

# Social Media as ad hoc Design Collaboration Tools

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## ABSTRACT

This paper explores the extent to which existing online collaboration tools support the demands encountered during the early stages of the creative design process. Results from a web survey among design communities and the interviews with 9 designers suggest that Facebook is the most used platform to collaborate with other designers. A qualitative analysis of the data collected reveals that existing tools do not properly support the social processes that define the design process. Furthermore, the design process is affected by the huge amount of information and the inability to filter out and connect the different information provided by the collection of tools. We conclude with a discussion of the results and challenges for future collaboration tools.

## Author Keywords

Collaboration; design; creativity; groupware; social media

## ACM Classification Keywords

Computer supported cooperative work, Social media

## INTRODUCTION

The increasing popularity of the Internet and its wireless and mobile access capabilities have freed designers from spatial and temporal boundaries, opening up opportunities for nomadic work and the emergence of new design practices. Designers can work from multiple locations, directly in the field, or “*on the run*” [3, 5]. Contemporary open innovation processes make good use of these possibilities, bringing about a shift from a single in house collocated design team, to networks of stakeholders collaboratively pursuing innovation. The question that arises is how well existing computing and networking solutions are able to cover the demands of the designer for such scenarios and what patterns characterize the use of these technologies for supporting collaboration between

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designers. Answering this question can inform the further development of design processes that embrace modern media, as well as the design of new tools to support distributed design teams.

We report on a survey and interview study that explores how existing online collaboration tools support designers during early stages of design. Specifically, we were interested in identifying:

- What technologies are most frequently used for collaboration during early design?
- What are common and useful practices?
- What are the challenges that designers face while using those technologies?

In the remainder of this paper we first summarize prior art identifying trends and challenges regarding the exploration of tools to support the collaboration in distributed design teams, particularly the emergence of Internet-based applications and social media. We go on to motivate and detail the set up of the study and summarize its results, which reveal the appropriation of social media to support collaboration. Interview data was analyzed qualitatively using a grounded theory approach to explain these trends and to identify ways in which future tools could best support design collaboration. We conclude the paper with a review of the main contributions it makes.

## RELATED WORK

There is a weak connection between research on Groupware and the current diversity of (commercial) applications, which promote collaboration, and are widely adopted and publicly available on the Internet. Furthermore, it is not clear how those applications “in the wild” are actually used in design practice and whether they were intended to support designers or not. Although research on collaboration investigates how to support group activities, few empirical studies have focused on understanding the practices and needs of designers working together from the perspective of collaboration tools [3, 20, 21]. Earlier empirical studies on Groupware applications present cases of interventions where an implementation is purposely developed and deployed and the resulting collaboration patterns are reported [1, 11, 15, 20]. Other interventions involve the comparison of two or more similar tools to

identify the differences in their affordances and limitations [2, 17]. The study of collaborative practices could benefit from taking also into account what is practiced by users, not on what is imposed by the scientists [11].

This calls for a bottom up approach where current practices and needs are evaluated critically to identify directions for future developments. A recent study [16] drew attention to how distributed groups of students naturally employ a considerable number of popular and generic online collaboration tools to support their nomadic work patterns. Additional research is needed to more deeply understand the patterns of behavior during the early design to effectively design collaboration tools. This paper aims to provide concrete insights of the actual practices of designers in the context of groupware and these online collaboration tools.

## METHODS

In order to find out what are the online tools that designers use to collaborate and to gain insights into their most common related practices and challenges, we planned and executed a web survey. A selection of survey respondents was then invited for an interview.

The survey consisted of 23 questions distributed through a 6-page web survey. It included general demographic questions, technology use questions involving the use of collaboration tools and social media, questions about team projects, and several items related to the participants' experience in projects that involved teamwork. Selected respondents took part in a semi-structured interview, which was audio recorded and partially transcribed during the interview. Each interview lasted between 30'-60'. Participants were asked specifically about the most recent project, in which they used collaboration tools, and the goal and context of the project, team size, how the tools supported their activities, and what difficulties they have encountered while collaborating: project wise, team wise and tool wise.

