluator e.g. “does the platform clearly describe how it fulfils the member’s and platform owner’s goals”. The crowdworkers give a score either of “strongly disagree, disagree, neutral, agree or strongly agree” with the given statement, followed by an explanation of their choice. Last, we ask the crowdworkers to provide a

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[3] www.microworkers.com

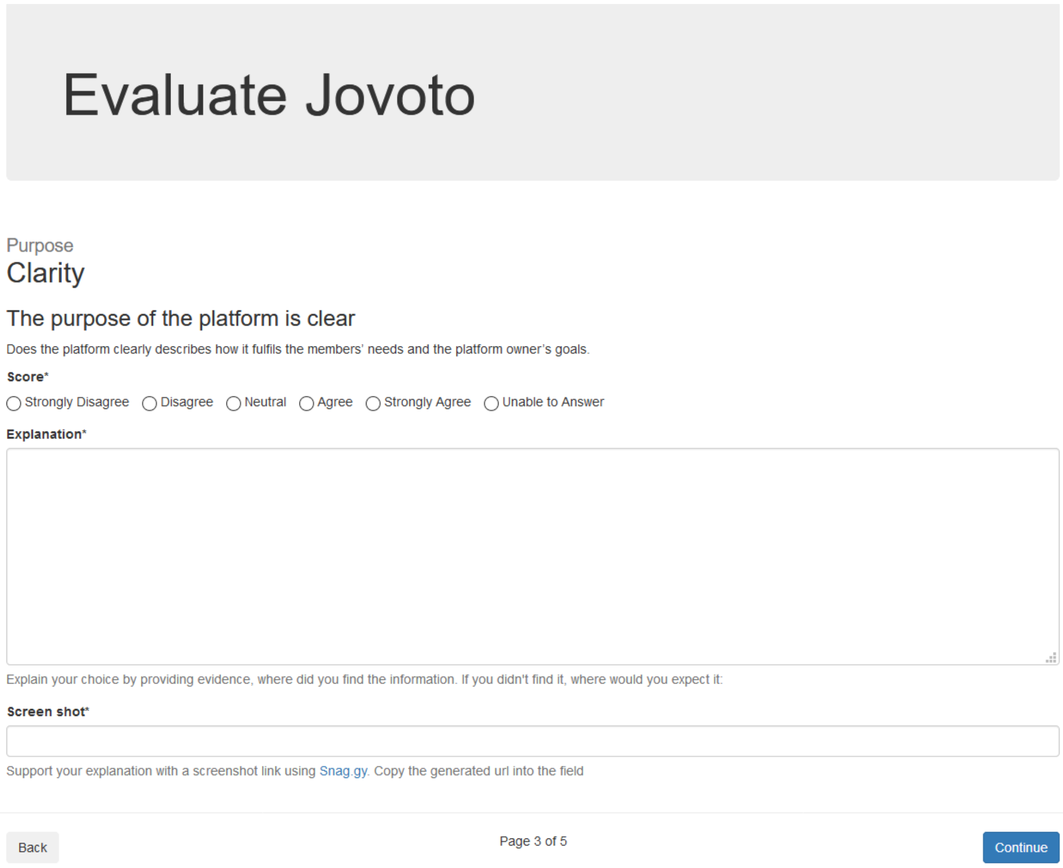

Figure 1. Screenshot of the demo asking crowdworkers to evaluate the community heuristic “clarity” of the crowdsourcing platform Jovoto. The crowdworker gives a score to show in what way they agree with the platform following the community heuristic. They are required to give a short explanation among with a screenshot of the platform supporting their explanation.

screenshot supporting their explanation. These help us to understand where on the platform, the crowdworkers look for evidence that adhere to the heuristic.

At the end of the evaluation, the crowdworkers are given an unique code that they can fill in on Microworkers.com. We manually match the data from our platform and the task on Microworkers.com to pay the crowdworkers.

