Proposition de recherche doctorale

Collaborative cultures of creativity: a socio-cognitive and intercultural analysis of engineering design teamwork in France and Japan

Mots clés :

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- Unité de recherche : Laboratoire Traitement et Communication de l'Information
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- Domaine scientifique principal : Divers

Résumé du projet de recherche (Langue 1)

ABSTRACT Creativity and innovation require collective efforts and collaboration between diverse social actors, with development of a “culture of collaboration” (shared values and practices). This research aims to understand relations between collaboration and creativity and, in a globalised world, between different cultures of collaboration, in creative engineering design of ICT. Engineering design is seen as a technical process, and also a social one (socio-cultural, interpersonal). Originality of this research resides in combining analysis of creative design processes, an interactional approach to collaboration, and an intercultural comparative dimension (France/Japan). The research is situated in the intersection between fields of design studies, cognitive ergonomics, group creativity and Intercultural Collaboration. Data will be collected in comparable collaborative design projects, with students in Telecom ParisTech and Tokyo Institute of Technology, using videos of groups and interviews of participants. Data will be analysed using combined methods for understanding creativity, collaboration and shared values, defining collaboration culture. Perspectives include identifying and fostering “best practices” of creative collaboration, extending the field of validity to other cultures of collaboration, and designing ICT for multicultural, collaborative engineering design. This doctoral research will be carried out within the framework of an international research collaboration, involving Telecom ParisTech and Tokyo Institute of Technology.

DÉTAILLED DESCRIPTION OF PhD PROJECT

1. MAIN OBJECTIVES This research will explore relationships between cultures of collaboration and creativity by adopting a comparative approach on the dynamics of interactions in innovative design projects. It will address this question in the specific case of creativity in engineering design, across French and Japanese engineering schools’ institutional contexts (Telecom ParisTech, and Tokyo Institute of Technology). Achieving this objective requires developing a theoretical and methodological framework for studying cultures of collaboration, and applying this framework to the comparative analysis of two situations for collaborative engineering design, across two cultures (France, Japan). The research project bears on ICT in a double sense: firstly, the groups whose collaboration will be studied are involved in designing new creative and innovative ICT; secondly, the research will be relevant for designing ICT that facilitates collaboration in design, either face-to-face (e.g. CAD tools) or at a distance (Internet tools for communication and shared work).

