



INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

Project-Team Eiffel2

Cognition and Cooperation in Design

Rocquencourt

THEME COG

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1. Team

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2. Overall Objectives

2.1. Overall objectives

Keywords: *argumentation, cognitive ergonomics, cognitive processes, cognitive psychology, collective design, cooperation, cooperative systems, design tools, design methodology, distant mediated cooperation, individual design, knowledge management and capitalization, reuse, viewpoints.*

The Eiffel team is a joint research group comprising members from INRIA (National Institute for Research in Computer Science and Control) and CNAM (National Conservatory of Industrial Arts and Crafts). The objectives of the team are to model cognitive and cooperative processes involved in design activities and to assess and specify tools and methodologies that support design.

Generally, studies on reasoning in design have been carried out on individual problem-solving activities. More recent studies have shifted their focus in response to the increasing need to assist collective work in an industrial context. Major concerns in industrial modernization include: the creation of new organizations that support collective work, greater interaction between designers and manufacturers and capitalization and reuse of design knowledge.

The methodology used in conducting design projects is becoming a key issue. However, models of individual and collective design activities are not taken into account in current methodologies, causing problems that are measurable in terms of cost, efficiency and productivity. Taking cognitive models of individual and collective reasoning into consideration appears therefore to be essential in order to specify and assess the methodologies and more generally the systems that support design. The contribution of Cognitive

Sciences, in particular Cognitive Psychology and Ergonomics, is becoming crucial for handling and improving the design process.

Our research topics are organized into three main axes.

- **Axis 1: Functional and cooperative activities in design**
A current research topic concerns the identification and development of new functionalities to assist a) functional activities involved in all design tasks and b) cooperative activities involved in collective design. The objectives of this research are to define distributed work environments that integrate design tools (e.g. CAD) and communication tools that make use of the Internet and other means of communicating from remote locations. Our research activities focus on: modelling and assisting individual design; analyzing software reuse and service-based design; identifying viewpoints in design; analyzing cooperative design in Open-Source Software (OSS) from a socio-cognitive viewpoint; analyzing web-based cooperative systems for product innovation in the automotive industry and annotation supports and tools in product design.
- **Axis 2: Reflective aspects in design: knowledge management and capitalization**
An additional research objective is to identify and develop new methods and tools for knowledge capitalization and particularly knowledge relating to design. This leads us back in part to the issue of assisting reflective activities - meta-functional activities in which the operator or group of operators reflect on the work itself. This issue is given a constructive perspective (assisting the individual or the group to accumulate knowledge), as well as an integrated approach (integrating the accumulation of knowledge into their main activity, in our case design). Our research activities focus on: meta-cognition in collaborative learning; the role of local adaptations in the evolution of rules in cancerological therapeutic decision making; and mutual learning between users and designers.
- **Axis 3: Methodological aspects**
Research on this axis involves the development of two methodological aspects: analysis methodologies for researchers and user-centered methodologies for the design and assessment of new systems. Our research activities focus on: developing analysis methods of collaborative design; developing methods for the design of new emerging technologies; and developing methods for the analysis of error production.

3. Scientific Foundations

3.1. Scientific foundations

Keywords: *cognitive ergonomics, cognitive psychology.*

In engineering, the aim of design is to produce specifications for the technical solution that is to be implemented. Cognitive ergonomics does not identify design in relation to a social function or status, but qualifies certain situations, in which a set of formal characteristics can be identified, as “design tasks”. From the Cognitive Psychology standpoint, design problems may be considered as “ill-defined” problems [29].

The specificities of design tasks are as follows:

- A design problem has several acceptable solutions, not just one “correct” solution.
- Problems tend to be large and complex. They are not generally confined to local problems, and the variables and their interrelations are too numerous to be divided into independent sub-systems.
- One of the consequences of this complexity is that finding a solution to these problems often requires the combination of multiple skills and abilities, leading to the development of collaboration within a single working group.

- Whatever the application domain, cognitive invariants are found in design activity: e.g. the reuse of previous designs.

Design is usually a group activity, involving and requiring a combination of skills and professions. From a socio-organizational perspective, design is a matter of communicating and integrating the various specialist skills that are involved, primarily due to the difficulty of dealing with the many diverse aspects of a complex artefact, as well as all the relationships that exist between these aspects.