In a pilot study, we asked 10 English speaking crowdworkers to evaluate the visibility and clarity heuristic of the platform Jovoto. The crowdworkers received $1 for successfully completing the evaluation which would take a maximum of 15 minutes. A second pilot study with again 10 English speaking crowdworkers evaluated only the “life cycle” heuristic and were offered $0,50. One can access the survey that the Microworkers used to evaluate the platform Jovoto at: http://tinyurl.com/ecscwdemo

Preliminary data

Most of the crowdworkers (60%) were female for the two studies. The age ranged between 19 and 35 years. The majority (70%) provided their email address to perform evaluations in the future. All of the evaluators provided evidence for their explanation of which two used a direct link to the platform and the rest a screenshot link. For the heuristic “clarity”, only one person gave the score “Agree” and the rest (9 crowdworkers) chose “Neutral”. The scoring for the heuristic “visibility” were more diverse: 1x “Disagree”, 3x “Neutral” and 6x “Agree”. The average amount of words used for explanation of the heuristic “clarity” is 32,5 and 20 words for “visibility”. One of the better evaluations of the “clarity” heuristic noted “*The website gives pretty concise clear introductions on the https://www.jovoto.com/creatives/ page regarding how the site will benefit the creative side of the platform. On the https://www.jovoto.com/how-it-works/ it gives detailed information for the brand side of the platform. There is information on both pages as to what the owner's goals are but they aren't as clear and laid out as the other sections.*” And an example of an extensive visibility heuristic explanation: “*The purpose is made known to the visitor with the first sentence seen on the page ‘Transform your products...’ This gives a general impression of what the platform does. Scrolling down a little and the visitor can get a clearer idea of what it does with short phrases explaining the services provided.*” Two evaluators were inspired to investigate the evaluated platform further for their own use: “*I will spend more time on the site working on my profile, etc. after I have completed this survey.*”

The lesser paid evaluation of the “life cycle” heuristic, which contained only one question, had a more mixed quality of evaluations. ”. We declined two of the evaluations, since they didn’t provide any sign of having performed an evaluation “*I think it is a great idea and I have seen it in online*”. One of the evaluators provided a relatively long 140 word explanation containing detailed information of how the platform could be improved “*...but a few examples of potential earnings on the How It Works page would be very useful*”. The scoring for the life cycle was: 6x “Neutral” and 4x “Agree”. The average words used for the explanation is 39 words (without the extensive explanation, 27 words).

Future work

The preliminary data looks promising and we will continue to study if the crowdsourcing of a complete evaluation is possible. The crowdsourcing of evaluations would allow us to create a listing and ranking of crowdsourcing platforms. Using this comparing platform for crowdsourcing platforms, workers and requesters could choose the best platform, fitting their needs. At the same time, platforms would like to increase their scoring to generate more traffic to their platform. Although we now evaluate the social aspect of platforms, more elements of the platform should be evaluated for the listing. The platform itself could become a community of crowdsourcing workers, helping to improve the online working environment.

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Designing IT support for co-located synchronous innovation workshops

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Abstract. *The main goal of our research is to capture usage barriers and benefits of supporting synchronous innovation workshops, and then to design and evaluate a solution that addresses the barriers and raises the benefits. For capturing perceived usage barriers and benefits we conducted an interview study with meeting facilitators. The solution we designed from these requirements is based on a mobile phone app to capture results from paper posters and post-its, and to import these in an electronic workspace for presentation and further work. An evaluation of the solution in a real-world setting shows that the chosen balance of IT support and work with physical artefacts can provide a robust solution providing benefit to all.*

Introduction

For two decades, the field of Computer-Supported Cooperative Work has been dealing with the electronic support of meetings (Herrmann & Nolte, 2010; Nunamaker, Dennis, Valacich, Vogel, & George, 1991). In contrast to established video conference and presentation solutions, systems used for the mutual editing of artefacts in synchronized, collocated cooperation could not assert themselves in the field. In our research, we address the question of how a support system for the mutual editing of artefacts should be designed in order to facilitate existing work practices, prevent operational barriers, and fully exploit the potential of IT support. Innovation workshops serve as practice-oriented usage scenarios which are characterized by varying degrees of interaction intensity using several physical aids for the visualization of contributions (e.g. written post-its).

Requirements Analysis – Interviews with Facilitators

For requirement analysis, we concentrated on capturing the perspective of workshop facilitators - since we found that their perspective often was neglected in related work, though they decide on the use of a support system.

From a series of interviews conducted with professional workshop facilitators, we learned that IT support could really help – by avoiding media breaks during workshops and for documentation of workshops. However, barriers of use nonetheless outweigh the benefits, and led the facilitators to a negative usage decision. All the barriers that have been mentioned by the facilitators allude to the fear that the IT support disturbs their workshops, due to (a) **external influences**, (b) **complexity** and (c) **parallelism**. Additionally, facilitators fear to (d) **change their way of designing workshops**. See (Schön, Richter, Koch, & Schwabe, 2014) for a detailed description of the interview questions and the complete results of this step including quotes from the interviews.