2. STATE OF THE ART

This work is at the boundary of several active fields of research on design, collaboration, creativity and intercultural studies. Design Studies. This field of research aims to establish several foundations of design theory (e.g. Simon, 1973; Hatchuel & Weil, 2009) as well as to understand practices of design problem solving (e.g. Détienne, 2006; Visser, 2006). The most common conception of design problems is to consider them as “ill-structured” problems (Simon, 1973). The recent switch of focus in design studies, from individual to collaborative design, has entailed an evolution of the theoretical frameworks. Both Bucciarelli (1988) and Schön (1988) advance that designing is also a social process. Research theoretical frameworks in design studies have integrated the social and organisational aspects and the situated aspects of the collaborative design situations, with the adoption of concepts developed in distributed cognition, situated cognition, and activity theory. Collaboration studies. In the field of Cognitive Ergonomics of design collaboration and CSCW, a major and continuing topic of interest has been to understand the collaborative processes by which co-designers work towards common, negotiated design solutions. Empirical studies (Olson et al. 1992; Stempfle & Badke-Schaub, 2002; Burkhardt et al. 2008; Détienne, 2006; MacDonald & Lloyd, 2009) involving analyses of interactive processes have also raised questions concerning the relationship between the design process, the collaboration process and the resulting design product, and this in various application domains (engineering design, software design, architectural design). They have highlighted distinctive collaborative processes that can be taken as a benchmark for good collaboration with respect to design, grouped along several dimensions concerning communication processes such as communication, task, group and reflexive processes. Group creativity Studies. Creativity is a research subject well established in the areas of psychology, social science and management science (Edmonds & Candy, 2005; Paulus, & Nijstad, 2003) where research focus either on the person (a set of a person’s attributes (Sternberg, 1999), on the product (novelty and appropriateness) or on the processes (diverging/converging processes, problem-solution co-evolution, Dorst & Cross 2001). The major methodological approaches are psychometric, cognitive, and systemic. The interactional approach, adapted to study group creativity dynamics, has been adopted more recently (for example see MacDonald & Lloyd, 2009, Hébert et al. 2010). Intercultural collaboration studies. Over the past ten years, a new interdisciplinary research field called “Intercultural Collaboration [IC]” has emerged, focussed on analysing cross-cultural differences in human-computer interactions (Vatrapu & Suthers, 2007). “Culture” in IC research not only comprises national/linguistic dimensions, but also “sub-cultures” based on gender, religion and political structures. It is studied on the basis of a combination of psychological (e.g. intersubjectivity), sociological, interactional (e.g. the negotiation of shared understanding and identities) and technological aspects (e.g. the development of platforms for intercultural collaboration, incorporating machine translation). In empirical studies, it is thus an issue to understand complex relations between these different dimensions. Given the recent emergence and development of the field, integrative theoretical and methodological frameworks are lacking. Originality of the approach. Its originality resides in combining an analysis of creative
design processes, an interactional approach to collaborative processes, and an intercultural dimension. In this direction, the concept of "creative collaboration cultures" will be developed at two levels: values shared by a group and put forward in a particular institutional context; practices of design and practices of collaboration. More specifically it will concern values and practices related to the articulation between individual and collective work/contributions to group design activity. 3. RESEARCH APPROACH This research will be based on data collected in comparable innovative design projects for training in Telecom ParisTech and TokyoTech. At Telecom ParisTech, the terrain of study will be groups of (seven) students (élèves ingénieurs) working, with the aid of a tutor and domain experts, on innovative projects on ICT, within the framework of the recently implemented “PACT” project (“Projet d’Apprentissage Collaboratif Thématique”; http://pact.enst.fr/). At Tokyo Institute of Technology, similar projects have been carried out over the previous years, by groups of students in mechanical engineering. In addition to studying the development of student projects over a long time period (over 6 months, each year), it is planned that projects in each institution will begin with the same, commonly designed, sessions for stimulating creativity (“brainstorming”), for initial generation and selection of divergent ideas, avoiding too restricted ideas, or too early commitment to them). A masters student at Tokyo Institute of Technology, Design Engineering Lab, will collect data on students’ creative engineering design meetings. The general planning of the PhD at Telecom ParisTech is as follows: Year 1: state of the art on collaboration cultures and creativity; elaborate terrain and analysis methods of year 1 to further develop and improve the collaboration culture practices at Telecom ParisTech; collect and analyse new data • Year 3: synthesise analysis results (last 6 months = writing of the PhD) The data to be collected will be principally videos of specific collaborative design meetings, logs of students’ use of ICT (emails, forum), and interviews of the PhD student and the PhD supervisor. The three classes of analysis methods will be jointly developed and applied to the corpus data (interactions in groups and interviews): (1) methods for analysing degree of creativity, of design process and products (e.g. degree of divergence, semantic coverage etc. of proposed solutions, in interactions), content analysis and expert engineering designer evaluation of design practices and products; (2) methods for analysing collaboration processes in groups (approaches to analysing interactions in groups, cognitive, social, socio-relational, affective, gestural dimensions; quality of collaboration); (3) methods for analysing shared values of creative collaborative engineering design, from auto-confrontation interviews. The combination of these three sets of methods will enable understanding of the relationships between culture of collaboration (2 & 3) and creativity (1). Analysis methods will concern both quantitative aspects of data (e.g. fluidity and duration of turns; duration of pauses) and qualitative aspects (e.g. types of communicative acts, typology of types of more or less creative proposals). The mode of collaboration between research carried out in France and in Japan, will be detailed below. Results will be a theoretical and methodological framework for studying collaborative cultures. They will enable identification of conditions and processes of collaborative cultures that favour creativity in innovative engineering design, within the cross-fertilisation of Japanese and French contexts. They will also inform future directions for developing ICT for collaborative design. References Bucciarelli, L. L. (1988). An ethnographic perspective on engineering design. Design Studies, 9(3), 159-168. Burkhardt, J.-M., Détienne, F., Moutisigna-Mpaga, L., Perron, L., Leclercq, P., & Safin, S. (2008). 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Culture and Computers: A Review of the Concept of Creativity and Innovation across Cultures. In T. Ishida, S. R. Fussell & P. T. J. M. Vossen (Eds.), Intercultural Collaboration I: Lecture Notes in Computer Science (pp. 260-275). Berlin: Springer-Verlag. Visser, W. The cognitive arts of designing. Lawrence Erlbaum, Māwhān, NJ, 2006. Résumé du projet de recherche (Langue 2) Creativity and innovation represent major challenges for contemporary societies, which in order to be met require collective effort, and often effective collaboration between a diversity of institutional and social actors. Fostering collective creativity on a stable long-term basis necessitates the development of a “culture of collaboration”, i.e. shared values and practices. The question arises therefore as to the relations between culture of collaboration and creativity. In a globalised world there are in effect multiple cultures of collaboration, each of which may have a different kind of relationship with creativity. It is essential to understand this diversity for intercultural institutional collaboration in order to developing “best practices” of creative collaboration, on the basis of mutual inspiration across cultures. Expected results of this PhD research will be: • Identification of “best practices” of creative collaboration in engineering design (of ICTs); • Improvements to creative collaboration practices in engineering design (e.g. to Telecom ParisTech PACT project); • Design considerations for Internet technologies that facilitate creative collaboration in engineering design, within or across collaboration cultures. Informations complémentaires (Langue 1)
This research will be carried out within the framework of an international collaboration between Telecom ParisTech and TokyoTech, two institutions of internationally recognised research/training excellence. A French-Japanese PhD supervision committee will be constituted involving 4 research professors; 2 from Telecom ParisTech (F. Détienne & M. Baker), 2 from TokyoTech (C. Mougenot & M. Okuma). This committee will jointly supervise the PhD student in France, and a master student in Japan, in elaboration of theory and methods. It will ensure that there is sharing and productive confrontation of theories, methods and results across the two countries. Meetings are planned in Paris and Tokyo, alternately every 6 months (project sakura requested, for travel funds, but this does NOT fund PhDs). Concerning the mode of collaboration between research carried out in France and in Japan, the PhD student at Mines-Telecom will collect and analyse data in France, in both quantitative and qualitative terms. The data collected in Japan (by a masters student) will also be analysed by the PhD student in France, in quantitative terms (language-independent aspects). This will enable comparative analysis of aspects between the two data sets, in relation to collaboration cultures. This doctoral research will contribute to establishing the foundations of a long-term research project on cultures of collaboration in engineering design. Within the framework of the doctorate, two cases will be studied in depth — France/Telecom ParisTech and Japan/TokyoTech — in order to develop theory and methods, as well as to establish a first dataset and set of results. One research perspective is to extend the field of study to a greater diversity of collaborative/creative design situations, notably in professional contexts in France and Japan. Each of the partners of this research also has other international contacts — e.g. Japan with Korea and China; France with USA, etc. — that would also enable testing the models of cultures of collaboration in a broader sense.

Informations complémentaires (Langue 2)

DOMAINS Cognitive Ergonomics Uses of ICT