The research carried out within this team focuses on 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 [57], 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), Psycholinguistics and Linguistics. Our theoretical framework refers to cognition within situations, collective cognition and developmental cognition: humans act and learn through interaction with other agents (human or not), in objective-oriented activities and in context [58].

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 favoured methodology is observation from within the workplace. We collect “natural” data, such as spontaneous dialogues, written productions, drawings and information collected by individuals in the context of their activity [56].
- 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. Introduction

EIFFEL’s research has been focusing on collective, rather than individual design, for several years now. Nevertheless, for many reasons, research on individual design is still relevant to our focus. Firstly, even if many design projects are undertaken by large teams involving numerous designers, engineers and other participants, and even if discussions, negotiations and cognitive and operative synchronization play a crucial role in the elaboration and selection of solutions, a large proportion of design activity remains the work of single individuals, particularly during the stages of distributed design. Secondly, even during the stages of codesign, cognitive activities in collective design are the same as those that are implemented in individual design, with in addition other activities specific to cooperative work (particularly coordination, communication, management of viewpoints, synchronization and conflict resolution, primarily in argumentative activities). We have no grounds to suppose that cooperation modifies the nature of the elementary problem-solving processes implemented in design (i.e. solution development and evaluation processes). Finally, the development of appropriate work environments, such as shared and private work spaces in computer-mediated design, requires analyzing the articulation between the different forms of reasoning implemented in both individually and collectively conducted activities.

4.2. Axis 1: Functional and cooperative activities in design

4.2.1. *Designing as construction of representations*

Participant: Willemien Visser.

We have elaborated a new cognitively oriented viewpoint on design, which constitutes an alternative to the two main approaches that today are mostly adopted in cognitive design research. One of these two rival approaches is the classical cognitive-psychology viewpoint, represented by Herbert Simon's symbolic information processing model. The other is the situativity framework, which, in design studies, generally takes the form of reflective practice. We consider that, from a cognitive viewpoint, the design activity that is implemented by designers during their actual work on professional design projects is most appropriately characterized as a construction of representations.

We present and characterize the different representational structures and the activities operating on them. We also outline some initial directions regarding functional linkages between these structures and activities. We discuss different aspects of the representational structures –e.g., their form and function– and the differences between representations as they occur at different phases of the design process: representations at the source of a design project (requirements, or “design problems”), intermediate representations, and representations at the end of a design project (specifications, or “design solutions”).

The construction of representations is a high-level cognitive activity that is implemented through three main types of activities, i.e. generation, transformation, and evaluation of representations. These activities resort themselves to other activities and operations, such as interpretation, association, brainstorming, reinterpretation, confrontation, articulation, integration, analysis, exploration, inference, restructuring, combining, drawing (sketching, drafting and other forms), hypothesizing, and justifying.

We adhere to the idea of “generic design”, but formulate the hypothesis that there are also different “forms” of design, depending on characteristics of the artifact that is to be designed. We propose some candidates for dimensions underlying differences between such forms of design [29].

4.2.2. *A socio-cognitive approach of cooperative design in Open-Source Software (OSS)*

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

Our research question concerns the design processes of an Open-Source Software (OSS) project devoted to the development of a programming language called Python. The designers of Python engage in a particular process called Python Enhancement Proposals (PEPs). PEPs are akin to a design process, called Request For Comments, that has been practised for decades to define standards for the Internet (used, especially, by the Internet Engineering Task Force). PEPs may also be compared to technical review meetings as practised in many corporate and governmental settings. Thus, our refined research question is as follows: What are the structure and dynamics of PEPs and how do they differ from classical technical review meetings in traditional software development? We have identified two main directions for analysis. Firstly, we are interested in the interaction dynamics of the software designers and implementers. Secondly, we want to understand what we will term the “socio-technical couplings” of the OSS project, i.e., the “statics” that accompanies the interaction dynamics. The set of methodologies that we have been using are: Social network analysis methods; Corpus-based, computational linguistics and computational measures of stylistics; Discourse analysis and speech act analysis; Ethnography.

This work is performed in collaboration with UC Santa Cruz and Berkeley. In order to address our first research direction, we have analysed online discussions in the Python project, where the majority of the design takes place. Our methodology is based on quoting analysis as a mechanism used to maintain the discursive context in online discussions [35].