From all the input about work practices, potential benefits and barriers of IT support we have derived the following requirements for a successful support system:

Flexible number of participants: The support system should work with up to 50 participants, but also support smaller groups.

Portability: The support system has to be portable to provide the facilitators an independency of existing infrastructure. The system has to be installable in short time without asking for long introduction phases for the participants.

Agility: In innovation workshops, we have a frequent change between information and interaction phases. The support system has to be agile in the change between the different group constellations.

Work in sub groups: The work in small groups with high interactivity has to be supported. Every small group needs a large common work space that is portable in the available rooms.

Modular use / Calm technology: The support system should be flexible to be integrated in traditional work practices. That means, the use of the support system should be able punctually on demand. It should not force the participants (or facilitator) to use a fixed process or to replace existing tools completely. It should step into the background especially in the interactive phases – so that the focus stays on the interaction between the participants. The support system should be as boring as possible to avoid distraction.

Solution – As boring as possible

In the following we present the support concept we derived from the requirements analysis – providing support for different phases in innovation workshops.

Figure 1. Collaboration in small groups (left) and presentation in the plenum (right)

During **work in small groups** (Figure 1, left) the advantages of analogous artefacts should be maintained. Because of that, existing tools like poster, poster templates and post-its will be preserved. Participants can work on post-its on their own or in subgroups and share the result in the small group on the poster(s) as collaborative work spaces.

The basic idea of unobtrusive IT support is to use a smartphone (on a tripod) to capture the template poster(s). The group then works as usual on the physical poster with physical post-its. By image recognition the images captured by the smartphone are analyzed and the post-its are cut out and transferred to a cloud-based collaboration software, and placed there as digital post-its on a digital version of the poster template. The image captures are automatic but also can be triggered by the participants explicitly.

It is possible to add photos of prototypes and other artefacts that have been created in the workshop. The smartphone also offers the possibility to project an earlier version of the work if needed via pico-projector.

When the **groups come together in the plenum** to present and discuss the concepts they have developed, the groups do not have to move their posters with the post-its to the plenum room, but can use the captured version of the posters. The team may even present the evolution or zoom in to details. It is also possible to present multimedia content added in the digital representation of the posters.

When it is time for the next sub group to present, there is no need to move physical posters, but the facilitator can simply switch to the digital poster of the next group.

Since the posters are stored in a digital collaboration software, the team members can work on these even **afterwards** – using tablets or laptop computers.

Prototype Development and Evaluation

We implemented the support system in the form of a smartphone app (Rapid Scanner – see https://www.youtube.com/watch?v=lufKOAlLec8) that interfaces with an existing cloud-based collaboration solution (Rapid Modeler – see https://www.rapidmodeler.de/).

After finishing the iterative design and development of the support system, we wanted to try if the system really works better than other systems before. The evaluation should check if the identified work practices can be supported, if usage barriers appear and if support potentials are exploited. This evaluation took place during a real-world innovation workshop that lasted several days with asynchronous phases in between. In the evaluation, we found that the system worked and was not perceived as disturbing or risky by the facilitators. Furthermore, they did not have to change their traditional way of designing workshops. The facilitators did not perceive the system as a risk and were willing to use it in future workshops. Additional benefits were identified, particularly in the much shorter time needed to start plenum sessions, and the additional flexibility generated for moderation through this fact.

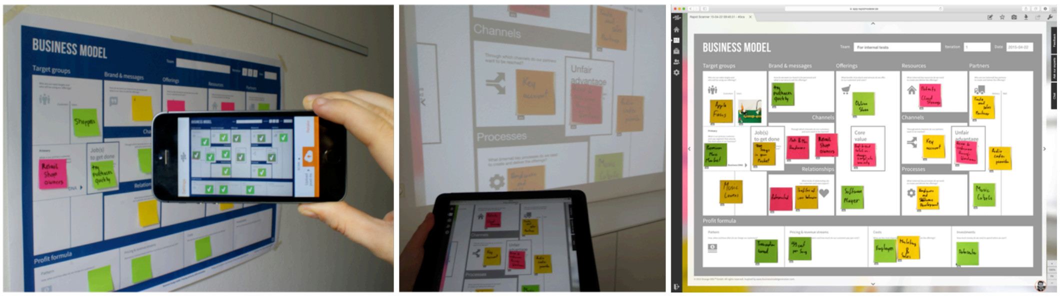

Figure 2. System prototype in action (left/middle) and cloud-based collaboration tool (right).