## Participants

The online survey was distributed through social networks (LinkedIn, Facebook) among 12 design-related online groups from the Netherlands. Fifty-nine people (32 males, 27 females; with age average of 39.3 years, SD = 7.4) responded during the first two weeks of March 2014. Most respondents indicated to be active in the disciplines of user experience design (32,2%), interaction design (27,1%), visual/graphic design (27,1%) and industrial design (27,1%). Additionally, Web design (11,9%), and interior design (11,9%) were other of the most active disciplines. Of the 59 respondents, 42 reported to be based in the Netherlands, 4 in the Czech Republic, 3 in Finland and 2 in Belgium. Others reported to be located in the United States, Mexico, Thailand, China, Australia, Austria, Ireland and Italy. Amongst the survey respondents, 25 respondents

indicated their willingness to be contacted for an interview. We selected 15 participants from the web survey with the purpose to cover all possible specializations and available experience. Participants with previous experience in developing collaboration tools were excluded from the interview. Eventually 9 designers (4 males, 5 females) were interviewed remotely (5) or in person (4).

## RESULTS

### The design team: composition and distribution

The majority of the respondents had worked in a distributed team project within the previous 6 months (See Figure 1). Respondents from the web survey reported that their team typically consisted of 3 to 4 people (Avg. 3.7, S.D. 2.0) including themselves (See Figure 2).

### Collaboration technologies

Design work is very much digitized; most respondents use a computer (98,3%) and the Internet (94,9%) for work on a daily basis. 82,7% of the respondents has used some online collaboration tool in the past 6 months. The most frequently mentioned tools are Dropbox — a file hosting service— and Skype — a voice over IP software — followed by Google Docs and Google Drive — online document editing and file hosting services. Surprisingly, email was not mentioned very often, though we suspect that the respondents did not consider it worth mentioning.

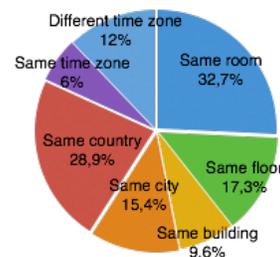


Figure 1. Reported geographical distribution of the team

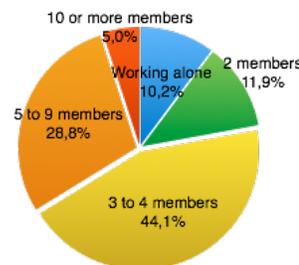


Figure 2. Reported team size of the designer

Social media is used as a collaboration tool for work: 59,6% responders indicated to have used an online social media site to communicate within their team in the last 6 months. The most frequently mentioned sites are Facebook,

Twitter, LinkedIn, Whatsapp, and Skype. In relation to mobile collaboration tools, 48,1% of responders had used tablet or smartphone applications to improve collaboration with their team in the past 6 months. Whatsapp, an instant messaging application, was the most popular mobile application, followed by Dropbox, Gmail, Google Drive and Skype.

Table 1 provides an overview of all tools referred clustered by functionality. Services like Google, SharePoint, and Basecamp were categorized as integrated platforms since they include a considered number of different features. The results of the web survey suggest that social media applications are the tools used most often for collaboration, followed by instant messaging and file sharing applications (see Figure 3). Online document editors and integrated collaboration platforms are also quite common.

Functionality	Tools referred
File sharing	Dropbox, Google Drive, Fileshare, Intranet file-sharing, SkyDrive, Yousendit, iCloud, Wetransfer
Online editing of documents	Word, Google Docs, iCloud, SkyDrive
Instant messaging tool (Chat, Video chat, Group Chat)	Skype, Office Communicator, Google Hangout, wechat, Facebook chat, Whatsapp
Online blogging sites	Blogspot, Wordpress, Tumblr, Twitter
Group discussion	Online Forums
Social networking	Facebook, LinkedIn, Whatsapp, Twitter, Yammer, Tumblr, Google, other.
Specialized video collaboration tool	Collaborate.io, Webex, Teamviewer
Email	Outlook, Gmail, own email service
Scheduling tool	Doodle
Lists, Tasks tracker, Project management	Trello, Evernote, Shotgun, JIRA, tgant, Wunderlist, Teambox
Version control	Tortoise SVN, Github, Bitbucket
Community (mass) collaboration	design2gather, visual.ly
Integrated platforms that include many functionalities	Services provided by Google, IBM, Samepage.io, Slack, Sharepoint, Sametime, Basecamp, Confluence, Bitrix
Other	Mural (virtual whiteboard), Excel, Axure