We show that a quotation-based representation of online discussions maintains a better design thematic coherence than a thread-based representation and that this approach is promising for developing OSS design-rationale tools [34].

Our analysis reveals also that OSS online discussions are focused and framed by specific members of the project, especially the project leader. We outlined that: evaluation activity is much more important in this case

of distant and asynchronous design than is traditional face-to-face design; and clarification activity is still present but seems to be framed by the project leader. Finally, we show that we can select messages which are more informative on the design activity (in terms of the design alternatives they cover), on the basis of their position in the quotation graph and of their structure, and which could become the basis of OSS design-rationale tools [33], [54].

4.2.3. Viewpoints in design

Participants: Jean-Marie Burkhardt, Françoise Détienne.

The notion of “viewpoint” associated with design activities is here defined as the effects of designers’ speciality and possibly their role in the design process on the main constraints and objects that are cognitively favoured. We distinguish the notion of “viewpoint” from that of “representation”, classically used in Cognitive Ergonomics. In order to provide design tools, we present an approach to explore the viewpoints of experts that is based on cognitive-discursive analysis and geometric data analysis [30].

Furthermore, a distinction between three types of viewpoints has been made: prescribed viewpoint, discipline-specific viewpoint and integrated viewpoint. This distinction allows us to analyse the dynamics of viewpoint confrontation and the cooperative modes that enable these different viewpoints to be integrated [23].

4.2.4. MAGIE: A web-based cooperative system for product innovation in the automotive industry

Participants: Françoise Darses, Thierry Février-Quesada.

The MAGIE project addresses the design issues of a cooperative environment, called COOPARENA. Our design approach is based on cognitive engineering principles, which consist in specifying the cooperative system requirements at a cognitive level but in terms that can be manipulated by the computer engineers in charge of developing the future system. From this standpoint, we first have carried out a cognitive ergonomics analysis of the current collaborative situations, synchronous or asynchronous, in which the team members are involved. This human-factors analysis resulted in COOPARENA. This cooperation space is made up of collective tasks (which the partners in the innovation project must necessarily undertake to achieve the process) that are carried out using a finite number of Basic Cooperative Functions. Our approach then consisted in translating this model into UML use cases, in close interaction with the system designers. The resulting architecture of the cooperation environment is thereby able to meet the real needs of the Web-based collaborative platform’s future users. A poster [46] presented at ECSCW’05 summarizes the modeling of COOPARENA, the implemented system and the validation by a scenario-based assessment.

On the basis of the MAGIE project, Thierry Février Quesada is going to defend a doctoral dissertation (planned for spring 2006). His topic is the collective design activity in innovation projects.

4.2.5. Meta-cognition in collaborative learning

Participants: Françoise Détienne, Laurence Gagnière.

This research aims to study, in computer-supported collaborative-learning situations, the impact of reflection tools that are assumed to help students to develop and improve meta-cognitive skills. The process by which students develop problem solving, decision making and investigation activities in these situations, is determined by the relationship between collaboration, computer tools and meta-cognitive skills. This relationship stems from research in two areas, Collaborative Learning Theory and Meta-cognitive Theory. It is studied in learning situations using a project-based-learning model. This research is performed in collaboration with the Université de Savoie and the Université de Genève.

The originality of our project lies in the integration of two theoretical perspectives in a complementary framework: the impact of meta-cognitive regulation on learning, and the potential role of traces of the learning activity in supporting the regulatory processes. We propose a method of confrontation aiming at supporting conscious awareness of regulation. It consists in confronting learners with the traces of another learner’s activity (individually or with a peer-tutoring approach) in order to both make explicit their procedures used to realize the learning task and to improve these procedures. Another important point of this project is to consider

the potential of computer environments for encouraging reflection by way of devices that could keep a record of learners' experience.

4.2.6. Mutual learning between users and designers

Participant: Pascal Béguin.

A current field of research considers the continuation of design in usage. Based on activity theory, human instruments are seen as containing components from both artefacts and users' utilization schemes. Users, through their use of artefacts, turn them into instruments. Extending this approach, design can be viewed as a mutual learning process between users and designers [28].

