DESIGN FOR NEXT
EAD12-ROME

*Design for Next*

*12th EAD Conference*
*Sapienza University of Rome*
*12-14 April 2017*

# Understanding Collaborative Design Through Activity Theory

Mithra Zahedi, Virginie Tessier, Dave Hawey

Université de Montréal
mithra.zahedi@umontreal.ca

**Abstract:** Complex projects are often designed and developed through teamwork of different disciplines, which allows for the consideration of multiple perspectives and knowledge construction across specific expertise. Although this type of collaborative design has been granted many benefits, it is also known that multidisciplinary teams can encounter difficulties when they go about sharing information and knowledge. With the intent of gaining clearer understanding of teams' interactions to reach the project outcome, we propose to use Activity Theory as a framework to analyse a team's collaborative evolution. This article seeks to demonstrate the value of Activity Theory to explain and interpret a design situation. The findings confirm its strong potential to gain in-depth understanding of a team's progression in an authentic design project. Activity Theory seems to provide a robust method to accurately disentangle the collaborative dynamics. Therefore, we seek to demonstrate the promising advantages of this framework as a next methodology for design research.

**Keywords:** Collaborative design, Knowledge co-construction, Activity Theory, Methodology.

## 1. Introduction

Many researchers agree that to tackle complex design context, projects need to be understood from multiple perspectives. Also, in professional settings it is now a common practice to bring together a team of multidisciplinary experts, in a virtual or face-to-face setting, to participate in all aspects of a design project. Researchers agree that participants (i.e. experts in specific domains, designers, marketing specialists, project owners) in these multidisciplinary settings often encounter difficulties when sharing knowledge. They each have their own area of expertise, operating procedures, ways to communicate with verbal or visual tools and use different approaches to represent their ideas (Preece et al., 2002; Kleinsmann et al., 2007; Zahedi, 2011, and others). This point is practically studied in contexts where the goal is to propose user-centered solutions to complex and wicked problems (Carroll, 2000; Norman, 2002; Garrett, 2003; Dourish, 2004; Löwgren & Stolterman, 2004).

Thus, design projects are known to be elusive: the participants have to face many contradictions in their own multidisciplinary team. Multidisciplinary design projects are especially challenging since

specific goals can vary according to every person involved. In all its subtleties, our interest through this research is for a better understanding of the design process of a team at the problem-setting stage. In such social practices (Bucciarelli, 1988), participants' interactions and negotiations can go through important tensions and contradictions before creating a common understanding or building consensus (McDonnell, 2012; Zahedi et al., 2013).

When reaching consensus, a team gain an unprecedented point of understanding as they start sharing the same set of references and a common goal. Of course, communication is fundamental in a collaborative design process and can be complemented with the use of negotiation procedures and framing and reframing of the project (Heaton and Zahedi, 2015). Exploration and knowledge co-construction between domains, and participants, facilitate the integration of specialized knowledge in order to create innovative design solutions that are desirable, feasible and viable. We agree with Kvan's definition of collaboration as being successful when "we have accomplished something in a group which could not be accomplished by an individual" (Kvan, 2000, p.410).

This paper presents a study of four graduate students, each from a different discipline, working together for the first time on an industrial design project. The research project is motivated by our interest in how multidisciplinary teams interact, create a common language, move toward a common goal, share expertise and experiences, and frame a professional project. The paper explains briefly the engagement of the participants in the project, then, it focuses on a methodological tool that is explored for analysing the empirical data on design negotiations between the participants. The contribution of the paper is its attempt to demonstrate the use of Activity Theory (AT) as a 'next' complementary analytical tool of the future for the design research community.

Our observation of the evolution of the design project through Activity Theory helps us understand the subtleties of the collaborative design process and the dynamics of collaboration between these four graduate students. Our choice of using AT to analyse the collected data asked for detailed observations of live interactions and through video and audio recordings. In this paper, we argue that AT, although used for many years as a design tool (i.e. in Interaction Design, Service Design, development of educational collaborative activities), also has strong potential of being a framework for analysing the design process of multidisciplinary and interdisciplinary teams.