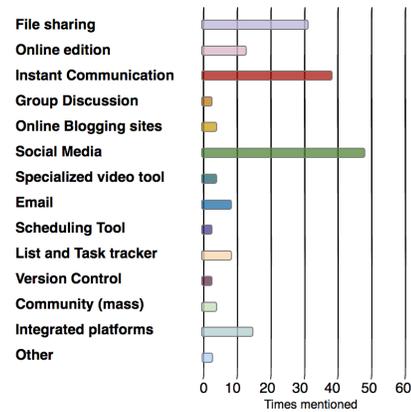
**Table 1: Online Collaboration tools clustered by functionality**

### Design Collaboration Practices

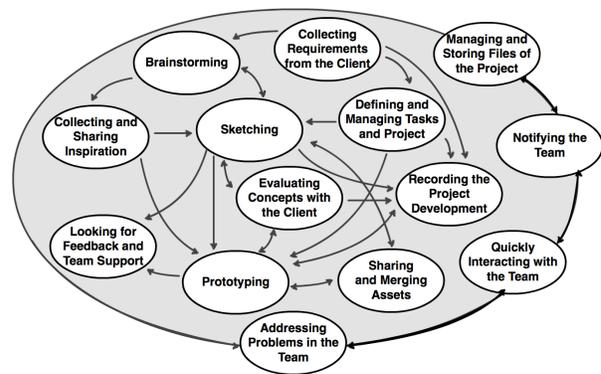
All audio recordings gathered during the interviews were transcribed verbatim and 183 quotes were selected that pertained to collaboration for design. Interview transcripts were analyzed using the Grounded Theory following the specific approach of Charmaz [6, 7]; specifically, we carried out open coding to identify recurring themes followed by focused coding to identify relations between them. Two of the authors analyzed the data, each working on one half of the data set. Clusters emerging were

iteratively compared and analyzed, resulting in an emergent set of initial codes, which represent meaningful collaboration practices. Each cluster contained information about different design activities and how those activities are supported by tools, e.g., Dropbox Facebook, Skype, etc. Several tools that appeared in one theme were also present in other themes, but the activity and the tool's context of use varied between them.

During focused coding, all initial codes with related activities were iteratively compared and combined into more relevant categories that pertain to a common underlying process. The comparison of the coded activities was aimed at identifying relations among groups based on conditions, consequences, processes or mechanisms, and the context in which an activity occurs. Figure 4 presents the clusters resulting from the initial coding and the temporal relationship between each activity.



**Figure 3. Tools clustered by functionality and times mentioned**



**Figure 4. Initial coding set of meaningful practices and their dynamic interrelationships**

We refined the resulting coding by identifying the needs, the actions taken to cover those needs and, finally, the consequences those actions. For example, the recurring codes pertaining to how designers craft ideas into sketches and prototypes were grouped into a single phenomenon. Finally, we grouped the categories that emerged from the

focused coding into high order conceptual constructs; as a result, five conceptual categories emerged:

- Creating ideas and concepts.
- Developing ideas and concept.
- Making sense of the material, resources, and experiential knowledge.
- Keeping the team on track.
- Managing the development of the project.

The first three represent core activities of the designer, which have a strong interdependence and are tightly interwoven within an iterative design process, whereas the two latter can be seen as enabling activities, which facilitate team collaboration and are present throughout the design, iterating at a different rate but closely interacting with and influencing the core activities. Figure 5 illustrates how the enabling categories, located in the external circle, are continuously supporting the iterative process relating the core categories. An overview of the categories is presented in Table 2, and concrete results per category are explained briefly in the following sections.

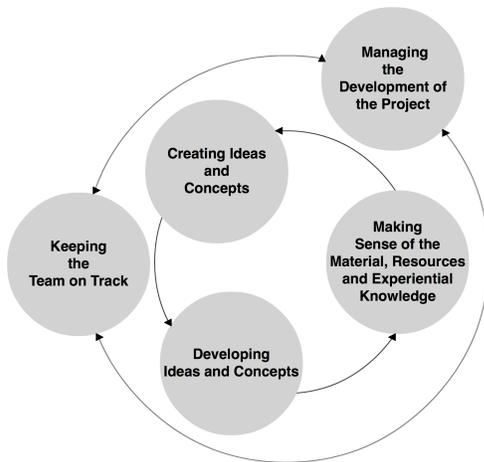


Figure 5. Flow of the conceptual categories.