This research question refers to the more general question of how to articulate users' and designers' creativity. Two main approaches have initially been explored. The first one, which consists in ensuring that the creativity of the user's activity will become a source for the designer's activity, leads to the idea that a system crystallizes representations (of functioning, of activities, of work). The second approach, which consists in ensuring that the result of the designer's activity will become a source for the user's activity, calls for a theorization of a system's plasticity and boundaries. A current research plan is centered on articulating the two previous approaches. The main idea is that design is a developmental, dialogical and distributed process of mutual learning between users and designers.

4.3. Axis 2: Reflective aspects in design: knowledge management and capitalization

4.3.1. Toward taking into account local expertise in the evolution of rules: therapeutic decision making in cancerology

Participants: Pierre Falzon, Vanina Mollo.

In medical practice, practitioners use pre-established protocols, which consist in a set of rules resulting from an analysis of scientific literature. When they are faced to unusual situations (that make the application of rules impossible), they can refer to a pluridisciplinary concertation committee (CCP). The objective of this study is to understand how practitioners adapt these rules to respond to unusual situations, and the role of existent resources (protocol and CCP) in knowledge construction and evolution ([50]). In an initial analysis, 19 practitioners were asked to think aloud while resolving 15 case studies involving one or more factors that make the strict application of the protocol impossible. Individual allo-confrontations have also been conducted: practitioners were confronted with the decisions of their colleagues, and had to comment on them. This method leads practitioners to make their knowledge more explicit. Moreover, it constitutes a concrete helpful tool of reflexive activity, allowing knowledge construction and development.

4.4. Axis 3: Methodological aspects

4.4.1. Methods for the analysis of error production

Participants: Pierre Falzon, H el ene Faye.

This study [45] stands in the context of post-Taylorian production management in the automotive industry, and aims at analyzing errors made by operators on an assembly-line. Two campaigns of data collection were conducted using participatory-ergonomics and systematic observation methods. We have analyzed the characteristics of operators' errors, their definition and nature, and their causes in relation to work organization. Systematic observation has provided information on the way in which errors are being managed. Results indicate a low rate of error (1 per hour). A large part of them (64%) is detected, among which the majority (90%) is being recovered.

4.4.2. Methods for the design of new emerging technologies

Participant: Jean-Marie Burkhardt.

We have continued the research carried out within the framework of (1) an industrial co-operation between the French Atomic Energy Commission (CEA) and Renault S.A.S and (2) the APLG project funded by the RIAM program [49] and (3) the Virtualis Project [38] devoted to the merge of VR technology with Human factors knowledge and methods for safety. Using the observations and the interviews with trainees and trainers done earlier [13], the functional and the user-interface specifications of an Augmented Reality (AR) prototype were elaborated [52], [53]. Then, a low-fidelity prototype was developed. According to the specifications, this AR prototype assists the tutor in showing some invisible vehicle parts (e.g. calculators) and in explaining their functioning. In perspective, the usability and the utility of the AR teaching assistance as well as some methods for evaluation will be assessed with real users. Within this research, we have compared interviews and task analysis as two techniques for eliciting end-user needs for emerging technologies. Interviews proved to be more useful for revealing and improving the acceptability of the future emerging technology, while task analysis proved to be particularly useful for revealing utility and usability aspects. In parallel, we have conducted a survey on the use and the socio-technical configurations of Virtual Environment for Training and Education (VET/E). We extracted four main patterns of current design of VET/E thanks to the pedagogical and use configuration. Each pattern favours specific alternatives in terms of the interaction devices, users' representation, users' feedback and offered guidance [39], [16]. We have also reviewed the ergonomics literature on relevant methodological aspects for the design of new emerging technologies, especially for VR and AR [16], [15], [17], [25], [10], [37]. Empirical studies for VR usability were carried out in the same context [48], [44]. Finally, we participated in an AS STIC CNRS action devoted to the reflexion and the methodological preparation of the future human-like Human-Computer Interfaces [55].

4.4.3. Analysis methods of collaborative design

Participants: 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 the preparation of a book, to be published in 2006 at the PUN (co-edited by F. Détienne and V. Traverso).

4.4.4. Verbal and graphico-gestural components of the interaction in architectural design

Participants: Françoise Détienne, Willemien Visser.

In addition to the analysis of collaborative activities through people's dialogues, we have also examined their generation and use of external representations, and more specifically their graphico-gestural activities. A graphico-gestural coding has been proposed [24].