Summary and Conclusion

In our work, we re-examined the feasibility of designing a support system for synchronous co-located creative processes – taking tablets, smartphones or large screens in "Collaborative Interactive Spaces" as well as new concepts using paper interfaces and tangible interfaces into account. We designed and evaluated a simple support system using a mobile app to import post-its from physical posters to a digital workspace, showing the feasibility of the concept.

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Jeffrey Bardzell, Nina Boulus-Rødje, Michael Muller, Antti Salovaara, Alina Krischkowsky, Verena Fuchsberger (2017): Discerning Designers' Intentions. In: Proceedings of 15th European Conference on Computer-Supported Cooperative Work - Panel, Reports of the European Society for Socially Embedded Technologies (ISSN 2510-2591), DOI: 10.18420/ecscw2017_p1

Discerning Designers' Intentions

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Abstract. Design is often done by teams of designers and other stakeholders. Design also creates a time-lapsed collaborative relationship between designer(s) and user(s), who "complete the design through use". The intentions of designers in designing and crafting computational artifacts are therefore important for multiple HCI and CSCW related research and design traditions, including (a) appropriation studies, (b) participatory design, (c) design criticism, and (d) design collaborations in organizational contexts. All of these design philosophies handle intentions differently, including normative, organizational, and ethical aspects of what designers and designs 'should' intend. Some people consider intentions to be highly important, and demand explicit articulations of intentions; some people question whether we give the wrong kind of weight to designers' intentions. With this panel, we will bring these notions to the discussion table to allow a deeper understanding of the diverse theoretical perspectives and research methods available to account for designers' intentions. This will help to theorize design as a social activity, and to understand how people negotiate, evolve, and change designs over the lifecycle of a product or a system. This panel opens a conversation, comprising multiple perspectives, to help HCI and CSCW develop new ways to consider designers' intentions from an empirical and theoretical perspective.

Introduction

Physical and digital artifacts are part of our daily experience during work, play, sometimes love, and sometimes contemplation. We may find those artifacts to be well designed, aesthetically or functionally pleasing, fit-to-task, or not. There are rich debates about how to characterize attributes of an artifact (e.g., Fuchsberger et al., 2016), and about how to regard users and other stakeholders in relation to those artifacts. Nevertheless, there exists only little consensus about how the concepts of function and use relate to one another, to the designers' and users' intentions, or to their actual actions and encompassing contexts (Vardouli, 2015).

Further, designers' and users' intentions of how to use an artifact may be different, and therefore, a source of possible conflict (e.g., in workplaces), but also a source for innovation (e.g., users finding new uses for an artifact). Thinking about intentions from the two perspectives of designers and users allows us to understand that both, the intentionality in *designing* an artifact, and *actually* using it, play a fundamental role of how we research, understand, and design for *use*. Intentionality can be viewed as an imagined potentiality, opening up to a wide range of possibilities which may, or may not, be actualized. The focus on intentionality opens up the possibility to investigate how visionary intentions and imagined potentialities of designers and users are enacted and actualized in and through design processes of artifacts.

In this panel, we want to broaden the discussion to involve not only the artifact and the people who use and are affected by it, but also the designers who created or deployed the artifact. We are concerned with questions such as

- *How can we understand the ways in which individual (or groups of) designer(s) reach their decisions?*
- *Is it beneficial for designers to reflect about intentions? If so, how can we encourage designers to reflect upon their intentions? And what do we gain from reflecting upon designer's intentions?*
- *How can we help clarify and understand the intentions of the designers?*
- *How can we explore designer's intentions in relation to intentions of users and their un/anticipated use?*

Designers create or amend designs for many reasons. A design may solve a practical problem (Biskjaer, 2014), or it may compel users to work faster or more productively (Hasan and Al-Sarayreh, 2015). A persuasive design may move, motivate, or influence its user (Fogg and Hreha, 2010). An ambiguous design may open a space for contemplation, exploration, and reflection (Gaver and Martin, 2000). A strategically incomplete design may pose the question of how it can be used (Kaye, 2006), or what its worth may be (Cockton, 2006), and allows us to study how users "complete a design through use" (Carroll, 2004). Designers' decisions may contain and produce a certain 'geography' of responsibilities, or causes – that are open to question and may be resisted (Akrich, 1992). However, HCI lacks a well-developed literature and vocabulary on designers' intentions; how designers' intentions relate to users' intentions; and what potential impact, matching or mismatching intentions between the two have on our ways of researching and designing for use. The designers' intentions are important for at least four traditions in HCI:

