



INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

*Project-Team Eiffel2*

*Cognition and Cooperation in Design*

*Paris - Rocquencourt*

THEME COG

*Activity*  
*R* *eport*

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# 1. Team

## Head of project-team

Françoise Détienne [ DR, INRIA-Rocq, HdR ]

## Vice-head of project-team

Willemien Visser [ CR, INRIA-Rocq ]

## Administrative assistant

Nathalie Gaudechoux [ TR, INRIA (shared time with the Complex team) ]

## Staff member

André Bisseret [ DR (Rhône Alpes), (DR emeritus since June 1999) ]

## External collaborators

Jean-Marie Burkhardt [ Assistant professor, Paris 5 - René Descartes University ]

Béatrice Cahour [ CR, IRIT ]

## Ph.D. Students

Flore Barcellini [ MESR funded, preparing a thesis in Ergonomics at CNAM ]

Lionel Barrand [ INRIA funded, preparing a thesis in Ergonomics at CNAM ]

Thierry Février Quesada [ CNAM funded, preparing a thesis in Ergonomics at CNAM ]

Laurence Gagnière-Foubert [ preparing a thesis in Psychology at Savoie University - University of Geneva ]

## Graduate Students interns

Linda Moutsinga Mpage [ University of Amiens; CNAM from October 2006 on ]

# 2. Overall Objectives

## 2.1. Overall objectives

**Keywords:** *cognition, cognitive ergonomics, cognitive psychology, collaboration, cooperative systems, design, distributed design, evaluation methodology for CSCW, multimodality, technology mediated human-human collaboration.*

The objectives of the EIFFEL team are to model cognitive and collaborative processes involved in complex problem solving activities such as design and to assess and specify tools and methodologies that support them. Our main focus is on human-human collaboration in complex tasks mediated by information and communication technologies, mostly groupware technologies.

Human-human collaboration in complex tasks takes place when three conditions are met: shared resources; a common objective (which can be defined at various levels of granularity and abstraction); and interactions between participants' tasks. For example, in collaborative design, which can be viewed as a paradigmatic case of tightly coupled work, the complexity of the task produces great work interdependencies. Another consequence of this complexity is that solving design problems often requires that multiple competencies be put together, which in turn leads to development of collaboration between co-designers from various disciplines and thus involves the management of multiple perspectives.

The notion of collaboration recovers various processes: coordination processes like planning and task management; grounding, awareness and construction of shared mental models; co-construction, negotiation and other argumentative activities linked to design rationale; action coordination; and also, at the participant level, the notion of interactive profiles. Collaboration is also expressed through multimodal interactions, especially verbal, textual, graphical, and gestural. Our research addresses these various research issues akin to collaboration.

The technologies mediating collaboration, referred to as groupware technology, are classically categorized according to the spatio-temporal set-up in which they are used: for example; virtual and augmented reality in co-presence and synchronous situations; video-conferencing and shared applications in distant and synchronous situations; platforms with discussion lists and subversions in distant and asynchronous situations. We rather characterize the technology mediated collaboration situations by the characteristics of these groupware systems and by the characteristics of the communication modes available (e.g., visibility, audibility, simultaneity, as described by Clark and Brennan) as far as these characteristics constrain in some way the activity of the humans using them in their collaborative complex tasks.

Our research topics are organized into three main axes.

- **Axis 1: Complex activities and visualization**

Under this axis, our target collaborative situation concerns small groups (pairs or small teams) interacting in co-presence or at distance in a synchronous way. The interactions are multimodal and the group interactions are strongly mediated by shared external 2D or 3D representations acting as intermediary or boundary objects in collaboration. Technologies used are scientific visualization and simulation software, and augmented reality. A situation of reference concerns interactions around paper sketches and plans.

Our current research issues concern: multimodal collaborative processes in designing with augmented reality, grounding in distant collaboration around shared visual spaces, the function of gesture in collaborative design meetings, and information sharing in collaborative design meetings.

- **Axis 2: Distributed design**

Under this axis, our target collaborative situation concerns very large groups (hundreds of persons), also called epistemic communities or communities of practice, interacting at distance in an asynchronous way, with a design objective. The interactions are mostly textual, through discussion lists and updates of data repository. Our current research issues concern mostly the Open-Source Software (OSS) communities, especially the design process viewed as distributed participatory design.

- **Axis 3: Methodological aspects: analysis and evaluation of socio-technical systems**

Research on this axis involves the development of two methodological aspects: methodologies for data analysis and for user-centered design and assessment of new technical systems. Whereas many research on usage analysis is conducted in the field of CSCW (Computer Supported Cooperative Work), very few is concerned with the evaluation of the socio-technical systems and by the development of generic analysis and evaluation methods, accounting for problem solving efficiency (in terms of product and process) and collaboration quality/efficiency. This is one of our research directions. Our current research issues concern methods for collecting and analyzing data on complex activities, in particular design.