Using as data the polylogues between designers, and the external representations they produce and use, we have elaborated a method to analyze the activities implemented by designers during collaborative-design meetings. We have focused on the role of the architectural sketch in this collaborative-design context. We have situated this question in a broader framework that aims (1) at identifying the use of graphico-gestural expression in architectural design, sketches being one of the forms of this expression, and (2) at analyzing the modes of articulation between the graphico-gestural and verbal components of design interaction. We have

elaborated the first classification, which distinguishes two articulation modes: integrated activities and parallel activities [51].

5. Contracts and Grants with Industry

5.1. Contracts and Grants with Industry

- Contract (September 1st, 2005 – August 31st, 2006) between PSA and CNAM to study professional check-lists in the context of technical design reviews (F. Darses, S. Guibert).
- Research contract FTR&D “Activités collaboratives assistée par la Réalité Augmentée : questions de recherche en ergonomie informatique”.

Participants: Jean-Marie Burkhardt, Françoise Détienne.

This research began in September 2005 and deals with the use of augmented reality for assistance to multiple users engaged in collaborative open tasks like design. We will combine two approaches :

1. analysis of the human-factors and ergonomics literature on AR and CSCW support for collaborative open tasks;
2. empirical studies targeting users’ needs and behaviours in natural and RA-mediated collaborative situations involving open-tasks solving.

5.1.1. Grant for PhD Student

- Grant for a PhD on Error prevention funded by PSA Peugeot-Citroën in partnership with the Laboratory of Ergonomics (CNAM) and the National Association of Technical Research (ANRT).

Participant: Hélène Faye.

This project deals with human reliability in the context of operators working on an assembly line in an automotive manufacturing plant. Its purpose is to determine the relationship between human reliability and the process, on the one hand, and the workload of operators on the other hand.

- Grant for a PhD on methods for the design of emerging technologies funded by the French Atomic Energy Commission (CEA) and Renault S.A.S.

Participant: Margarita Anastassova.

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 currently in progress with Warren Sack (UC Berkeley, UC Santa Cruz).

6.2. European Collaboration

- **Alliance program:**
Participants: Jean-Marie Burkhardt, Françoise Détienne, Willemien Visser.
 Collaboration on “Applying user-centred design to the designers’ activity: the case of reusing SW through service-based engineering tools”, funded by the French-British Alliance program, with the Software Engineering team at Keele University (P. Brereton, D. Budgen, S. Owen, M. Turner). The project aims to apply user-centred design in the case of software reuse through service-based engineering tools.
- **Université de Genève:**
Participants: Françoise Détienne, Laurence Gagnière.
 Collaboration on “Meta-cognition in distant collaborative learning” is currently in progress with Mireille Bétrancourt (TECFA, University of Genève) and Ghislaine Chabert (Université de Savoie).

6.3. National Collaboration

- **Project APLG (Atelier Pédagogique Logiciel Générique) - RIAM program:**
Participant: Jean-Marie Burkhardt.
 Collaboration with AFPA, Ecole des Mines de Paris, Laboratoire d’Informatique de l’Université du Maine, SNCF, Clarté, Communication & Système. This project aims to specify a generic pedagogical computer-assisted software environment for the development of learning-oriented Virtual Environments. In the first phase of the project, we have analysed user needs in the context of existing virtual environment for training. We are participating in the development of a task-based model to monitor learner behaviours in simulated virtual worlds. In the second phase, we will carry out experiments with the resulting prototype.
- **Réseau thématique : Action Spécifique CNRS- STIC “Humain Virtuel”:**
Participant: Jean-Marie Burkhardt.
- **Project “Supervised and automatic acquisition of adaptation knowledge”. Interdisciplinary TCAN program “Knowledge processing, learning and NTIC”:**
Participants: Pierre Falzon, Vanina Mollo, Catherine Sauvagnac.
 This TCAN project is conducted under the responsibility of A. Napoli (LORIA, Nancy). In addition to AI researchers, it also involves ergonomists (EIFFEL – CNAM) and oncologists (CAV, Nancy). This collaboration, established several years ago, deals with the acquisition, the implementation and the evolution of medical knowledge. The objective is to acquire adaptation knowledge in order to develop a case-based reasoning system designed to propose adaptations of therapeutic rules for particular cases.
- **Project “Use Construction and System Design”:**
Participants: Pascal Béguin, J. Brown, Pierre Falzon, Vanina Mollo.
 This project [which involves ergonomists (EIFFEL – CNAM), oncologists (ONCOLOR – NANCY), and private doctors (URMLL)], deals with the development of medical practices in relations with NTIC and evidence-based medicine. It takes place in a general context of networking (prescribed by the Cancer Plan of the French Ministry of Health), which involves a better coordination between the respective roles of private doctors and oncologists in the treatment of patients having a cancer. The first objective was to identify the activity and perspectives that are specific to private doctors and oncologists, and the actual form of coordination between them, in order to define new schemes and technical resources that could support the network.