Appropriation studies focus in part on how people make use of designs for "unanticipated users, usage, circumstances" (Krischkowsky, 2015), helping us to learn about new arrangements of people and things, and about how unanticipated usage generates and 'naturalizes' new forms and orders of causality and knowledge about the world (Akrich, 1992). Can we theoretically and empirically investigate how the designers' intentions are 'encoded' in the artifact and 'interpreted' (in either anticipated or unanticipated ways) by the users? Vardouli (2015) identified three attitudes towards human-artifact engagements: design-centric, communicative, and use-centric. We hope to add designers' intentions to Vardouli's analytic framework, through reflective inquiry with and by designers and users, as they consider unanticipated and unintended usages *and* users.

Participatory Design (PD) advocates for involving democratically all stakeholders in the design process in order to ensure their needs are heard and met. PD acknowledges that design processes often take place in a space of contested interests (Bjerknes and Bratteteig, 1995; Bratteteig and Wagner, 2016). Therefore, PD scholars raise questions such as, who benefits from a design (Beck, 2002), or how can a project be re-designed to benefit particular stakeholders, such as workers (Bødker, 2009). However, complex projects often have more than one "designer", and these designers may work at various levels of specificity and policy (Light and Akama, 2012), entangled in complex webs of intention, difference, and power (Muller, 2007). Indeed, if PD is deliberately "multi-voiced" (Törpel, 2005), then the concept of "designer" becomes multiple by definition, and the questions of intention and values become a study of negotiation, compromise, and emergent innovation (Björgvinsson, 2010).

Design criticism refers to historically and theoretically informed interpretations of the relationships among one or more *design activities, events, processes, and/or products*, including their performative, material, and perceptual qualities and broader situatedness in culture, and *experiences* of those designs, including meanings, behaviors, perceptions, affects, insights, and social sensibilities in the context of the design product, its use, and its outcomes (Bardzell and Bardzell, 2015). A Romantic conception sees art as a vehicle for personal expression (Croce, 1909); such a view might locate meaning in the artist's intentions. Against such a view have been theories such as Wimsatt and Beardsley's (1954) “intentional fallacy” and Barthes’ (1967 and 1998) “death of the author”—both of which argue that readers should attend to works themselves and/or in relation to other works. A third perspective is that we perceive creators’ intention through our awareness of how the work “hangs together”, how individual choices contribute to its overall purpose, how the work expresses a perspective (Booth, 1983; Carroll, 2001). We ask, is “design intention” located in the minds of individuals, or is it manifested in the design of the artifact?

Design in Organisations is influenced through negotiations involving many stakeholders (Neto, 2005), who may or may not agree in their intentions (Fleron, 2005; White, 2007; Winn and Novick, 1995). There may also be a timecourse of design leadership through a product’s development lifecycle (Pew and Mavor, 2007), consequently changing priorities in intentions of the current leader (White, 2007). Discerning intentions in an organizational context requires first to discern who the stakeholders are, what aspects of the design are influenced by each of them, and the relevant influences of each respective stakeholder at various moments-in-time. In this context, understanding designer intention is part of understanding the changing organizational configurations during the conceptualization and development of a complex system.

Methods

To ensure engaging discussion and debate between the panelists, we have invited them to represent diverse views on design traditions, the importance of design, and the work of designers. We anticipate the emergence of contrasting views, but also converging agreements, generating new understandings across our panelists’ diverse perspectives and experiences.

We will begin the panel with a brief (provocative, speculative, narrative) statement from each panelist, followed by 3-4 questions from the moderators. We will then invite the audience to join the conversation and broaden the discussion.

In addition to conventional position statements, questions, and dialogues among members of the panel, we plan to conduct an experience where we present the audience with (representations of) digital and physical artifacts, in order to invite their interpretations, collect their responses in real-time, and display them on a large screen via a Twitter hashtag or paper cards. To enrich the discussion, we will solicit artifacts in advance from panelists and moderators, for interpretation during the panel. Our intention (as designers of the panel) is to create a space of interpretation in which panelists and audience take turns in creating a rich dialogue about designers, design, and intentions, which can lead to a more formal HCI discourse afterwards. We will use these different forms of presentation and interaction strategically, to keep the panel experience interactive and engaging.