## 2. Activity Theory

For about half of a century, AT has been used widely in the domains of psychology, ethnography, education (Engeström, 1987, 1993, 1999; Béguin, 2004; Igira and Gregory, 2009) and, more recently, in the field of human-computer interaction (Gay and Hembrooke, 2004; Kuutti, 1996, 2009; Nardi, 1996), to understand individual or group activities as systemic, and socially situated phenomena. In addition, with the emergence of Service Design as a distinctive field, a number of researchers (Maffei and Sangiorgi, 2006; Sangiorgi, 2008, 2009; Menichinelli, 2015) have been using AT in order to understand people's activity in context. They tend to do so by analyzing existing groups of people (users of a service) and people involved in collaborative processes.

AT is widely known for its triangular diagram made of six interrelated elements that allow for multiple networks of descriptions and interpretations of a dynamic situation. It considers the complexity of the real life activity and accounts for historical context, culture, role of instruments, and motivations of people (subjects) in order to attain the object (outcome).

As a system (Figure 1), AT includes subject(s), object (objective leading to outcome), tools, rules, community and division of labor. Its main concept, mediation, is "the idea that humans' interactions

with their environment cannot be direct but are instead always mediated through the use of tools and signs" (Igira and Gregory, 2009). Mediations along with tensions and contradictions motivate activities and innovations. Over the years, the theory has evolved in order to focus on the collectivity involved in the activity, instead of the individual.
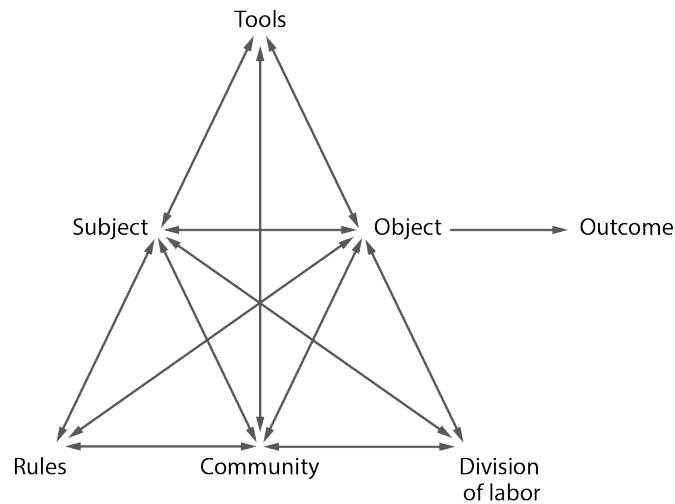


*Figure 1. Triangle of Activity Theory with its six elements
and the interaction between elements.*

## 2.1 Activity Theory as a design tool & as a qualitative framework

Through our extensive literature review, we identified that, in design, the theory can be operationalized in two distinct ways: as a design tool (i.e. In graphic design: Tan, 2010; In service and product design: Maffei and Sangiorgi, 2006; In product development: Chatzakis et al., 2016, Hyysalo, 2004; In interaction design: Nardi and Kaptelinin, 2006; Kuutti, 1996), or as a qualitative analytical framework for understanding and describing designers dynamics while designing.

**As a design tool.** Throughout the various disciplines, when utilized as a design tool, AT mainly helps to identify the problems and contradictions related to a specific project or context. Designers tend to use it in the early phase of a project to help framing the problem and to gain a deeper understanding of the issues that need to be worked on. It is useful to identify existing problems, define design criteria and resolve contradictions.

Sangiorgi (2008, p.417) explains: "Activity Theory has provided a framework to go beyond one-to-one (user-service interface) and sequential interaction models (service scripts) to include wider systems of action and interactions." Thus Activity Theory, in service design offers a structure that helps the designer to grasp the unexpected experiences and potential conflicts among users of the service in situated and wider context of action.

As mentioned earlier, AT is also a framework in education. Jonassen and Rohrer-Murphy (1999) discussed largely the potential of AT in their article entitled "Activity theory as a framework for designing constructivist learning environments". These authors emphasize that learning needs to be constructed and the activity of learning "cannot be understood or analyzed outside the context in which it occurs" (p. 62).

**As a qualitative framework.** When used as an analytical framework, AT's contribution is mostly valued during or after a project completion to study the design team's process, choices or different variables that may have affected the design outcome. For the moment, we only found few researchers in the design community who have exploited AT in the way we intend to in this article.

Thus, our aim is to present AT to our research fellows, demonstrate its operationalization and exploit its strong potential.