- **MEDIANNOTE: Annotation supports and tools in product design. Interdisciplinary CNRS-TCAN program “Knowledge processing, learning and NTIC”:**
Participants: Flore Barcellini, Jean-Marie Burkhardt, Françoise Darses, Françoise Détienne, Sylvie Guibert.
The pre-project MEDIAPRO, funded by CNRS/STIC in 2002, has been submitted and accepted by the TCAN-CNRS program as a full project, named MEDIANNOTE. Four disciplines are represented in this project: mechanical engineering, ergonomics, psychology and computer science. It aims at investigating how argumentation processes can be modelled and supported in collaborative design. The project, notified in September 2003, ended in mid-2005.
- **MAGIE: Cooperative environment for product innovation. RNTL project:**
Participants: Françoise Darses, Thierry Février Quesada.
Participants in this project, funded by the RNTL program of the French Ministry of Industry, and led by RENAULT, are CNAM, LAMIH-CNRS, JALIOS-BULL and ILOG. These stakeholders aim at designing a portal, named MAGIE, to support the technological innovation process in the automotive industry. This upstream process takes place in an extended firm, which is characterized by collaborative work by geographically distributed team members. These teams need to get access, through a web platform, to a collaborative environment that allows the multiple collective tasks of the project to be performed.
- **ACI “School and Cognitive Science”. Ministry of National Education and Research:**
Participant: André Bisseret.
“School and Cognitive Science” is a research program funded by the “*Fonds National de la Science*” (“National Science Fund”). In this framework, André Bisseret was a member of an international group (Australia, France, Germany, Switzerland) in charge of writing a state of the art on “The Effects of Animated graphics on Learning”. The report has been completed [14].
- **MultiFiches (self financing):**
Participant: André Bisseret.
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 Clips-Multicom) and Nathalie Lépy (Consultant in cognitive sciences). From 2002 to the end of 2005, more than 300 short papers have been published; a textual base is being built in order to make information retrieval easier for the users.
- **Clips-Multicom - CNRS-Grenoble University:**
Participant: André Bisseret.
Clips is a research center in Grenoble specialized in language communication and person-computer interfaces. Part of Clips, Multicom is a laboratory devoted to the evaluation of interfaces (Director: Jean Caelen). André Bisseret is collaborating with Clips and Multicom as scientific adviser in cognitive psychology and ergonomics. MultiFiches is published on the Clips’ site (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

- Ecole d'été 2005 INRIA-EDF-CEA-CNES on Distant work ("Travail collaboratif en réseau"). Coorganizer: F. Détienne.
- EPIQUE 2005, Septembre, 26-28, 2005, Toulouse. Doctoral symposium chairs: F. Darses & F. Détienne. Panel : "Les utilisateurs et les usages : quelle(s) complémentarité(s) entre la psychologie ergonomique et la sociologie des usages ?". Coorganizer: F. Darses.
- Workshop "Annotation for collaboration", November 24-25, 2005, Paris. Members of the organizing committee and of the scientific committee: F. Darses & F. Détienne.
- Research seminar "Design creativity and Collaborative design in virtual environments". Conference by Mary Lou Maher (Univ. of Sydney, Australia) – Studying the impact of virtual environments on Collaborative design. CNAM (Paris), January 4, 2005. Organizer and Introduction: W. Visser.
- CNRS-TCAN Summer school "Langue, connaissances, information", Batz sur Mer (France), May 22-27, 2005. Coorganizer: F. Darses.