Initial coding	Focused coding	Conceptual category
Brainstorming	Discovering and gathering possible ideas and concepts	Creating ideas and concepts
Collecting and sharing inspiration		
Sketching	Crafting the ideas and concepts	Developing ideas and concepts
Prototyping		
Sharing and merging assets	Integrating efforts	

Initial coding	Focused coding	Conceptual category
Looking for feedback and team support	Assessing, adjusting, and selecting the design	Making sense of the material, resources and experiential knowledge
Collecting requirements from the client	Gathering and clarifying evidence for the design	
Evaluating concepts with the client		
Notifying the team	Updating the team	Keeping the team on track
Quickly interacting with the team		
Addressing the problems in the team	Resolving conflicts	
Recording the project development	Keeping the project on track	Managing the development of the project
Defining and managing tasks and project		
Managing and storing files of the project	Managing knowledge and resources	

Table 2: Conceptual categories emerging from the Grounded Theory analysis of interview data

### Creating Ideas and Concepts

During idea generation sessions, designers constantly relate their ideas with ideas and concepts of other designers or other sources. Search engines are regularly used to find examples of images or texts on Internet. Designers also refer to personal collections of inspirational material, which is typically a folder containing a vast amount of resources and links about fashion, music, art works, and interesting designs or concepts. The gathering process is normally an individual process, followed by sharing parts of a collection with others to trigger and support new ideas. Pinterest, an online discovery tool, is widely used to gather interesting visuals (library of characters, scenes, UI elements, etc.); as one participant mentioned: *“You can quickly build up a mood board and easily share it with people.”* Cloud based file sharing services like Dropbox are used to store and share inspirational resources. Skype and Facebook are also used for sharing inspiration, such as links, images and videos. Facebook is popular as a sharing platform over multiple devices. Twitter tracks news about related topics.

All participants described that idea generation sessions are typically done together with other team members or stakeholders during face-to-face meetings using low-tech materials like whiteboards, sticky notes, and sheets of paper. Ideas and sketches are worked out in paper and then copied digitally using drawing software. At the end of the session, whiteboard contents are captured in a shared repository, like Dropbox or a Facebook Group. One designer mentioned taking notes and recording the audio of the session using Evernote, a multi-platform tool, which allows designers to use it on different devices simultaneously, for example, recording the voice with a

phone, and making notes with the tablet. However, sharing notes with the team was hard, since not everybody used Evernote. In a few cases, designers run brainstorm sessions together over a distance using cloud based office tools like Google Docs, Google Spreadsheets, and MindMeister connected to Google Drive. The process is similar to the face-to-face process.

### **Developing Ideas and Concepts**

Sketching is typically done usually together with other designers or while meeting the client. Our interviewees do not use any tool for collaborative sketching, but sketch mainly on paper or on a tablet (e.g., the iPad) using software like Adobe Ideas or the Paper53 app: *“it is easy to evaluate designs together with the client”*. The tablet is considered very convenient because the client can immediately see how the solution might look like and what to expect for the final product, *“even though it is in low detail and it looks like a child’s drawing”*. A designer explained that he could iteratively adjust his design while discussing it with stakeholders, and easily can share sketches with colleagues by email. However, the current tools do not support simultaneously drawing over the same sketch: *“They don’t allow you to simply say this is my colleague, share it with him, so we can also draw in the same thing”*. To circumvent this limitation this designer sends sketches via email to colleagues who then work separately on their own copy of the drawing. Our interviewees explained that work is usually divided among team members who later combine the parts together.