# 3. Case study

The case study is framed around a project brief strongly inspired from Kees Dorst and Nigel Cross' 2001 article entitled *Creativity in the design process: co-evolution of problem-solution*. The project challenged the participants to propose a solution to a complex and ill-defined situation. In Dorst and Cross' initial study, the participants, all design experts, were asked to realize the mandate individually, without external collaboration. The mandate, the design of a litter-disposal system to add to the new trains of Dutch Railways, was "designed to be challenging, realistic, appropriate for the subjects, not too large, feasible in the time available and within the sphere of knowledge of the researchers" (Dorst and Cross, 2001, p.426).

We adapted the brief so it fits our geographical localisation and used it to study how a multidisciplinary team tackles a design project. The team had 2.5 hours to work on this particular brief and come up with satisfying sketches of the solution. The multidisciplinary team was composed of one student of each of the following discipline: design, business management, sociology and engineering. The interactions of the participants, their use of tools and of the space were recorded and videotaped for further analysis.

# 4. Research methods

Due to the exploratory nature of this study, we went through a number of steps in order to provide rigorous data analysis. The process, as described in the following paragraphs, revealed itself as having strong potential to study the design process under an innovative angle.

## 4.1. Data processing

The first step of our analysis process was to code the transcription of the case study. According to the subject discussed, two researchers tagged one element of the AT's triangle to more or less every turn of speech (i.e.: subject, tools, object, rules, community, division of labor; see Figure 1). Doing so was very informative as it allowed us to get a general sense of the challenges the team was facing.

Once the individual coding was completed, the two researchers compared the coding grids. The rigorous comparison of the coding results allowed us to verify consistency and identify the recurrence of some elements. Clear episodes naturally emerged from the collective version of the coded transcription. The in-depth study of these episodes is the second step of the data processing.

## 4.2. Identification of main episodes

Through our analysis, it became clear that some elements of the triangle were more solicited at certain stages of the case study, therefore, creating a distinct episode. Seven general episodes were identified, listed and depicted in AT triangles. For each episode, we identified the main tension (or contradiction).

The AT triangle supports the interpretation of the actions taking place during the design activity. It provides visual support and helps to understand what is happening within the collaborative interactions. Moreover, it allowed us to study the situation under a new and, yet, unexplored angle and to identify the dominant contradictions. As we wanted to dig deeper in our understanding, we

took an even closer look at the situation. We created a timeline punctuated by AT triangles depicting the evolution of the situation.

## 4.3. Creation of a timeline

In order to work with even more detailed information, we decided on the creation of a visual analysis tool that would depict the progression of the dynamics over the course of the project development. Using the form of a timeline with 30 minutes grading, we depicted the evolution of the situation through seven AT triangles. This timeline provides efficient support for the analysis of the collaborative dynamics over the 2.5 hours of the case study. The timeline is presented in the next section of this article.

## 4.4. Data Analysis

Organized chronologically, the timeline depicts the seven episodes identified and provides quick visual reference of the evolution of the team's dynamics. Each episode is numbered between brackets to facilitate communication (see numbers below AT triangles, Figure 2). The timeline leads to a multi-layered interpretation: (1) a general overview of the case study's progression, (2) a frame to study the collaborative dynamics through the contradictions, and (3) data on the team's progression to the outcome.
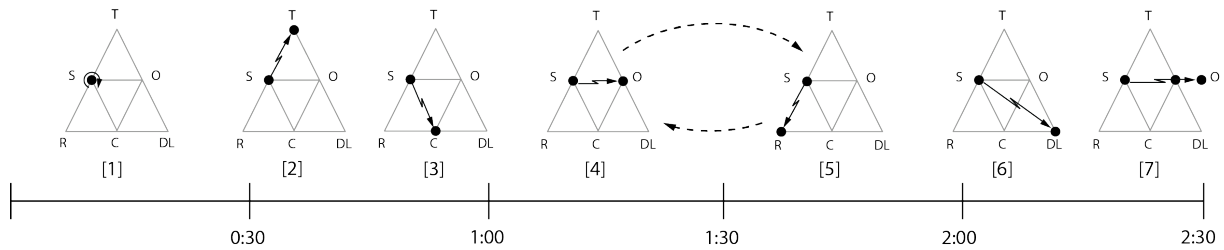


*Figure 2. Timeline illustrating the seven episodes of the collaborative project through Activity Theory triangles*

The first half-hour [Episode 1] can be described as a period for expressing their way of tackling the project. During episode [2], the team shows a strong interest in developing management tools (schedule, tasks listing, etc.). Then, in episode [3], participants concentrate on the identification of users and stakeholders that they will consider to develop their concept. Between hours 1:00 and 2:00, corresponding to episodes [4] and [5], the participants discuss the design constraints and translate their decisions into choices for the final product. We address these two episodes simultaneously because the participants alternate from one to the other during this period. For efficiency concerns, during episode [6] they divide the workload strategically in-between the participants and according to their expertise. Finally, episode [7] consists of a recap of the client's request, project objectives and design criteria.

