Viewpoints in co-design: a field study in concurrent engineering

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We present a field study aimed at analysing the use of viewpoints in co-design meetings. A viewpoint is a representation characterised by a certain combination of constraints. Three types of viewpoints are distinguished: prescribed viewpoint, discipline-specific viewpoint and integrated viewpoint. The contribution of our work consists in characterising the viewpoints of various stakeholders involved in co-design ('design office' disciplines, and production and maintenance disciplines), the dynamics of viewpoints confrontation and the cooperative modes that enable these different viewpoints to be integrated.
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The aim of the study presented in this paper is to analyse the viewpoints brought into play in co-design. The chosen design context is a Concurrent Engineering process. This framework seemed to us to be the most relevant for studying the topic of viewpoint, as the Concurrent Engineering process (Darses, 1997) is assumed to encourage the confrontation of viewpoints during solution development.

Aerospatiale Matra Airbus has conducted the re-engineering of its design processes in a Concurrent Engineering procedure, in order to better control costs, schedules and quality in the design of its products. This industrial development is assisted by cognitive ergonomics research work, which is the framework of this study.

After a state of the art and a presentation of our working hypotheses, we present our field study aimed at understanding the use of viewpoints in

an industrial Concurrent Engineering context. Our approach is strongly guided by cognitive ergonomics work on the notion of constraint, and linguistics notions on argumentation.

1 State of the art

The confrontation of knowledge and the integration of viewpoints are at the heart of the cooperative mechanisms implemented in co-design. In team design, tasks corresponding to sub-problems are distributed among individuals, each carrying out various sub-tasks. As soon as tasks are divided, conflicts between designers from various disciplines arise and generally negotiation ensues. Design is a process of negotiating among disciplines (Bucciarelli, 1988). Solutions are therefore not only based on purely technical problem-solving criteria. They also result from compromises between designers: solutions are negotiated (Bucciarelli, 1990; Martin et al., 2000).

Viewpoints or views or perspectives have been the focus of research in various disciplines: computer science, linguistics, cognitive ergonomics. An initial general definition of the notion of 'viewpoint' is: 'for a person, a particular representation of an object'. Different participants, with different competencies, skills, responsibilities and interests, inhabit different object-worlds. As such, while admittedly working on the same object of design, they see the object differently (Bucciarelli, 2002). Most of the authors agree that a viewpoint is strongly influenced by the domain area of the designer. Factors such as the field of expertise and specific technical interest play a role in this representation. Several participants see the design object differently according to the constraints specific to their discipline.

Our approach is based on several working hypotheses. Firstly, we have constructed an operational definition of the viewpoint notion in order to study viewpoints involved in multidisciplinary co-design. We consider that a viewpoint is a representation characterised by a certain combination of constraints: it is strongly influenced by domain area or discipline knowledge. Secondly, we have adopted a dynamic approach to the notion of viewpoint. During the design process, different viewpoints are adopted. In the course of co-design, in particular in multidisciplinary meetings, viewpoints evolve and may become shared by various disciplines designers: integrated viewpoints are constructed.

Furthermore, we have adopted several methodological principles in order to choose our field study situation and to analyse this situation.