After the Panel

Having two moderators will allow us to carefully document the discussions, supplemented by the Twitter feed and/or paper cards. Based on those notes, we will submit a report for *interactions*. We hope that this panel will result in generating solid and rich material for a formal paper to be submitted to ECSCW 2019. Depending on the outcome of our experiment with presenting artifacts for interpretations, we may also create an online space to allow the continuation of such discussions.

Confirmed Panelists

Jeffrey Bardzell is known for his work on interaction criticism and aesthetic interaction, developed in and through a humanistic approach to HCI.
Nina Boulus-Rødje is known for studying the design, implementation and use of various technologies and collaborative practices.
Michael Muller is known for studies of participatory and collaborative activities in organizations.
Antti Salovaara is known for his field trials on appropriation of everyday technologies. He is interested in the situated cognitive processes that underlie discoveries of novel use.

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MUTE: A Peer-to-Peer Web-based Real-time Collaborative Editor

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Abstract. Real-time collaborative editing allows multiple users to edit shared documents at the same time from different places. Existing real-time collaborative editors rely on a central authority that stores user data which is a perceived privacy threat. In this paper, we present Multi-User Text Editor (MUTE), a peer-to-peer web-based real-time collaborative editor without central authority disadvantages. Users share their data with the collaborators they trust without having to store their data on a central place. MUTE features high scalability and supports offline and ad-hoc collaboration.

Introduction

Real-time collaborative editing allows multiple users to edit shared documents at the same time from different places and from different devices. It receives a lot of attention from both industry and academia, and gains in popularity due to the availability of free online services such as Google Docs and Etherpad. Real-time online collaborative editors have multiple benefits. Firstly, they provide a ready-to-use platform for all users to view and modify documents on their web browsers, without installing any software. Secondly, users co-contribute to shared documents in a fast and easy manner as merging of concurrent changes is automatic. Users do not need to manually deal with concurrent revisions and conflict resolution.

These real-time collaboration services rely on a central authority. This places confidential information contained in the shared documents in the hands of a single organisation. Users perceive it as a privacy threat. They have no control on the usage of their data and may even lose their ownership after sharing them with the authority. These collaboration services generally rely on a centralised architecture that does not scale well in terms of the number of users as shown by Ignat et al. (2015); Dang and Ignat (2016). Moreover, users have to be connected in order to contribute to shared documents. Editors are neither offline capable, nor partition-tolerant: if users lose Internet connection, the changes they performed while they worked on isolation, are lost when they go back online. Furthermore, users cannot collaborate in an ad-hoc manner where they work separately in different subgroups and then synchronise their changes among subgroups.

Peer-to-Peer (P2P) collaboration eliminates disadvantages of systems based on a central authority. Users maintain their data and decide with whom to share it. P2P collaboration reduces the risk for privacy breach as only part of the protected data is exposed at any time. P2P collaboration is highly scalable. It supports a large number of users. It also supports online and offline collaboration as well as ad-hoc mode of collaboration. Users can intentionally split the group into separate subgroups. This enables implementing subgroup-scoped obliviousness such that some exchanged information in the subgroup is not disclosed to the rest of the group. For instance, a subgroup can privately brainstorm on modifications.

In this paper we present Multi-User Text Editor (MUTE), a P2P web-based real-time collaborative editor that supports ad-hoc collaboration. We first describe the different collaboration modes and then the demonstration we propose that highlights subgroup collaborations.

Supported Collaboration Modes

MUTE supports various modes of collaboration. The default one is the online mode. In this mode, all users join the editing session and collaborate on the document at the same time. Firstly, to set up a P2P network between browsers, MUTE relies on the *WebRTC* standard. It allows, using a participant discovery system known as *signalling server*, to connect peers and to broadcast messages. Secondly, to ensure high availability, participants hold a copy of the document. MUTE relies on a Conflict-free Replicated Data type (CRDT) proposed by André et al. (2013) to merge participant contributions. As shown in Shapiro et al. (2011), a CRDT ensures that participants that receive the same set of contributions in an arbitrary order from other users get a convergent view of the document without the need of extra exchanges. To make up for the unreliability of the network and to ensure that users get all contributions eventually, user contributions are exchanged using an anti-entropy mechanism such as presented by Demers et al. (1987).