In the following section of this article, we will expose our research results and initiate the analysis of a specific portion of the timeline corresponding to episodes [4] and [5] since the most substantial data came from those episodes.

# 5. Research results

The results gained from the use of AT as an analytical framework for studying the period between episodes [4] and [5] offer a global, yet in-depth perspective of the participants interactions in their activity of 'working together'. Moreover, we noted that collaboration and designing were at their

climax during these periods. As a matter of fact, we observed that the participants exchanged ideas in various ways to frame the project: (a) verbal communication around different understanding of the goals for the final outcome and about multiple interpretations of the rules and constraints; (b) sketching temporary solutions individually, and representing ideas to the team; (c) sharing viewpoints and specific knowledge; (d) discussing, negotiating and evaluating proposed ideas and reframing the project. As explained later, the study of an interdisciplinary design project has allowed us to adopt AT's tools and concepts in order to translate the iterative nature of designing.

The one hour period between episodes [4] and [5] is characterized by collaborative learning "which views learning as construction of knowledge within a social context" (Oxford, 1997, p.443). This period can be identified as being part of a "zone of proximal development" (ZPD). ZPD, introduced by Vygotsky, is the concept of the potential learning that a learner could reach within a given developmental span under optimal circumstances and support (Oxford, 1997, p.448). The settlement of such a zone is particularly important in a collaborative context since "working out a collective zone of proximal development calls for a conceptual model that can be used for representing the activity as an object-oriented system" (Engeström, 1999, p.66). During this time, the participants were aware of their final goal and they framed their process into a ZPD in order to keep track of their object and outcome.

The following figure zooms in episodes [4] and [5] of the timeline (Figure 3). The figure depicts the team's movement between two distinct designerly actions: facilitating understanding and proposing ideas (Zahedi et al, 2016). In short, episode [4] was about long and complex discussions between participants in order to clarify design criteria. These discussions often took the form of confrontations and trade-offs which are understood as explorations of the design problem. Episode [5] was centered on the creation of new "rules" (to understand as new or additional design constraints). Custom rules can be defined by the approval of all participants and lead to a collaborative design decision. More specifically, episode [5] translated the emergence of a shared understanding in the team.
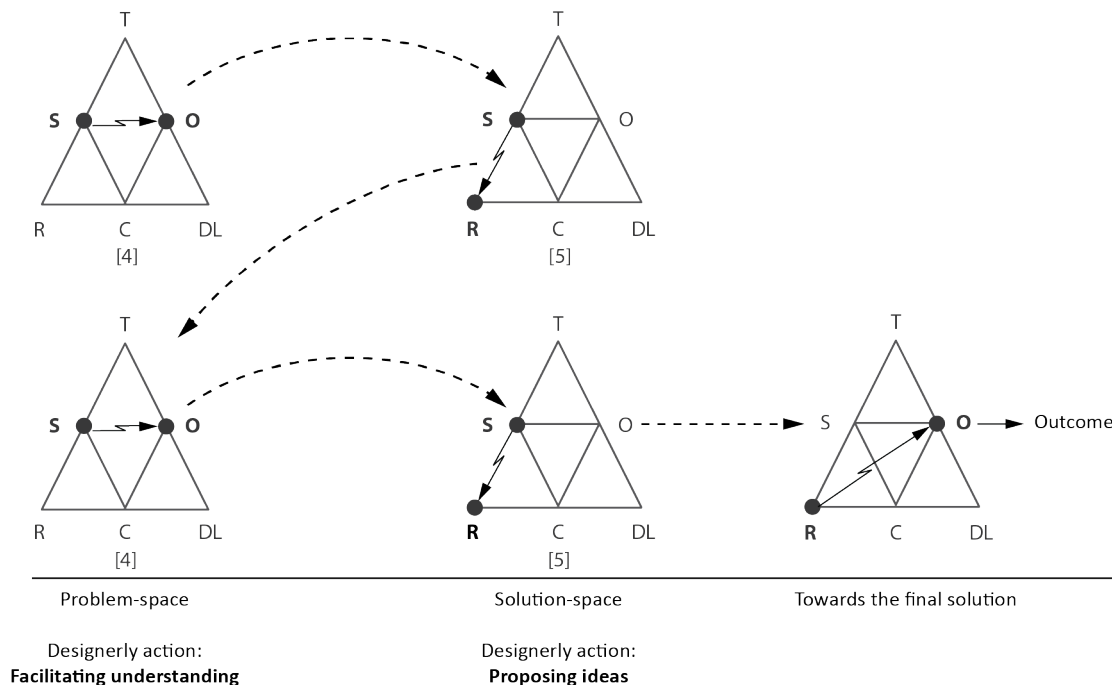