## 3. Scientific Foundations

### 3.1. Scientific foundations

**Keywords:** *cognitive ergonomics, cognitive psychology.*

#### 3.1.1. Our domain of expertise: *Cognitive ergonomics and psychology*

The research carried out within the EIFFEL team is grounded in Cognitive Ergonomics and Cognitive Psychology. The main concern of Ergonomics is to accumulate and apply knowledge that is likely to improve efficiency and interest in the work activity, in this case cognitive work, as opposed to purely physiological aspects, which are naturally also important. Traditionally Ergonomics applied to human-computer systems primarily focuses on the interaction between humans and their cognitive work environment (including colleagues, technical devices, their work space). Cognitive Psychology is of major importance in Cognitive Ergonomics, at both a theoretical and a methodological level. In a broader context, Cognitive Ergonomics and Cognitive Psychology belong to the still expanding field of Cognitive Sciences and therefore benefit from the many interactions with the other disciplines that constitute this domain, primarily Computer Science (particularly Artificial Intelligence), Socio-Informatics, Pragmatics and Linguistics.

Our theoretical framework refers to cognition within situations, collective cognition and knowledge development: humans act and learn through interaction with other agents (human or not), in goal-oriented activities and in context. It is based on Newell and Simon's classical cognitive model of information processing, centered on knowledge and reasoning, and on the theory of activity, which has strongly inspired francophone Ergonomics, in particular through its distinction between task and activity. Our approach is also developmental as far as any activity is also an occasion to learn.

Our theoretical framework is also constructed in reference to situated action and situated cognition theories, respectively from Schön and Suchman and the distributed cognition theory from Hutchins. On the one hand, we consider that cognition should be understood and situated within a context that is not only technical but also socio-organizational. On the other hand, technologies and humans should be modeled as joint cognitive systems. However, these before mentioned theories and models are not adopted in their extreme position, which under-estimates the planning activity (the human is then considered as only "reacting" to the context modifications) and poorly distinguishes the resources coming from the human from the ones coming from the environment (e. g., technical systems).

### **3.1.2. A main focus on design**

Our focus is on complex tasks. We consider design as a paradigmatic case of tightly coupled work in which the complexity produces great work interdependencies. This is why design has been our main focus.

Design covers a great range of activities in various knowledge domains: engineering design, architectural design, software design, etc. Historically, various research issues have been focused on, depending on the particularities of design domains. In software design and engineering design studies, in which design is guided (if not constrained) by process models and methods, the issues covered are work interdependencies, modular design and coordination issues. In architectural design and other domains like mechanical design in which there are various forms of representation of the design artifact, in particular graphical ones, one important issue has been to understand the roles of these representations in individual and collaborative design. In design of products, where taking into account users or end-users is an important aspect of design, one important issue has been to anticipate the uses by collaborative methods such as participatory design.

As stressed by Thomas and Carroll early in 1979, design activities involved in these various domains have much in common. This is the approach we follow in our research (see for example [6], [8]), assuming that there are similar cognitive and collaborative processes whatever the design application domain. However, some design domains, in which some processes are emphasized, may be heuristically more relevant to study these processes.

### **3.1.3. Design and HCI**

Two relationships between design and HCI may be stressed out. Firstly, the designers can be considered as end users if we consider the technical support through which they perform their design activity. It is the approach we adopt in our research group. We consider the design process going from the initial specifications to the production and maintenance of the design artifact and the tools to support collaboration during this process.

Secondly, we can consider the end-user of the designed artifact. End-users may be more or less involved in the design process depending on the design approach. In classical user-centered design situations, the role of the user is informative (e.g., needs elicitation) and evaluative (e.g., prototype evaluation), whereas in participatory design situations, the role of the user is also generative (solution elaboration) and sometime decisional: in this way, the end-user becomes a co-designer. The various ways in which the user may be involved, directly or indirectly, in the design process is also of main interest for our group.

### **3.1.4. Our methodology: field and laboratory studies**

Our methodological approach is to conduct empirical studies, either field studies or laboratory experiments:

- Field studies: our main focus is on work in a natural environment. The favored methodology is observation from within the workplace. We collect "natural" data, such as spontaneous dialogues, written productions, drawings and information constructed, collected and used by individuals in the

context of their activity.

- Laboratory experiments: we also conduct "natural" experiments, i.e. experiments in realistic conditions, that is to say with real practitioners, performing realistic tasks, using their common tools in their common environment. We also use knowledge elicitation techniques and post-hoc interviews based on observational data (e.g. videos and transcripts of dialogues).

## 4. New Results

### 4.1. Axis 1: Complex activities and visualization

#### 4.1.1. *Multimodal collaborative processes in designing with augmented reality*

**Participants:** Jean-Marie Burkhardt, Françoise Détienne, Linda Moutsinga Mpage.

Augmented reality (AR) is of main interest in domains where together textual and graphical (2D and 3D) representations are generated and are used as intermediary objects in the collaborative process: this is the case in architectural design. Our research issue is to evaluate how Augmented and Mixed Reality technologies can support the collective dimension of the activity in the context of ill-defined and open tasks like design. In this aim, we have conducted an experiment with pairs of architectural designers working in co-presence with an AR environment, the virtual desktop, developed by the Lucid group at Liege University, which allows freehand sketching and simulations.

