
Mixed-Initiative Interfaces for Collaborative Creative Work

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Abstract

Drawing on a series of projects aimed at supporting collaborative creative work, I propose that it is pertinent to explore how mixed-initiative interfaces can be developed to support, enrich, and transform existing forms of collaborative creative work, and potentially create novel forms of collaborative creativity. I outline three questions for discussion at the workshop: How can we leverage input and data from multiple users to support collaboration? How can we support particular forms of creativity? And what does a collaborative mixed-initiative interface look like?

Author Keywords

Creativity Studies; Computer-Supported Creativity; Collaborative Creativity; Ideation; Design.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

How can we develop mixed-initiative interfaces to meaningfully support and transform collaborative creative work?

While digital tools are increasingly used in creative activities, both in the workplace and beyond, we know little about how these tools affect the creative process. A consequence of this is that many tools are poorly

suitable to support creative practices. This is particularly pertinent when it comes to collaboration, even though many contributions have shown that creative work often relies on collaboration [e.g. Amabile 1983; Fischer et al 2005]. While there are examples of software that supports collaborative creative work, e.g. Murally [<http://mural.co>], or the coordination and documentation of creative work, e.g. the Project Reflection Tool [Dalsgaard & Halskov 2012], they are few and far in between. Most of the tools employed in the creative industries are still developed as single-user tools, often built on hardware that is also primarily built for single-user scenarios. Moreover, the integration between these tools, e.g. when it comes to moving between applications, is often time-consuming and causes breaks in the creative flow.

While developers are starting to address the issue, e.g. via the development of cloud-based collaborative services, the everyday work practices of creative professionals are still dominated by systems and interfaces that are not developed with collaboration in mind.

In order to address these challenges, my colleagues and I have undertaken a series of projects to develop a better understanding of the role and nature of digital tools in collaborative creativity. On the one hand, this will give us a richer understanding of both creativity and digital tools; on the other hand, it can help us build better digital tools for supporting creativity in the future. Specifically, I am the PI of three projects - *CoCreate*, *Creative Tools*, and *PLACED* - that launch in 2017. The MICI 2017 workshop is highly relevant for these projects, since the use of mixed-initiative systems is likely to play a large part in collaborative

creative work practices in the future. What I would like to focus on in this paper, and to discuss at the workshop, is the potentials and challenges for developing MICIs that are specifically intended to support collaborative creative work, e.g. among teams of specialists such as architects or designers, or in participatory activities that involve both specialists and end-users, e.g. systems developed to support participatory urban planning with the participation of e.g. city planners and citizens. I will first briefly introduce the three projects, and then outline a series of potential topics for discussion.

Three projects that explore creativity support in collaborative work

CoCreate is a 4-year project that studies the current use of digital tools to support collaborative creative work in a global digital design agency. The objective is to develop methods for studying the interplay between digital tools and creative work, to carry out in-depth studies of distinct creative events, e.g. a joint concept development workshop, as well as longitudinal studies of design projects, and to develop and evaluate novel systems that augment and/or transform creative collaboration. Moreover, the theoretical aim of the project is to develop a conceptual framework that combines insights from creativity studies, design research, and HCI in order to develop an integrative understanding of the role of digital tools in creative work. The project team consists of two Postdocs, one PhD student, one programmer, and three HCI professors, including the author.

Creative Tools extends the objectives of *CoCreate* to examine a wider range of creative work domains. These span from the production of digital art and installations,

e.g. media architecture and digital scenography, to domains that are typically not considered creative, but which we nevertheless hypothesise to have similar traits, e.g. the use of digital tools in the explorative phases of microbiological design. The project team consists of two Postdocs, one programmer, and two HCI professors.



Figure 1: Designers use a blended interaction setup for participatory ideation in an Inspiration Card Workshop.

PLACED is an EU project that explores novel digital services for co-creation in libraries. The project examines how place- and activity-centric digital services coupled to the physical library space can leverage the active participation and co-creation of knowledge by citizens to enrich library collections. The objective is to develop and evaluate prototypes that show the potential of place- and activity-centric library services. The demonstrators provide a web-based open source infrastructure for integrating libraries' activities with collections, and enables documentation and capture of knowledge generated in these activities in the library collection, creating an ever-evolving collection built on urban activities and knowledge generation.

In summary, the three projects will study both the benefits and shortcomings of digital tools used in collaborative creativity, and combine this knowledge with insights from humanistic IT research to develop and deploy prototypes of novel digital tools that present meaningful alternatives to how we can integrate digital tools in the creative process. This can be described as an experimental research-through-design approach [Dalsgaard 2010], and all projects, the objective is to develop prototypes of novel interfaces, and deploy and test them in real-life use situations. It would therefore be highly beneficial for the projects to discuss the



Figure 2: A prototype of a cross-device setup for collaborative creative work in a design agency.

potentials and current limitations of developing mixed-initiative interfaces as part of these prototypes. Moreover, concepts developed and discussed at the MICI workshop could potentially be implemented in the projects, and thus provide basis for continuing collaboration among workshop participants.

