

Agent-supported portals and knowledge management in complex R&D projects

Jean-Paul A. Barthès^{*}, Cesar A. Tacla

CNRS UMR 6599 HEUDIASYC, Computer Science Department, University of Technology of Compiègne, 60205 Compiègne, France

Abstract

This paper is concerned with organizing knowledge management in complex R&D projects where time is the prime factor. We argue that specific portals developed using groupware technology and products should be augmented by agents in order to increase the overall system reactivity and achieve the global objective, namely to save time. We describe a portal we have developed using a groupware approach, we give the structure of a system of cognitive agents, and discuss our current attempt to bring the two technologies together. © 2002 Elsevier Science B.V. All rights reserved.

Keywords: Knowledge management; Groupware; Multi-agent systems; Project portals

1. Introduction

Our paper analyzes the research being done in the context of a French national project for the automotive industry. The main problem to be solved is to organize knowledge management in complex high priority urgent R&D projects, so that the gained experience can be used by the following complex high priority urgent R&D projects. A similar but more general concern was expressed in the MOKA European project [1]. In order to offer possible solutions, one has to take into account the reality of the situation, and in particular organizational constraints, rather than devising elegant but impractical systems. Since we are dealing mostly with information, two technologies are useable: groupware for document management and cooperative work, and multi-agent systems (MAS) for flexibility and dynamics. The point of view taken in the paper is that of the application.

The paper is organized in four parts: Section 2 introduces the context of the work; Section 3 describes the features of a portal we developed for R&D projects; Section 4 discusses the multi-agent architecture that we have developed recently; and Section 5 discusses the possibility of putting the two technologies to work together, mentioning some problems which remain to be solved.

2. R&D projects and knowledge management

This section introduces the type of R&D projects we consider, the need for knowledge management, and the concept of *ba* as proposed by Nonaka and Konno [2] for supporting knowledge creation.

2.1. Complex projects and knowledge creation

The R&D projects that we consider belong to *re-design* or *routine design*. Redesign consists of starting from an existing product and trying to improve it. Routine design is usually related to the repetitive

^{*} Corresponding author. Tel.: +33-3-44-23-44-66;
fax: +33-3-44-23-44-77.
E-mail address: barthes@utc.fr (J.-P.A. Barthès).

design of the same family of products. A new product is produced by modifying previous ones, reusing past designs and combining previous partial solutions. Most of our products follow this process from appliances to computers, cars, airplanes, or factories. In our case, redesign or routine design cannot however be equated with *catalog design* [3]. Indeed, designing a new vehicle is not a simple combination of past designs and assembly of old parts, it also requires newly engineered parts and new methods developed specifically for the project, which characterizes innovative situations. The projects we consider lead to the development of prototypes that will eventually be built in a volume production. The critical resource, and also the main criterion in such projects, is time. Everything is expressed in terms of time including costs (man–year, man–month, man–hour). The projects of interest have a 2–5 year time-to-market delay. While the project team is working on the prototype, there is very little time allocated for recording justifications for design decisions (design rationale) in details, or producing comprehensive documentation. As a consequence, information ends up spread in a multitude of documents on various supports. Most lessons learnt on the project are buried in the heads of the project team members. Then, since R&D teams change from one project to the next, a great deal of experience is usually lost. Thus, a major problem is to find some means of

organizing and managing the knowledge created in such R&D projects.

2.2. Knowledge and knowledge management

2.2.1. Various types of knowledge

In a company, one can distinguish between *company knowledge* and *corporate knowledge*. Company knowledge refers to technical knowledge used inside the company, its business units, departments, subsidiaries. Corporate knowledge is used by the management at a corporate level. Company knowledge includes, on one hand *explicit knowledge*, i.e. the specific know-how characterizing the ability to design, build, sell, and support products and services; on the other hand *tacit knowledge*, i.e. the individual and collective skills that characterize the ability to act in accordance with circumstances, and to make progress. When stored in archives, cabinets, and people's minds, knowledge consists of tangible components (data, procedures, drawings, models, algorithms, documents of analysis and synthesis). Otherwise, it consists of intangible components (people's abilities, professional knack, private knowledge, routines—the unwritten logic of individual and collective action—knowledge of company history and decisional contexts. Fig. 1 (Grundstein and Barthès [4]) summarizes company knowledge under two main categories: *explicit* and *tacit knowledge*.

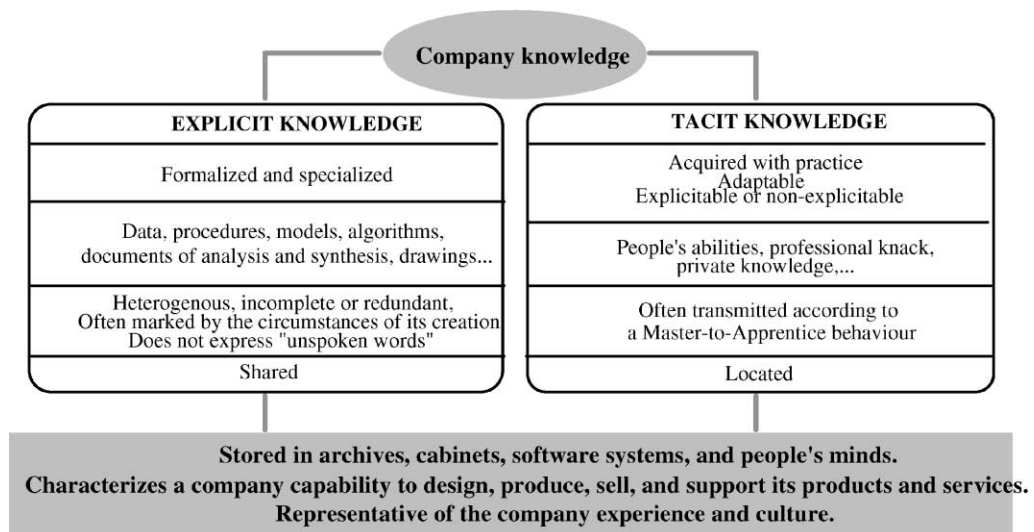


Fig. 1. The two main categories of company knowledge (Grundstein and Barthès [4]).

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