Based on methods we developed in previous studies of collaborative design, we have distinguished the design process, the collaborative process, as well as the modalities used. The environment together with the co-presence situation offer each modalities of interaction, in which designers maintain easily a shared local context with no problems of co-reference and possibilities of gestural coordination. However, the constraint of sequentiality for entering the data entails an added task of coordination. Other results concern the use of EsQuise, the software that allows sketching and early simulations in design.

This year we have refined our method to assess the effect that the AR-environment constraints and interaction-modality constraints have on both the design process and the collaboration process. In this objective, we have run a second experimental condition with pairs of architects conducting the same task at distance with AR environments. Detailed results are in ([30], [29]).

#### 4.1.2. *Grounding in distant collaboration around shared visual spaces*

**Participants:** Lionel Barrand, Françoise Détienne.

Common ground refers to that knowledge people (who interact with each other) have in common and are aware of they have in common. The establishment of common ground ("grounding") is an important process in design tasks because of the domain and cultural differences of co-designers. This activity ensures inter-comprehension and construction of a shared representation of the current state of the problem, solutions, plans, design rules and more general design knowledge. The establishment of common ground is a collaborative process in which the co-designers mutually establish what they know so that design activities can proceed. Grounding is linked to sharing of information through the representation of the environment and the artifact, the dialog, and the supposed "pre-existing" shared knowledge.

Distant work is mediated by various technologies that may affect grounding. Various media provide distinctive kinds of cues that may imply various kinds and levels of collaborative effort for people to establish common ground. In this direction, we have analyzed grounding in distant collaborative scientific visualization conducted by pairs of scientists and engineers at EDF R & D and EDF SEPTEN. This experiment has allowed us to set up a methodology (inspired by Kraut & Fussell's work) to analyze the collaborative effort and its progression over time through the use of implicit or explicit references to the visual display, combined with an automatic analysis of the domains of semantic references. This work has continued in the framework of the SCOS project (RNTL).



### 4.1.3. *The function of gesture in collaborative design meetings*

**Participant:** Willemien Visser.

In the framework of DTRS7, the 7th Design Thinking Research Symposium, a group of design researchers and design teams from all over the world have received an identical series of video recordings of two engineering and two architectural face-to-face, synchronous professional design meetings (as in 1994, when in the framework of DTRS2, a comparable group received a series of videos of designers solving individually or collaboratively an experimental design problem [32]). This distribution of data aimed to confront, through the analysis of the same data by different researchers, a variety of today's perspectives on design thinking.

We have performed a cognitive analysis of the spontaneous, co-speech gestures ("gesticulation") in one of the two architectural design meetings (A1 in DTRS7). This investigation is the first stage of a larger cognitive-ergonomics analysis. Our long-term objective is to formulate specifications for remote, possibly asynchronous, collaborative-design systems, especially for supporting the use of different semiotic modalities (multimodal interaction). We have distinguished gestures according to their function in the design interaction. This has led to differentiate two main types of gestures: representational (design-entity designating and design-entity specifying) and organizational gestures. Two functions that can be combined with the previous ones are the modulation of discourse and interaction, and the resolution of ambiguities. Discussion of a series of topics closes the paper: the attribution of fixed functions to particular forms of gesture (e.g., deictic, iconic, and ideographic), the design function of designating gestures, the idiosyncrasy of the gestures identified in the architectural meeting, the irreplaceability of certain gestures relative to other semiotic modalities, the use or substitution of such gestures in computer-supported collaborative software (CSCW), and the contribution of this study to gesture studies and to cognitive design research [27].

### 4.1.4. *Information sharing in collaborative design meetings*

**Participant:** Willemien Visser.

"Common ground" and "grounding" are central notions in research on collaborative design. Even if authors generally do not assert that the construction of such structures results in identical representations, references to differences remaining are rare. Yet, our observations in cognitive design studies have led us to consider that, even if collaborating designers proceed to grounding, and even if they construct interdesigner compatible representations, each designer remains with representations that are incompatible with those held by their colleagues. Given the disregard for this question in the domain of cognitive design research, we have wished to open the debate.

The notion of "grounding" has been developed in order to explain that, in conversation, participants aim to reach understanding "to a criterion sufficient for current purposes" ("the grounding criterion"). However, in work interaction such as design, participants do not only need to attain a certain degree of mutual understanding: they also need to achieve agreement on a common, final, external representation (in design, the specifications). In order to identify forms of differences between different designers' representations, we have analyzed protocols of design meetings in the domains of mechanical engineering, software review, and architectural design. Analysis of the data of the design protocols has led to some first, preliminary results.

In general, people do not know the representations constructed by their colleagues. Differences of representation may become explicit, but often do not. When colleagues express ideas different from one's own representations, designers not necessarily express their opposition; yet, they may convey, more or less explicitly, their representation (which is different). Finally, many differences of representation are never "solved."

By reference to research, in the domains of judgment and decision-making in (small) groups, on "information sharing," "information exchange," and "social sharedness," we propose a new topic to be developed in cognitive design research: the analysis of information that is "unshared" or "partially shared" [26].