*Figure 3: Teams tensions and contradictions moving back and forth between Subject and Object, Subject and Rules, and Rules and Outcome.*

6

In Figure 3, the arrows moving between triangles are interpreted as the challenges a multidisciplinary team can confront when building its shared understanding. The participants encountered difficulties such as difference in values, viewpoints or reference frameworks. This way of building their collective understanding relates to Maher & Poon's article *Modeling design exploration as co-evolution* (1996). The article reports an iterative process of 'searching' or moving back and forth from the design problem space to the solution space to explore the situation. The authors mention that "during conceptual design, designers play around with ideas to get more understanding about the problem rather than focus on just finding a solution" (1996, p.195). Authors go on explaining that during the exploration process, designers interact, over time, with problem space (for example, functional requirements) and solution space. Thus, moving between the two spaces helps define new goals, which leads to new solutions. The process of moving back and forth between the two design spaces is also discussed by Dorst and Cross (2001, p.434), for whom "creative design seems more to be a matter of developing and refining together both the formulation of a problem and ideas of a solution, with constant iteration of analysis, synthesis and evaluation processes between the two notional design 'spaces'—problem space and solution space".

Moreover, the arrows also translate the various iterations inherent to the act of designing. A recurring pattern was identified: when the participants came to an agreement on a specific aspect of the project (problem-space), they collectively accepted to create a new custom rule (solution-space), and then focused on tackling another part of the project. In this type of problem-setting situation, the creation of custom rules was foreshadowed by a more or less long period of "negotiations and trade-offs [which] are required to bring participants' efforts into coherence" (Bucciarelli, 2002, p.220). Consequently, we noted that during episode [5] the amount of custom rules drastically increased.

# 6. Discussion and future research

Describing designers' dynamics while designing has been the interest of many researchers for more than 50 years now. To address the complexities of design projects, Design Research Society (DRS) was created in 1966. It emerged from activities of the Design Methods Movement, which had the intention of explaining design in a scientific way. However soon "it became clear that real world problems were 'wicked', requiring a different approach" (Langrish, 2016). Progressively processes and new methods across disciplines started to shape and scientific design methods were proposed as a replacement to traditional empirical practice (Bihanic, 2015). This work explored Activity Theory as a possible method that can help to understand how a designer or a team of designers structure ideas while designing.

This study has attempted to explore the potential of Activity Theory as an analytical framework to foster our understanding of the design practice in collaborative settings. The research findings are encouraging and support the anticipated value of Activity Theory for our research. The framework lets us separate the knowledge on the process from the conceptual/product design itself. Although the timeline of our observation and documentation is divided artificially in 30 minutes periods, we studied carefully and rigorously the whole two and half hours of the team's activity. Activity Theory seems to provide an appropriate and strong structure for in-depth understanding of authentic and entangled design contexts. Therefore, with this article we sought to demonstrate the forces and advantages of this framework as a potential 'next' methodology for design research.

As mentioned by many design thinkers, design activity is goal oriented and contextual. As a matter of fact, a designer or a team of designers need to deal with constraints of different natures (i.e.

individual human and social, technical, economical, environmental) in their exploration and decision-making (Schön, 1983; Bucciarelli, 1988; Gero, 1990; Cross and Cross, 1995; Valkenburg and Dorst, 1998; others). Our particular interest on the collaborative design activity brings the focus on cross-disciplinary negotiations, sharing of expertise and experiences, the process of learning from one another, building a common language and common decision-making.