For prototyping, paper is commonly used. Axure, a rapid prototyping tool, is the most used tool followed by Indigo studio and UXpin. Surprisingly, spreadsheet applications were mentioned as useful for designing prototypes and wireframes: *“it is surprising that [Microsoft Excel] is so powerful but it is very, very time consuming compared to other tools”*. This participant uses Microsoft Excel as a wireframing tool by manipulating the grid of cells to design interfaces with the main advantage that it is so commonly available, which helps sharing. To streamline designing interface components in Excel, she has created a library of components that she could reuse during the design of new wireframes: *“You have to design your own stuff... In that way it is very time consuming, if you want to go for details. For feedback it is easier”*. Crucially, this application supports commenting on document elements, which allowed her to add small explanations along the components that she was designing and receive feedback. The designers interviewed often need to work on the same assets as their colleagues at the same time. They develop a variety of shared strategies for coordinating and integrating the work of their colleagues depending on the task and the type of asset and application. Most participants use tools like Dropbox and Google Drive for collaboration support. Dropbox is preferred for working in files like Photoshop and Illustrator, since Google Drive does not support

preview of these types of files. The main problem with Dropbox is that the individual does not know if someone else is working on the same file. In order to avoid conflicted copies, our designers stressed that they either make agreements and divide the time per team member and specific asset, or they “lock” or “unlock” assets. Some commented that it would be convenient to receive automatic notifications about this. Google Drive is preferred if several persons have to work on the same text document since it allows the team to see who else is working on the file. One participant and her colleagues use different colors while writing a design specification on Google docs to identify each others’ contributions and comments, and to take ownership on the parts that needed to be improved: *“you can give and receive very specific feedback on each contribution, and track who wrote what”*. Several participants mentioned that they tried to use Axure to jointly design prototypes with the team, but *“the sharing option in Axure didn’t work for us because we had problems with setting the environment like the server or something like that”*.

Our interviewees stressed that they would usually prefer to use version-tracking systems like SVN, Github, Bitbucket, which are commonly used among software engineers to allow several individuals to work on the same file, tracking changes, and facilitating the resolution of conflicts between file versions. The main problem of version tracking systems, as our participants explained, is that *“for non-technical people”*, they are difficult to set up, learn and use. *“It should be like just press a button and it works, so I can focus in creating. And it feels more like a necessary evil”*.

### **Making Sense of Material, Resources, and Experiential Knowledge**

Individuals share pictures or screenshots of their work or will meet personally with the rest of the team members, who provide their comments and help the designer make decisions after the discussion is finished. For example, one interviewee details how she was trying to understand the goal of her assignment: *“[...] if I have some doubts, I write them down and say [...] the client sent this and my interpretation are this and this, is it correct or not?”*

Depending on the context and the geographical distribution of the team, designers might meet in person or use tools for communication like Email, Skype, or instant messaging. Even though email is used universally, it is not a popular collaboration tool in early design; rather it serves mainly for formal communications with colleagues or other stakeholders. One of the most positive features of email is that it can be archived and “saved for later” and for reference, whereas designers dislike its slow pace of communication: *“you sent an email today in the morning and maybe by the end of the day you will get a reply or maybe not at all.”* Group mailing lists are another context of use of email, which is useful for building conversations

around a topic. However, our designers complained about the noise in such discussions.

In contrast, Skype, Lync, Facebook Chat and Google Hangouts are some of the tools used for direct communication with other team members, especially with peers. Chat groups are also used when distribution and size of the team is large. A participant *“find[s] chats very convenient. It is fast. It feels faster than email. You can basically do the same things as email. You can send files, links, pictures and actually it looks like a real conversation.”* The adoption rate of a tool is one of the biggest considerations for using it. For instance, Lync is used within big corporations, but when working across organization boundaries it can mean that not the whole team is connected. Skype video calls are used for getting more detailed immediate feedback and is typically used between peers and organizations for short sessions to solve specific questions and clear doubts, to obtain immediate feedback. Facebook chat has several features that are very valuable according to our participants: (i) the possibility to leave a message even if the recipient is not available / online; (ii) the sender can check whether the recipient has seen the message; (iii) the possibility to read your messages directly from the mobile phone. Evernote was mentioned as a way to share directly to the group so that others can add their own notes. Having the possibility to easily share their work and immediately receive feedback enables designers to *“explore more and think of different ideas”*.