## 4.2. Axis 2: Distributed design

### 4.2.1. *OSS communities: distributed participatory design?*

**Participants:** Flore Barcellini, Jean-Marie Burkhardt, Françoise Détienne.

The design behind OSS (Open-Source Software) (OSSD) becomes an important phenomenon in the computer science world: there are thousands of OSS projects and millions of users of OSS systems. This new way of working together brings up many issues for cognitive ergonomics ([20]) some of which our research aims at investigating. OSS can often involve a distant and asynchronous form of computer-supported collaborative design, and a large number of developers and users, members of online communities. If there is a lot of research on collaborative design, very few focused on distant and asynchronous design situations. We assume that the OSSD process is an interesting paradigmatic case to study distant and asynchronous collaborative work.

Moreover, OSSD is a case of continuous design and can be considered as a case of participatory design ([22]). In OSSD, users can be potentially involved in all the phases of the design process. This participation is seen as one of the most important factors explaining the success and the quality of the designed OSS. Thus, OSSD can be considered as a participatory kind of design. Forms of participation in OSS communities are supposed to be "open" in time (the design is continuous) and for different kinds of participants whoever they are (administrators, developers, or users). As far as we know, there is no research that aims at understanding globally the OSSD process and the position effectively occupied by users proposing new functionalities in this self-organized design process.

In this direction, the objective of our research is to analyze the ways members of OSS communities participate in design. We developed a multi-dimensional methodology combining structural and content analysis of interactions between participants, based on the concept of role ([23]).

In particular, we focus on how users of an Open Source (OS) programming language, Python, participate in adding new functionalities to the language. Our study characterizes the Python galaxy and analyses a formal process to introduce new functionalities to the language called Python Enhancement Proposals (PEPs) from the idea of language evolution to the PEP implementation. The analysis of particular design proposals shows that the design process is distributed and specialized between online and physical interaction spaces; and there are some cross-participants between user and developer communities which act as boundary spanners ([11]). These boundary spanners foster the design-use mediation process offering technical and discursive support to some other participants ([21]). This on-going research will be extended on the basis of a methodology developed to study OSSD dynamics based on quoting practices in online discussions ([12]). We do so in collaboration with researchers of the University of California at Santa Cruz with whom we developed a socio-cognitive approach to analyze OSSD ([12]).

In order to refine our methodology, we also initiated a field study in a French society specialized in OSS ([28]).

### **4.3. Axis 3: Methodological aspects: analysis and evaluation of socio-technical systems**

#### **4.3.1. Methods for collecting and analyzing data on complex activities, in particular design**

**Participants:** Béatrice Cahour, Françoise Détienne, Willemien Visser.

Cognitive psychologists and ergonomists have proposed various methods for the analysis of individual verbal protocols, but much less for dialogues in collective work settings. Many professional activities, however, are carried out by people working together through verbal interaction. From a perspective of cognitive ergonomics, we have developed principles for the analysis of collaborative design, amongst which the COMET method. An extension of COMET has been elaborated for the analysis of distant and mediated collaboration.

Dialogue analysis has long been the concern of linguistics, especially pragmatic linguistics. In task-oriented design activities, dialogues are said to be cooperative since the partners share a common goal: they have to converge towards agreement concerning a solution. That is why they differ from several other types of dialogues, such as political debates, interviews, chatting, where the aim is not primarily to collaborate towards a common outcome.

In the framework of the MOSAIC project, we have compared analysis methods adopted and results obtained by researchers from cognitive ergonomics and linguistics, the two disciplines collaborating in this project. Various approaches to analysis have been elaborated, compared and discussed in the framework of a book, in press, co-edited by F. Détienne and V. Traverso [15], [16], [17], [13], [14], [10], [9].

One direction followed has been to develop and test an analytical framework [10] that aims to bring out the nature of participants' contributions to co-design meetings, in a way that synthesizes content (epistemic) and function (argumentative) dimensions, together with the dimension of dialogicality (referred to as "enunciative"). We term the resulting global vision of contribution, the "interactive profile". An interactive profile is made up of the emerging roles adopted by a participant on several dimensions. This work is being extended to analyze the quality of the collaboration in teamwork.

Another direction has been to confront the methodological approaches adopted by linguistic interaction analysis and cognitive ergonomics to the analysis of the MOSAIC corpus through a twofold analysis of two identical segments of this corpus. The results of this confrontation concern two levels: the data-analysis method (the objects of analysis and the levels of structuring the corpus) and the interpretations adopted by each discipline (especially, the status attributed to a pre-existing theoretical framework). Interestingly, the methodological questions have been not only of a comparative nature: they have influenced also each individual analysis. The cognitive ergonomics' analysis indeed has been extended in two directions compared to previous analyses: consideration of interaction's multi-modality and introduction of a finer way to code the design solutions [18], [19].