7.1.2. Journals' editorial boards

- Le Travail Humain: A. Bisseret, F. Darses (members of the board of consultants), W. Visser (reviewing).
- International Journal of Human Computer Studies (IJHCS): J.-M. Burkhardt (reviewing).
- Interacting with Computers (IWC): F. Détienne (member of the editorial board), F. Détienne (reviewing).
- Research in Engineering Design (RED): W. Visser (reviewing).
- Artificial Intelligence for Engineering Design, Analysis and Manufacturing (AI-Edam): W. Visser (reviewing).

7.1.3. Conference Program committees

- PPIG2005 Psychology of Programming Interest Group Annual workshop, June 28 - July 1, 2005, University of Sussex, Brighton, UK: W. Visser.
- EPIQUE2005, Troisièmes Journées d'Etude en Psychologie ergonomique, 26-28 September, 2005, Toulouse, France: J.M. Burkhardt, F. Darses, F. Détienne, W. Visser.
- HBiD05, Second International Workshop on Human Behaviour in Designing, August 15, 2005, Melbourne (Australia): W. Visser.
- SCAN 05, "Séminaire de conception architecturale. Le Rôle de l'Esquisse Architecturale dans le Monde Numérique" (National workshop on Numeric architectural design. The role of architectural sketches in the numeric world), Charenton-le-Pont (France), December 1-2, 2005: F. Darses.
- IC2005, Ingénierie des connaissances (Knowledge Engineering), May 31 - June 3, 2005, Nice (France): F. Darses.
- EUROGRAPHICS 2005 - Dublin (Ireland), August 29 - September 2, 2005: J.-M. Burkhardt.
- IEEE VR'05, International Virtual Reality Conference, Bonn (Germany), March 10-12, 2005: J.-M. Burkhardt.
- VRIC 2005 - Virtual Reality International Conference, April 20-22, 2005, Laval (France): J.-M. Burkhardt.
- 1st VRL - Virtual Reality for Learning Seminar, April 20-21, 2005, Laval (France): J.-M. Burkhardt.
- CONTEXT'05, Workshop on "Cooperative Systems and Context", Paris, July 5, 2005: F. Détienne.
- ACM DIS 2006, Designing Interactive Systems, State College, PA (US), June 26-28, 2006: F. Détienne.
- COOP 2006, Carry-le-Rouet, France, May 9-12: F. Détienne.
- CITE 2006, Nantes, June 26-28, 2006: F. Détienne.

7.1.4. Other expert activities

- 6th PRCD (NEST): Expert: F. Détienne.
- Member of INRIA Evaluation committee: F. Détienne.
- Examining member for PhD (S. Buisine): F. Détienne.
- Member of the PHD jury de G. Ruiz, Génie Industriel, GILCO, INPG Grenoble : F. Darses.
- Expert for a research project (presented by Jacques Marc, INRS, Nancy) aiming methods enabling designers to incorporate health and security factors in system design: W. Visser.
- CNRS Summer school "Environnement Informatique d'Apprentissage Humain" (EIAH 2006). Member of the scientific and pedagogical committee: J.-M. Burkhardt.

7.1.5. Professional and academic societies

- SFP (French Psychology Association). Member: A. Bisseret.
- ARCo (Association for Cognitive-Science Research). Member: W. Visser.
- EACE (European Association of Cognitive Ergonomics). Executive board: F. Détienne (responsible of legal affairs). Members: J.-M. Burkhardt, F. Darses, W. Visser.
- SFP working group in Ergonomic Psychology (GRAPE): Members: J.-M. Burkhardt, F. Darses, F. Détienne.
- Francophone Ergonomics society, SELF. Members: F. Darses, J.-M. Burkhardt.

7.2. University teaching

- Falzon teaches Ergonomics at the CNAM, and is responsible for the DEA in this subject (CNAM – Paris V-Paris VIII).
- F. Darses is senior lecturer at the CNAM.
- J.-M. Burkhardt is senior lecturer at the University of Paris 5.
- F. Détienne is research director for DEA students in Ergonomics (CNAM – Paris V-Paris VIII) and Cognitive Processes (Paris VIII). The Eiffel laboratory receives students from these departments.
- S. Guibert teaches at the CNAM as “monitrice d’enseignement” (64 h/year).
- V. Mollo (A.T.E.R.) teaches at the CNAM (192h/year)
- M. Anastassova teaches at René Descartes University, Psychology Department: TD, Introductory Statistics for 1st year undergraduate psychology students (48h/year).
- M. Anastassova teaches at Ecole Polytechnique Féminine-Ecole d’Ingénieurs, Information Systems Department: An Introduction to the Ergonomics of Augmented Reality for 4th & 5th year engineering students (4h30/year).
- Master Recherche Ergonomie CNAM - Seminar “Analyse de données verbales”, 26/05/05: F. Détienne & W. Visser: “Méthode d’analyse de corpus multi-modaux d’activités de conception collective” (3 hours).