This cluster is also related to the process communication with clients and other stakeholders. Most of the interactions between the clients and the designers occur at the beginning of a design iteration while gathering the requirements and during the delivery and revision of milestones resulting at the end of the design iteration. Clients typically do not communicate daily and directly with designers. Such communication is done mostly via Email and Skype. Personal contact is preferred but not common. Instead, contact is usually mediated by the team leader or project manager who filters, discusses, and prioritizes the information before passing it to the rest of the team. The client will provide feedback about a (finalized or not) version of an artifact — e.g., requirements, prototype, sketch, image, video recording, interactive PDF or a document. In some cases the client will print the screenshot, manually make the annotations, to later scan it and send it via email back to the designers. This can become an iterative process until the client is satisfied with the result. Designers commented that it would be valuable if the software application that they use for designing would allow them to add comments and annotations as popular word processing applications do: *“the client cannot as easily just click and place a remark here, like they have in Word.”*

Some design teams create a dedicated Dropbox folder for the client to upload their input files and share them with the

design team rather than share the folders shared within the team, which would create an excessive amount of update notifications. Basecamp, a project management and collaboration tool, was found very convenient for sharing results and files with the client, who could leave comments on the document, thus enabling a direct conversation between external stakeholders and the designers.

### **Keeping the Team on Track**

Facebook Groups and other group communication platforms are used to keep the team updated. Several designers consistently refer it as the company’s intranet where weekly announcements are published and general information is shared. The fact that *“everybody uses Facebook”* makes it a great tool for collaboration: *“With Facebook, it is easy to keep in touch, and because everybody is always on Facebook, you are already sure that if you post something on it, it will be read.”* Facebook groups are also used to update the team about meetings and events. Since Facebook can be accessed by smartphone, it is very useful for last minute updates, like someone being late or a meeting being cancelled. Finally, Facebook Groups are used to keep in touch with other designers through projects that they work on intermittently for a long time.

Whatsapp Groups are commonly used for direct communication with the whole team, e.g., for urgent matters or last minute updates. A use pattern relating to the Whatsapp was to have two Whatsapp groups in a team, one for work related issues and the second one for sharing *“fun stuff”*. Whatsapp is preferred when on the move, because it takes less effort to leave a message to the whole team. One participant stressed that it is faster to arrange a meeting through Whatsapp than using any more traditional planning tool, like Outlook and shared agendas: *“So I asked in Whatsapp, and it was faster because everybody reacted in Whatsapp.”* Doodle was also mentioned as a tool for arranging meetings: participants can indicate their preference between several date and time options facilitating the arrangement among all the attendees.

### **Managing the Development of the Project**

Many interviewees find it important to have every project well documented. A project management document is usually created containing the requirements and specifications of the design project on Google Docs or using a web blogging platform in which everyone can contribute and modify it. The goal of the project and the requirements are clearly stated, as well as the approach and all the decisions that have been made until that moment, i.e., a working document *“to keep everyone on the same page”*, *“It gets updated, and it is not very strict but decisive. So what is on that document, it will be on the end product.”*

Organizing time is done often individually, and is closely related to the task organization. Some respondents use Gantt charts — using online project management tools —, or shared calendars to keep track of the project, the

availability, and the progress of the others. Some of the most successfully used tools for distributed project management are Outlook, Teambox, Trello and Excel. Outlook is used to write down what the designer is doing at the moment, and to map it into a calendar, while Excel is used to maintain a simple list of tasks to be done. Designers argued to be more satisfied with management tools that gave them more flexibility when defining and organizing tasks and that allow them to easily modify the status of a task during its realization: planning tools should not require a big effort to learn in order to achieve “*a relatively simple goal*”. Trello, a project management application, is the tool that was most mentioned by several of the participants because of its simplicity and the possibility to define their own approach to the management of tasks: “*In Trello, you define your functions, like I wanted to do the MoSCoW [a requirement prioritization method] for example. I can use it that way*”.