## 5. Contracts and Grants with Industry

### 5.1. Contracts and Grants with Industry

#### 5.1.1. *Research contract FTR&D (Activités collaboratives assistée par la réalité virtuelle et augmentée : questions de recherche en ergonomie informatique).*

**Participants:** Jean-Marie Burkhardt, Françoise Détienne, Linda Moutsinga Mpage.

This research, which has began in September 2005, aims to evaluate how Augmented and Mixed Reality technologies can support the collective dimension of the activity in the context of ill-defined and open tasks like design. We investigate (a) the requirements and functions needed in situation of collaboration, (b) the limits and contributions of current technologies in terms of utility (functionalities) and usability (interface and interaction) in collaborative activities of design in order to propose (3) a method to evaluate the support and potential negative effect of AR/MR systems on the collaborative design activities.

## 6. Other Grants and Activities

### 6.1. International collaboration

- **UC Berkeley-Santa Cruz project:**

**Participants:** Flore Barcellini, Jean-Marie Burkhardt, Françoise Détienne.

Collaboration with UC Berkeley and UC Santa Cruz on "Social and Cognitive Analyses of Collaborative Design for Open Source Software", funded by the France Berkeley Fund, is still in progress with Warren Sack (UC Berkeley, UC Santa Cruz).

- **USP-NOMADS:**

**Participants:** Françoise Détienne, Willemien Visser.

Collaboration with Universidade de São Paulo (USP), Escola de Engenharia de São Carlos, Dep. de Arquitetura e Urbanismo, is still in progress with members of the NOMADS research group on "Assistance to distant collaborative design using software tools".

### 6.2. European Collaboration

- **Université de Genève:**  
**Participants:** Françoise Détienne, Laurence Gagnière-Foubert.  
Collaboration on "Metacognition in distant collaborative learning" is currently in progress with Mireille Bétrancourt (TECFA, University of Genève).
- **Université de Liège:**  
**Participants:** Jean-Marie Burkhardt, Françoise Détienne, Linda Moutsinga Mpage.  
Collaboration with the Lucid Group on Augmented Reality in collaborative design has started this year. The Lucid Group has developed a virtual desktop (le bureau virtuel) for design, which is tested for collaborative design tasks.

### 6.3. National Collaboration

**Participants:** Lionel Barrant, Françoise Détienne, André Bisseret.

- **Project SCOS (Systèmes Complexes Open Source) - RNTL program Labellisé pôle de compétitivité System@tic:**

Collaboration with Artenum (SS2L), Bull, CEA, CNRS/CCSD/Ciel, Ecole Centrale de Paris/MAS, ONERA/DESP, CS, Safran, EDF, ENS Cachan/CLMA, Grooviz, IFP, GET-INT, LIRIS, Mandriva, Oxalya, INRIA/SCILAB, SETI, TER@TEC, Dassault Aviation and ESA/TEC.

The project aims to specify and develop an open-source generic platform for the development of complex systems. Our involvement concerns the specification and evaluation of collaborative environment for distant scientific visualization.

- **MultiFiches (self financing):**

MultiFiches is an on-line bulletin, published monthly on the Internet and devoted to the domain of multimedia documents and interface design. About forty journals are regularly examined. Each issue presents short papers likely to be of interest to practitioners. The writers are: André Bisseret (DR emeritus INRIA), Mireille Bétrancourt (Professor at Geneva University), Anne Pellegrin (Head of the ergonomists' team at Lig-Multicom) and Nathalie Lépy (Engineer in project Helix at INRIA Rhône-Alpes). From 2002 to the end of 2007, about 430 short papers were published. A textual base is maintained which allows searching by keywords directly in the texts.

- **Lig - Multicom - CNRS-Grenoble University:**

Multicom is a team of Lig (Computer Science Laboratory of Grenoble). This team manages a laboratory devoted to the evaluation of interfaces (Director: Jean Caelen). André Bisseret is collaborating with Multicom as scientific adviser in cognitive psychology and ergonomics. MultiFiches is published on the site of this laboratory: [http://www-clips.imag.fr/multicom/web\\_site\\_multicom/Multifiches/](http://www-clips.imag.fr/multicom/web_site_multicom/Multifiches/).

## 7. Dissemination

### 7.1. Roles in the scientific community

#### 7.1.1. Organizing scientific events

Organization of two national meetings of PhD students in ergonomics: April, 23rd and November, 15th and 16th, Cnam, Paris, France: F. Barcellini

### 7.1.2. Journals' editorial boards

- Interacting with Computers: F. Détienne (member of the editorial board)
- International Journal of Design Sciences & Technology: W. Visser (member of the International Advisory Board)
- Human Technology: F. Détienne (reviewing)
- Le Travail Humain: F. Détienne (reviewing)
- Artificial Intelligence for Engineering Design, Analysis and Manufacturing: W. Visser (reviewing for the Special Issue on Multi-Modal Design, Vol. 22, No. 2, Spring 2008)