Thus, our research uses Activity Theory as a multi-layered analytical framework for studying complex situations such as interdisciplinary collaboration in design projects. As the understanding of collaborative design amongst interdisciplinary teams is at the centre of the authors' research interests, we intend to dig deeper in our explorations of interdisciplinary collaboration as seen through the lens of Activity Theory. The teamwork of four other teams working with the same brief and in similar conditions will be observed and documented. The Activity Theory will be used as the framework to analyse the other design teams' work. An additional research objective will match our observation that the theory doesn't take into account the physical context in which participants interact (for example, participants' distance between each other). We are interested in learning more about the impact of these types of constraints on the activity. If so, can the triangle of the Activity Theory be expanded to include this type of information?

Firstly, AT as an analytical tool is useful to translate data to episodes, stories or information that can be understood easily. Moreover, it can allow to (1) find out more about the appropriateness of the theory for design research; (2) improve our analytical process; (3) capture patterns, consistency and differences between other cases studies of teamwork; and (4) use the research outcomes in refining teaching of collaborative design considering that, as highlighted by John Dewey (1997), learning is constructed and learning is better achieved in social contexts.

In our view, collaborative design is strongly connected to collaborative learning, which is defined as a reflective and social dialogue (Oxford, 1997). In light of the following description, we can see the connection: "Collaborative learning is a reacculturative process that helps students become members of the knowledge communities whose common property is different from the common property of knowledge communities they already belong to" (Bruffee, 1993, p.3 - cited in Oxford, 1997, p.444).

From Dewey's point of view, we do not learn in isolation. Rather, we learn through experiences and by being part of a larger world and context. Oxford (1997, p.447-448) drew a parallel between John Dewey's and Lev Vygotsky's (pioneer of Activity Theory) beliefs. She explains that according to Dewey "ideas are meaningful only if they are (a) part of an acceptable theory, (b) instrumentally useful for creating positive action, (c) constructed by participants in society, and (d) related to the guideposts or reference points provided by society." For Vygotsky, also a social constructivist, "ideas have social origins; they are constructed through communication with others. An individual's cognitive system is a result of communication in social groups and cannot be separated from social life."

# References

Béguin, P., & Cerf, M. (2004). Formes et enjeux de l'analyse de l'activité pour la conception des systèmes de travail. *Activités, 1*(1), 54-71.

Bucciarelli, L. L. (1988). An ethnographic perspective on engineering design. *Design Studies, 9*(3), 159-168.

Bucciarelli, L. L. (2002). Between thought and object in engineering design. *Design Studies, 23*(3), 219-231.

Cross, N., & Cross, A. C. (1995). Observations of teamwork and social processes in design. *Design Studies, 16*(2), 143-170.

Carroll, J. M. (2000). *Making use: scenario-based design of human-computer interactions*. Cambridge, Mass.: MIT Press.

Dewey, J. (1938/1997). *Experience & Education*. New York: Touchstone.

Dorst K. and Cross, N. (2001). Creativity in the Design Process: Co-evolution of Problem-Solution. *Design Studies*, 22(5), 425-437.

Dourish, P. (2004). *Where the action is: the foundations of embodied interaction*. Cambridge: The MIT Press.

Engeström, Y. (1987). *Learning by expanding: An activity-theoretical approach to developmental research.* Helsinki: Orienta-Konsultit.

Engeström, Y. (1999). Expansive Visibilization of Work: An Activity-Theoretical Perspective. *Computer Supported Cooperative Work*, 8(1), 63-93.

Engeström, Y., Miettinen, R., & Punanä, R.-L. (1999). *Perspectives on Activity Theory*. Cambridge: University Press.

Garrett, J. J. (2003). *The Elements of User Experience: User-Centered Design for the Web*. Indianapolis: New Riders Publishing.

Gay, G., & Hembrooke, H. (2004). *Activity-centered design: An ecological approach to designing smart tools and usable systems*. Cambridge, Massachusetts: The MIT Press.

Gero, J. S. (1990). Design prototype: a knowledge representation schema for design. *AI Magazine,* 11(4), 26-36.

Heaton, L., Zahedi, M., Guité, M., & De Paoli, G. (2015). *Distributing the Design(er) Role in Web Design Teams.* Participatory Innovation Conference (PIN-C), The Hague, Netherlands.

Igira, F. T., & Gregory, J. (2009). Cultural Historical Activity Theory. In Y. K. Dwivedi, B. Lal, M. D. Williams, S. L. Schneberger, & M. R. Wade (Eds.), *Handbook of Research on Contemporary Theoretical Models in Information Systems* (pp.434-454): IGI Global.