Tools like Dropbox, Google Drive, Facebook Groups, and internal network storage are used as a centralized repository for the team. Internal repositories are traditionally adopted for confidential projects. Several interviewees mentioned that it would be ideal if other collaboration platforms such as Dropbox could be connected to management tools and support project planning and work breakdown functionality. Project files are usually grouped together in folders according to the context of use, and are regularly regrouped into different categories following the evolution of the project. For example, at the beginning of the project, all visual artifacts, like photographs, and sketches may be grouped together in a category called ‘images’. Later, as sketches increase in number they might be moved into a new category called ‘sketches’. Later on, a specific design will be selected and all the images will be regrouped based on the chosen design. Sometimes the file structure gets messy requiring a cleanup and reorganization. The file structure stabilizes late in a project and is project specific. Dropbox is preferred when the project lasts longer, while Facebook Groups are used for shorter projects, e.g., lasting less than a month mainly because managing many files in Facebook is difficult.

## **DISCUSSION**

The results from the current study revealed that social media applications were the most popular tools for collaboration purposes among the wide range of collaboration applications. Social media seems to be a natural choice for team collaboration since it provides the flexibility required by the social dynamics of the design process with the feeling of more realistic and informal interactions, which are typical characteristics of a design studio. Participants choose social media because the whole team is familiar with it: a common problem of collaboration tools [14, 15]. However, they limit the design team to the possibilities of their services. This research forwards a set of challenges that emphasize on enabling and supporting

the social factors and social interactions that give shape to the design process.

### ***Iteration and process integration support***

While exploring and discussing ideas and solutions designers have trouble tracking back what happened during those sessions and trouble filtering the most relevant information that could help them find better concepts. The designer requires the selection and combination of information spread across a large amount of tools and information sources (drawings, pictures, texts, numbers). Their role demands fast switching between tasks, and thus, between tools and features. Without a seamless integration and filtering of the tools and information, the process is hard to track, structure and recall in the moment that is needed.

### ***Feedback support***

Designers have trouble communicating and receiving immediate feedback from their team and clients on each of the artifacts, especially when the practitioner has to make annotations and comments on a very detailed way. The tools should allow designers to immediately and easily share what they are working on at a current moment, and to support enhanced ways of providing feedback (e.g., combined video and audio comments) at specific levels of detail of the artifact.

### ***Collaboration support***

Current tools do not focus on the integration of the individual and group efforts during the outgoing design task, which generates several issues that hinder the design outcome. The designer should be able to share progress, track the changes of shared files and follow the progress of others when working on the same or related tasks.

## **Implications for our appreciation of design**

Designing is a social phenomena [4, 18] and the designer operates throughout a dynamic stream of interactions with multiple tools and individuals, rather than working isolated in a vacuum. The interviews revealed five particular kinds of behavior that the designers frequently perform: (1) creating ideas and concepts, (2) developing ideas and concepts, (3) making sense of the material, resources, and experiential knowledge, (4) keeping the team on track, and (5) managing the development of the project. These results can be related to previous studies that describe the specific patterns and activities that occur during the creative thinking process of design [8, 12, 13, 14]. The results show strong similarities to the well-known descriptive model presented by Nigel Cross [9] which consists of four stages: (1) exploration of the problem space, (2) generation of a concept, (3) evaluation of the concept, and (4) communication of a design. The only difference is noticed in the category of *making sense of the material, resources, and experiential knowledge* since it includes the evaluation and communication phase of the model of Cross.

It is noted that design process models emphasize the stages of the design but do not articulate as clearly the dual and parallel processes of actually doing the design, and coordinating the team and managing the design process while it takes place. These processes are parallel, intertwined, but happen at different rates of iteration and relate stakeholders with different relationships to each other and with different viewpoints. In the context of online collaboration, we provide empirical evidence on how these patterns of social interactions provide value and depth to the design process. It is during this rapidly changing process in which the design emerges as a transformative potential out of uncertainty.

## CONCLUSION

Surprisingly designers rely a lot on general-purpose tools, like social media intended originally for recreational use and informal social contact. They also repurpose general tools that do not, at first sight, lend themselves as design tools. In doing so, they show less preference to specialized tools developed for design professionals. The reasons are that they need to work across organizations and rely on common infrastructure and low threshold of entry, both in terms of costs and ease of use/learning. Interestingly social media are particularly powerful as collaboration tools. However, such tools and media appear to be cumbersome in handling large projects and the task and file management needs of group, who improvise and develop informal and suboptimal perhaps practices. These results suggest the need for new tools that will address these limitations working seamlessly with mainstream social media and general-purpose tools.

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