### 7.1.3. Conference Program committees

- SELF 2007, September 5-7, Saint-Malo, France: F. Détienne
- SFP 2007, September 13-15, Nantes, France: F. Détienne, W. Visser
- PPIG 2007, 2-6 July, Joensuu, Finland: F. Détienne
- ECCE2007 INVENT! EXPLORE!, the 25th anniversary conference of the European Association of Cognitive Ergonomics (EACE) organized in cooperation with ACM SIGCHI and BCS HCI, August 28-31, London: F. Détienne, W. Visser
- EPIQUE 2007, Sept 11-13, Nantes, France: F. Détienne, W. Visser
- SCAN 07, 2èmes journées du Séminaire de Conception Architecturale Numérique, "Les Apports de l'Image Numérique en Conception Architecturale" Liège (Belgium), May 10-11, 2007: F. Détienne, W. Visser.
- ACM DIS 2008, Designing Interactive Systems, 25-27 February 2009, Cap Town, South Africa: F. Détienne.
- COOP 2008, May 2009, French Riviera: F. Détienne
- CJCSC 2007, the Colloque Jeunes Chercheurs en Sciences Cognitives, Edition 2007, May 30-June 1, Lyon (France): W. Visser
- DCC'08, the Third International Conference on Design Computing and Cognition, Georgia Institute of Technology, Atlanta, Georgia, June 21-25, 2008 (<http://mason.gmu.edu/~jgero/conferences/dcc08/>): W. Visser (member of the Advisory Board)

### 7.1.4. Other expert activities

- AAP CIBLE Projets blancs, Région Rhône-Alpes: F. Détienne, expertise
- Appel d'offre interne, Conseil Scientifique de l'Université de Technologie de Troyes: F. Détienne, expertise
- Jury pour l'HDR de Pascal Salembier, "Analyse, modélisation et instrumentation des activités coopératives situées," Université de Nancy 2: F. Détienne, rapporteur et membre
- Jury pour le doctorat de Lisa-Marie Babin, "Aides à l'optimisation de l'apprentissage d'un système interactif," Université de Toulouse II Le Mirail: F. Détienne, rapporteur et membre
- Appel d'offre ANR on the theme "Audiovisuel et multimédia": W. Visser, expertise

### 7.1.5. Professional and academic societies

- EACE (European Association of Cognitive Ergonomics): F. Détienne, W. Visser
- PPIG: F. Détienne.
- GRAPE (Groupe de recherche en Psychologie Ergonomique): F. Détienne
- ARCo (Association pour la Recherche Cognitive): W. Visser

- GDR Psycho-Ergo: F. Barcellini, F. Détienne, W. Visser

### 7.1.6. Miscellaneous

- Member of the "Commission documentaire Rocquencourt": W. Visser

## 7.2. University teaching

- F. Détienne is research director for Master students in Ergonomics (CNAM - Paris V-Paris VIII). The Eiffel group receives students from these departments.
- Master Recherche Ergonomie CNAM: F. Détienne "Méthode d'analyse de corpus" (3h)
- Master Recherche "Processus Cognitifs" U. Paris 8: F. Détienne "Conception et collaboration" (4h)
- Conservatoire National des Arts et Métiers, Paris, Master 1 & 2 Ergonomie: "Ergonomie, conception et conduite de projet; Ergonomie cognitive; Techniques pour l'analyse des activités expertes" (31h): F. Barcellini
- Université Rennes 2, Haute Bretagne, Rennes, France, Master 2 mention Sciences de l'éducation spécialité Technologies de l'éducation et de la formation: "Ergonomie, Ergonomie et conduite de projets, ergonomie et formation, travail coopératif assisté par ordinateur, communautés en ligne et logiciels libres" (24h): F. Barcellini
- Université René Descartes, Paris 5, Master 2 Ergonomie: "Travail coopératif assisté par ordinateur" (3h): F. Barcellini
- Université de Technologie de Troyes, "Information and Telecommunication Systems Engineering" Master: "Usages, services and terminals: methods and tools for an ergonomic design" (3h): F. Barcellini
- Université de Technologie de Troyes, "Knowledge and Communities Management" Master: "Ergonomics and Human-Systems Interactions" (3h): F. Barcellini

## 7.3. Invited talks and Scientific popularization

- **F. Détienne**
  - PPIG 2007, 19th Psychology of Programming Workshop, 2-6 July, Joensuu, Finland: A multidimensional framework for analysing collaborative design: emergence and balance of roles.
  - JENUI 2007, 16-18 July, Teruel, Spain: Roles emergence and balance in collaborative design.
  - Atelier Travail Collaboratif, 13 Novembre, CNES, Toulouse: Approche ergonomique de la collaboration médiée.
- **W. Visser**
  - Troisième édition des Ateliers de la Recherche en Design, "La Recherche en Design : Diversité des pratiques et définition d'un projet de recherche," Nancy, France, May 22-23: "L'activité de conception. Point de vue de l'ergonomie cognitive".
  - International workshop on Design Meeting Protocols (DTRS7, the 7th Design Thinking Research Symposium), London, September 18-21: "The function of gesture in an architectural design meeting".