7.3. Invited talks and Scientific popularization

- **F. Darses**
 - Invited speaker at the summer school “Langue, connaissances, information” CNRS-TCAN, Batz sur Mer, France, May 22-27,2005.
- **P. Béguin & V. Mollo**
 - “COUCOS, Construction des usages et conception des systèmes”. Invited talk at the conference “Recherche, expérimentation et usages des TIC et de l’internet”, Aix-en-Provence, June 8, 2005.
- **J.-M. Burkhardt**
 - Virtual Reality, Human Factors and safety-related issues: the VIRTUALIS project. Invited talk at the Conference Virtual Concept 05, Biarritz, France.
 - APLG, Réalité Virtuelle/Mixte : travaux menés au L.E.I. Invited talk at the Seminar Environnements Virtuels de Formation, ENIB-UBO Centre Européen de Réalité Virtuelle, Brest, France .
 - Ergonomics contribution to Virtual Environment for Training and Education (VET/E) design : two examples. Invited talk at the 1st Virtual Reality for Learning seminar – Virtual Reality International Conference.
 - A survey on Virtual Reality in the fields of Vocational Training and Education: report on work in progress. Invited talk at INTUITION NoE – Training and Education Group KOM, Laval, France.

- Quelques dimensions ergonomiques de la conception et de l'évaluation d'environnements virtuels. Invited talk at the Seminar "Le virtuel et le tangible : ce qui résiste", Université Technologique de Compiègne- COSTECH, Compiègne, France.
- **F. Détienne**
 - Invited talk at the Seminar Communication Homme-Machine du LIMSI, Approche ergonomique de la conception collaborative, May, 2005.
- **F. Barcellini & F. Détienne**
 - Invited talk at the Seminar SIPA-IFRIS, Polytechnicum de Marne la Vallée, Les projets de conception de logiciels libres: analyse des activités collaboratives dans les discussions en ligne, November, 2005.

7.4. Participation in scientific events

- HCII 2005 – Human-Computer Interaction International, July 22-27, 2005, Las Vegas, USA. M. Anastassova (communication).
- Virtual Concept'05, conference. November 8-10, 2005, Biarritz, France. J.-M. Burkhardt (chairman).
- Virtual Reality International Conference, Laval, France. J.-M. Burkhardt (chairman, communication).
- ACM -IHM 2005, September 27-30, 2005, Toulouse, France. J.-M. Burkhardt (communication).
- Communities and Technologies 05, June 13-16, 2005, Milan, Italy. F. Barcellini, F. Détienne (communication).
- Epique 05, September 26-28, 2005, Toulouse, France. F. Barcellini, F. Détienne (communication), F. Darses, S. Guibert (participants); J.M. Burkhardt (discutant, communication).
- Group 05, November 06-09, 2005, Sanibel Island, Florida, USA. F. Barcellini, F. Détienne (communication).
- Rencontres Mondiales du Logiciels Libres, July 05-09, 2005, Dijon, France. F. Barcellini, F. Détienne (communication).
- ECSCW 2005, September, 20-22, 2005, Paris, France. T. Février Quesada, F. Darses (communication); F. Détienne, F. Barcellini (participation).
- SCAN 05, "Séminaire de conception architectural. Le Rôle de l'Esquisse Architecturale dans le Monde Numérique". National workshop on Numeric architectural design. The role of architectural sketches in the numeric world, December 1-2, 2005, Charenton-le-Pont, France. W. Visser and F. Détienne (communication).

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- [2] 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° 6, 2001, p. 143-159.
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- [13] M. ANASTASSOVA, J.-M. BURKHARDT, C. MÉGARD, P. EHANNO. *Results from a user-centred critical incidents study for guiding future implementation of augmented reality in automotive maintenance*, in "International Journal of Industrial Ergonomics", vol. 35, 2005, p. 81–91.
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