Jonassen, D. H., & Rohrer-Murphy, L. (1999). Activity theory as a framework for designing constructivist learning environments. *Educational Technology Research and Development,* 47(1), 61-79.

Kvan, T. (2000). Collaborative design: what is it? *Elsevier Science, Automation in Construction*, 9(4), 409-415.

Kleinsmann, M., Valkenburg, R., & Buijs, J. (2007). Why do(n't) actors in collaborative design understand each others? An empirical study towards a better understanding of collaborative design. *CoDesign*, 3(1), 59-73.

Kuutti, K. (1996). Activity Theory as a potential framework for human-computer interaction research. In B. Nardi (Ed.), *Context and Consciousness: Activity Theory and Human Computer Interaction* (pp. 17-44). Cambridge: MIT Press.

Kuutti, K. (2009). Artifact, Activities and Design Knowledge. In S. Poggenpohl & K. Sato (Eds.), *Design Integrations: Research, Methods, Collaboration* (pp.67-85): Intellect, London.

Löwgren, J., & Stolterman, E. (2004). *Thoughtful Interaction Design: A Design Perspective on Information Technology*. Cambridge, Massachusetts: MIT Press.

Maffei, S., & Sangiorgi, D. (2006). From communication design to activity design. In J. Frascara (Ed.), *Designing Effective Communications: Creating Contexts for Clarity and Meaning*. New York: Allworth Press: Allworth Press.

Maher, M. L., & Poon, J. (1996). Modelling design exploration as co-evolution. *Microcomputers in Civil Engineering,* 11, 195-210.

McDonnell, J. T. (2012). Accommodating disagreement: A study of effective design collaboration. *Design Studies*, 33(1), 44-63.

Menichinelli, M. (2015). Open Meta-Design: Tools for Designing Collaborative Processes. In D. Bihanic (Ed.), *Empowering Users through Design: Interdisciplinary Studies and Combined Approaches for Technological Products and Services* (pp. 193-212): Springer.

Nardi, B. (1996). *Context and Consciousness: Activity Theory and Human-Computer Interaction.* Cambridge: The MIT Press.

Norman, D. A. (2002). *The design of everyday things*. New York: Basic Books.

Oxford, R. (1997). Cooperative Learning, Collaborative Learning, and Interaction: Three Communicative Strands in the Language Classroom. *The Modern Language Journal,* 81, 443-456.

Preece, J., Rogers, Y., & Sharp, H. (2002). *Interaction Design: beyond human-computer interaction*. New York: Wiley.

Sangiorgi, D. (2009). *Building up a framework for Service Design research*. Paper presented at the 8th EAD (European Academy of Desgin) conference 'Connexity', Aberdeen, Scotland.

Schön, Donald A. (1983). *The Reflective Practitioner: how professionals think in action*. New York: Basic Books.

Valkenburg, R., & Dorst, K. (1998). The reflective practice of design teams. *Design Studies,* 19(3), 249-271.

Zahedi, M. (2011). *Modèle novateur de conception d'interface humain-ordinateur centrée sur l'utilisateur : le designer en tant que médiateur* (Ph.D.), Université de Montréal, Montréal.

Zahedi, M., Sharlin, M., & Bartus, T. J. (2013). *Collaborative Design in Client/Designer Team: Emergence of Goal Sharing through Communication Framework Development.* The 5th International Congress of International Association of Societies of Design Research (IASDR), Tokyo, Japan.

Zahedi, M., Heaton, L., Guité, M., De Paoli, G., & Reumont, M. (2016). *Exploring Framing Within a Team of Industrial Design Students*. DRS2016, Design Research Society 50th Anniversary Conference, Future-Focused Thinking, Brighton, UK.

About the Authors:

**Mithra Zahedi** is a professor of Design and a researcher at University of Montreal. Her background is in Product design, followed by her PhD, which focused on user-centered approach. Her research interests include design thinking and co-design in interdisciplinary teams.

**Virginie Tessier** is a PhD student at the University of Montreal. Her background is in graphic design. Her doctoral research is focused on the ethics of design education and evaluation in collaborative settings.

**Dave Hawey** is a PhD student and a professor of Art and Design at NAD School. His background is in art education and videogame development. His doctoral research is focused on the practice and the education of the videogame artists.