## 7.4. Participation in scientific events

- CHI 2007, 25th conference on Computer Human Interaction, April 27th-May 3rd, San José, USA. Workshop on Converging on a Science of Design through the Synthesis of Design Methodologies. Communication and participation: F. Barcellini, F. Détienne.
- ECCE 2007, European Conference on Cognitive Ergonomics, August 28-31st, London, UK. Communication: F. Barcellini, F. Détienne.
- Self 2007, 42ème Conf. de la Société Ergonomique de Langue Française, September 5-7, Saint-Malo, France. Communication: F. Barcellini, F. Détienne.
- 1ère journée de rencontre doctorale, 23 avril 2007, Paris, France. Organisation and communication: F. Barcellini.
- Congrès de l'Association pour la Recherche Cognitive, ARCO 2007, 28-30 Novembre, Nancy : F. Barcellini, F. Détienne (communication)
- First full session of the GDR network "Psycho Ergo" (Psychologie ergonomique et Ergonomie cognitive), September 10, Nantes, France. Participation: T. Février Quesada.
- EPIQUE 2007, September 11-13, Nantes, France. Communication: T. Février Quesada.
- Meeting of the Design Society Special Interest Group "Human Behavior in Design" (SIG DS-AS-1), Châtenay-Malabry (France), August 27. Communication: W. Visser.
- 16th International Conference on Engineering Design ICED 07, Paris, August 28-31. Communication: W. Visser.

## 7.5. Training

- Stage "L'entretien d'explicitation" animé par P. Vermersch. Paris, 19-23 mars 2007. Participation: W. Visser.
- Ecole d'été CNRS organisée par l'ARCO, "Enaction et sciences cognitives", Fréjus, 6-12 septembre 2007. Participation: W. Visser.

## 8. Bibliography

### Major publications by the team in recent years

- [1] F. BARCELLINI, F. DÉTIENNE, J.-M. BURKHARDT, W. SACK. *Thematic coherence and quotation practices in OSS design-oriented online discussions*, in "ACM Conference Group'2005, Florida, US", November 2005.
- [2] A. BISSERET, S. SÉBILLOTTE, P. FALZON. *Techniques pratiques pour l'étude des activités expertes*, 155 pages. The book having been out of print for a while, a reprinting has been released in 2007, OCTARES-Editions, 1999.
- [3] P. D'ASTOUS, P. ROBILLARD, F. DÉTIENNE, W. VISSER. *Quantitative measurements of the influence of participant roles during peer review meetings*, in "Empirical Software Engineering", n<sup>o</sup> 6, 2001, p. 143–159.
- [4] F. DÉTIENNE, J.-M. BURKHARDT, W. VISSER. *Cognitive effort in collective software design: methodological perspectives in cognitive ergonomics*, in "Proceedings of the 2nd Workshop in the Workshop Series on Empirical Software Engineering "The Future of Empirical Studies in Software Engineering", Monte Porzio Catone (Rome, Italy)", September 29 2003, p. 17–25.
- [5] F. DÉTIENNE. *Software design - Cognitive aspects*, Springer-Verlag, Practitioner Series: London, 2002.

- [6] F. DÉTIENNE. *Collaborative design: managing task interdependencies and multiple perspectives*, in "Interacting With Computers", vol. 18, n<sup>o</sup> 1, 2006, p. 1–20.
- [7] F. DÉTIENNE, G. MARTIN, E. LAVIGNE. *Viewpoints in co-design: a field study in concurrent engineering*, in "Design Studies", vol. 26, n<sup>o</sup> 3, 2005, p. 215–241.
- [8] W. VISSER. *The cognitive artifacts of designing*, Mahwah, NJ: Lawrence Erlbaum Associates, 2006.

## Year Publications

### Books and Monographs

- [9] F. DÉTIENNE, V. TRAVERSO (editors). *Méthodologies d'analyse de situations coopératives de conception*, Nancy: PUN, to appear.

### Articles in refereed journals and book chapters

- [10] M. BAKER, F. DÉTIENNE, K. LUND, A. SÉJOURNÉ. *Etude des profils interactifs dans la conception collective en architecture*, in "Méthodologies d'analyse de situations coopératives de conception", F. Détienne, V. Traverso (Eds), Nancy: PUN, to appear.
- [11] F. BARCELLINI, F. DÉTIENNE, J.-M. BURKHARDT. *User and developer mediation in an Open Source Software Community: boundary spanning through cross participation in online discussions*, in "International Journal of Human Computer Studies", to appear.
- [12] F. BARCELLINI, F. DÉTIENNE, J.-M. BURKHARDT, W. SACK. *A socio-cognitive analysis of online design discussions in an Open Source Software community*, in "Interacting With Computers", to appear.
- [13] F. DÉTIENNE, M. BAKER, W. VISSER. *La co-conception du point de vue cognitif et interactif : ergonomie cognitive de la conception et psychologie de l'interaction en apprentissage coopératif*, in "Méthodologies d'analyse de situations coopératives de conception", F. Détienne, V. Traverso (Eds), Nancy: PUN, to appear.
- [14] F. DÉTIENNE, L. GRECO, L. MONDADA, V. TRAVERSO, W. VISSER. *Principes de Transcription*, in "Méthodologies d'analyse de situations coopératives de conception", F. Détienne, V. Traverso (Eds), Nancy: PUN, to appear.
- [15] F. DÉTIENNE, V. TRAVERSO. *Introduction*, in "Méthodologies d'analyse de situations coopératives de conception", F. Détienne, V. Traverso (Eds), Nancy: PUN, to appear.
- [16] F. DÉTIENNE, V. TRAVERSO. *Présentation du corpus et de la situation*, in "Méthodologies d'analyse de situations coopératives de conception", F. Détienne, V. Traverso (Eds), Nancy: PUN, to appear.
- [17] F. DÉTIENNE, V. TRAVERSO. *Conclusion*, in "Méthodologies d'analyse de situations coopératives de conception", F. Détienne, V. Traverso (Eds), Nancy: PUN, to appear.
- [18] V. TRAVERSO, W. VISSER. *Co-élaboration de solutions et rôle du graphico-gestuel : comparaison méthodologique : bilan de la confrontation [Co-elaborating solutions and the role of the graphico-gestural: progress report of the confrontation between two methodologies]*, in "Méthodologies d'analyse de situations coopératives de conception", F. Détienne, V. Traverso (Eds), Nancy: PUN, to appear.