Novel systems for collaborative creative work

As a concrete example of our current work, my colleagues and I have developed a series of systems to examine the potentials and pitfalls of digitising a well-functioning ideation method that we developed 10 years ago, *Inspiration Card Workshops* [Halskov & Dalsgaard 2006; Halskov & Dalsgaard 2007]. Inspiration Card Workshops is a collaborative design method involving professional designers and domain participants, in which domain and technology insights are combined to create design concepts. We first developed the technique to support the design of experience-oriented applications of IT [Dalsgaard & Halskov 2006], but it has since been employed in a wide range of domains. The technique is intended for the early stages of the design process in which designers and stakeholders develop concepts for future products and systems. While the original workshop setup was based entirely on analogue materials (e.g. pen, paper, posters, analogue inspiration cards, etc.), we have developed two novel implementations: one using an entirely digital setup, and one employing a hybrid setup, which combines analogue and digital components, see Figure 1 [Olesen et al. 2017]. Our studies indicate that *the use of materials and tools in the creative process is highly complex*, and that *analogue tools in some instances have qualities for collaborative creativity that are still very hard to*

replicate with digital means. What we normally think of as collaborative work is in fact often characterised by *continuous transitions between individual and collaborative activities.* Moreover, *the tools and the physical and structural setup strongly influence the dynamics of idea generation.*

Another example from this line of inquiry is a current project to develop a system for a professional design agency, which leverages *blended* interaction [Jetter et al 2014] to enable teams of designers to work in an enhanced design studio environment that blends physical tools - pens, whiteboards, sticky notes, etc. - with cross-surface interaction combining multiple devices - phones, tablets, interactive boards working in concert - to support collaborative design activities, see Figure 2.

Both of these examples emphasise that there are complex dynamics at play in collaborative creative work processes, and that our normal approaches to designing interfaces are lacking in two crucial ways: 1) we have an inadequate understanding of the role of digital tools in creative processes, and 2) we tend to think of interfaces as individual devices that afford one person interacting with them at a time. Even if we take what is likely the most widely known collaborative tool, Google Docs, we find that it is at its core designed as a single-user interface with an added layer of collaborative features. It is clear that there is a large design space to explore in terms of developing systems to support collaborative creativity. In light of the MICI workshop theme, it is clear that the CHI community has only scratched the surface of how mixed-initiative interfaces could play a role in such systems.

Themes for discussion at the workshop

As is clear from the aforementioned projects and examples, the issue of collaborative creativity is at the core of my work. At the workshop, I would therefore propose to discuss the implications and potentials of mixed-initiative creative interfaces to support collaborative creative work. Since many work practices in the creative industries are collaborative, I consider this a relevant theme for future work in mixed initiative systems development. As a starting point, the following three themes could be interesting to discuss with peers at the workshop:

How can we leverage input and data from multiple users to support collaboration? In collaborative work activities, there is typically extensive information available about participants' previous activities, e.g. their past projects, their deliverables and products, their interactions with other participants, their preferred tools and systems, etc. How can a MICI meaningfully leverage this information to support collaborative activities? A few examples could be to identify common patterns in participants' past work, to identify different solution strategies, to suggest combinations of tools and approaches, etc.

How can we support particular forms of creativity? There are multiple dynamics that can drive creative processes, e.g. analogies, metaphors, and combinatorial creativity [Boden 2004]. How do we design MICIs to support these different forms of creativity, and are they - judging by what we know at the present - better suited to support some forms of creativity and less suited to support other forms? As an example, it may be that they are particularly suited to support ideation that relies on combinatorial creativity,

since this can be a question of identifying and suggesting a combination of sources of inspiration that different participants in a design project have each employed in their past work, and which they are therefore likely to know how to apply, while also bringing in components that are not present in prior work in the cases in which more divergent thinking is required.

What does a collaborative mixed-initiative interface look like? MICIs such as Tanagra [Smith et al 2011] are single-user interfaces and lean on traditional interface conventions for individual use of a device. However, there is no reason why MICIs could not take on other forms when they cater to collaborative creative activities. The question then becomes how to develop MICIs that fit into, transform, or enable collaborative activities, e.g. sketching, exploration of sources of inspiration, synthesis of ideas through grouping of related elements, etc. As an example, a MICI might support collaborative sketching by suggesting links between multiple individual concurrent sketches in different parts of a joint workspace, by identifying common and showing common patterns from other participants' work, by proposing a set of alternatives to a group and assign each participant to explore one, etc.

About the author

Peter Dalsgaard is an Associate Professor at Aarhus University. He is the director of the Digital Creativity Lab at Aarhus University and PI and director of three research projects that explore the role of digital tools in creative processes: *CoCreate*, *Creative Tools*, and *PLACED*. He has published extensively on research at the intersection between HCI, design, and creativity in

venues such as CHI, DIS, PDC, International Journal of Design, CoDesign, and TOCHI.

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