In offline mode, users can continue working on their copy of the shared document while they have no Internet connection. When a user switches back to the online mode, an anti-entropy mechanism is performed and her local copy of the document is synchronised with the shared document.

To introduce the ad-hoc collaboration mode, we use the following example. Suppose four users Alice, Bob, Dave, and Carol collaborate on a project proposal as shown in Figure 1a. Suppose that Alice and Bob have to attend a conference and they take a train together. Further suppose that during their travel Alice and Bob have no Internet connection to work online on the proposal. Alice and Bob can set up a Wi-Fi connection between them and collaborate during their travel on a copy of the proposal that will integrate contributions of these two users. In the meantime, Dave and Carol that had network connection contributed to the shared project as shown in Figure 1b. After their travel, when one of the users Alice or Bob has access to an Internet connection they can synchronise their changes with the ones of Dave and Carol as illustrated in Figure 1c. Changes of all users are integrated and they see the same view of the project proposal.

Demonstration

Our demonstration will illustrate this ad-hoc collaboration mode. We first set up a network of two wireless routers and one Raspberry Pi server. This server delivers the web editor code and acts as a signalling server. Alice, Bob, Carol, and Dave share a common document using MUTE. They connect their devices to one of the routers and access the same document URL. They download the web editor shown in Figure 2. Thanks to the discovery service, participants connect to each other and as shown in Figure 1a, they can edit the same document. In order to simulate the subgroup collaboration from Figure 1b, Alice and Bob will connect to another Wi-Fi network provided by our second router, while Carol and Dave will stay connected to the first one. As a result, the group of participants is divided into two subgroups. Participants of each subgroup are no longer connected to the participants of the other subgroup. Their modifications are only shared in their respective subgroup. After each subgroup performs several contributions to their copy, Alice and Bob reconnect to the first Wi-Fi network. Subgroups join into the initial group, as illustrated in Figure 1c. Then, users synchronise to get a convergent document. During the demonstration, we remove the server in order to

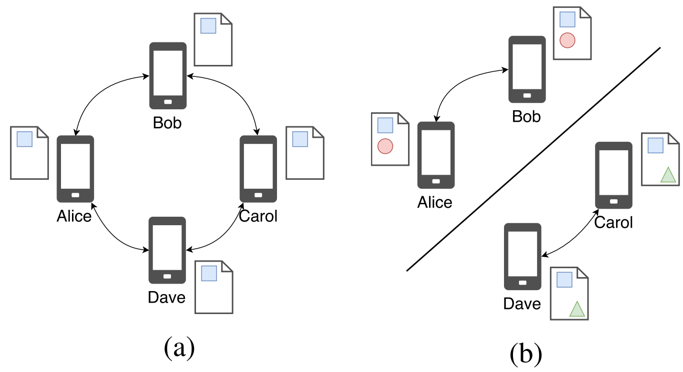

Figure 1: Ad-hoc collaboration: (a) A group of users share a common document. (b) A partition occurred, collaboration continues within the two subgroups. (c) Subgroups join together and then users share their contributions.

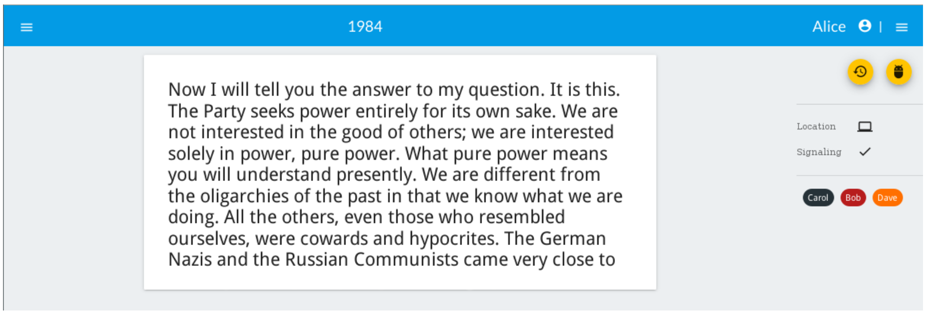

Figure 2: Screenshot of the web editor from the point of view of Alice.

show that it is unnecessary once the editor downloaded and the P2P network established. Conference participants can join the collaboration by using their laptops or smartphones.

Conclusion

We presented MUTE, a P2P web-based real-time collaborative editor and we showed its advantages over existing collaborative editors relying on a central architecture: user control over their data, better scalability and support for online, offline, and ad-hoc collaboration modes.

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