- [19] W. VISSER. *Co-élaboration de solutions en conception architecturale et rôle du graphico-gestuel : Point de vue de la psychologie ergonomique [Co-elaborating architectural design solutions and the role of the graphico-gestural: The ergonomic-psychology viewpoint]*, in "Méthodologies d'analyse de situations coopératives de conception", F. Détienné, V. Traverso (Eds), Nancy: PUN, to appear.

### **Publications in Conferences and Workshops**

- [20] F. BARCELLINI, F. DÉTIENNE, J.-M. BURKHARDT. *Conception de logiciels libres : enjeux pour l'ergonomie et rôle des utilisateurs dans le processus de conception*, in "Actes du XXXXIIème congrès de la SELF, Saint Malo, France", M. ZOUINAR, G. VALLÉRY, M. LEPORÉ (editors), Collection Le travail en débat, Toulouse, France : Octarès, September 5-7 2007, p. 43–52.
- [21] F. BARCELLINI, F. DÉTIENNE, J.-M. BURKHARDT. *Cross-Participants: fostering design-use mediation in an Open Source Software community*, in "Proceedings of the European Conference on Cognitive Ergonomics (ECCE), London", W. BRINKMAN, D. HAM, W. WONG (editors), August 2007, p. 57–64.
- [22] F. BARCELLINI, F. DÉTIENNE, J.-M. BURKHARDT. *OSS design communities: an emergent form of distributed participatory design*, in "Workshop on Converging on a Science of Design through the Synthesis of Design Methodologies at CHI 2007, San José, USA", April 29 2007.
- [23] F. DÉTIENNE, F. BARCELLINI, J.-M. BURKHARDT. *Une approche multidimensionnelle de la participation dans les communautés de développement de logiciels libres*, in "Congrès de l'Association pour la Recherche Cognitive (ARCo), Nancy, France", November 28-30 2007.
- [24] T. FÉVRIER QUESADA, F. DARSEZ. *Coopération en face-à-face et coopération à distance : une étude de cas dans un processus d'innovation*, in "EPIQUE 2007, Nantes, France", September 11-13 2007.
- [25] L. GAGNIÈRE, M. BÉTRANCOURT, F. DÉTIENNE. *La méthode d'allo confrontation comme incitation métacognitive dans des situations d'apprentissage*, in "EPIQUE 2007, Nantes, France", September 11-13 2007.
- [26] W. VISSER. *Collaborative designers' different representations*, in "ICED'07, the International Conference on Engineering Design, Paris, France", August 28-31 2007.
- [27] W. VISSER. *The function of gesture in an architectural design meeting.*, in "International workshop on Design Meeting Protocols (DTRS7, the 7th Design Thinking Research Symposium), London", September 18-21 2007.

### **Internal Reports**

- [28] F. BARCELLINI. *Vers la construction d'un collectif de travail et de la mémoire organisationnelle d'une société de service de logiciels libres*, Master Sciences de Travail et de la Société, mention Ergonomie, spécialité Professionnelle, Conservatoire National des Arts et Métiers, Paris, September 28 2007.
- [29] J.-M. BURKHARDT, F. DÉTIENNE, L. MOUTSINGA MPAGA. *La conception collaborative : outils de réalité augmentée et analyse ergonomique*, Rapport de fin de 2ème année, Contrat FTR&D-INRIA CRE no. 46133216, Institut National de Recherche en Informatique et en Automatique, Rocquencourt, France, November 2007.

- [30] L. MOUTSINGA MPAGA. *Analyse de l'activité de conception collaborative des architectes : apports et limites de la réalité augmentée*, Mémoire de Master Recherche d'Ergonomie. CNAM, Institut National de Recherche en Informatique et en Automatique, Rocquencourt, France, November 2007.

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- [31] A. BISSERET. *Preface to S. Caro Dambreville "L'écriture des documents numériques; approche ergonomique"*, 202 p., Hermes Science LAVOISIER, 2007.

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