



Chapter 17

Knowledge Sharing Across Organizational Boundaries with Application to Distributed Engineering Processes

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Collaborative engineering processes with more than one company involved raise the need for knowledge sharing across organizational boundaries. The problem is analyzed in general, but on the background of this real-world application domain encountered, e.g., in automotive industry. A solution concept called virtual project database is presented; deficits in the status quo of information technology are hinted at as well as directions of future work for implementing the solution concept.

INTRODUCTION

Today, a complex and innovative technical product is rarely being developed as a whole by one single company alone. Demands for higher productivity and shorter times-to-market in global-scale competition and the high and continually increasing system complexities have lead to intensified “outsourcing” and strategic alliances. Components or subsystems of an entire system can be developed (and produced) by firms with specific know-how and supplied to a system integrator. E.g., over 50% of a motor car is produced by suppliers (Pfannmüller, 1999). As a result of this, interlaced development processes and shared knowledge about a

product and its environment (such as product ideas, specification documents, system models, or simulation data) have to be managed across site and company boundaries (Distributed Concurrent Engineering).

Time-consuming manual processes such as printing and mailing of documents, shipping of diskettes, travelling to meetings etc. cause interrupts in information exchange leading to interrupts in the individual design processes or additional iterative changes due to intermediate work with old data. The delays resulting from inappropriate synchronization between development processes and partners accumulate during project lifetime and increase the total development time. Furthermore, unorganized redundancy in project data management is a permanent source of inconsistencies. Therefore, effective cross-organizational knowledge management in the context of development projects is required as a basis for improved distributed engineering processes. Expected effects are shorter times-to-market and – since there is a strong correlation between process and product quality – better products.

The authors' primary target within the application domain of distributed cooperative work across enterprises in the engineering field is electronic systems development. Electronic systems (embedded hardware/software systems) are of high economic importance since embedded software is one of the key innovation factors in many product areas, e.g., in the automotive industry (Müller-Glaser et al., 1999)¹. Nevertheless, similar principles should apply to a more general context.

CROSS-ORGANIZATIONAL KNOWLEDGE SHARING

“Outsourcing” of engineering tasks will be implemented in form of development projects with external partners. Therefore the knowledge sharing problem can be attached to a *project* context. For simplicity, in this chapter we assume a bilateral relationship between two organizations.²

Project Knowledge Sharing and Reuse

Projects start with some initial knowledge taken from the companies' expertise and produce additional knowledge during project lifetime. As a whole, a “*project memory*” is built up. It can be represented by a *project database*, a repository set up for all data specific for a certain project. The basic idea presented in this paper is the integration of all project-relevant knowledge by a *virtual* repository which consists of physically distributed parts (section).

Reuse of knowledge, i.e. retrieval and repurposing/adaptation of existing information from other projects, ideally is facilitated by a general repository, called “*reuse database*” or (with respect to process knowledge) “*experience factory*” (Basili and Rombach 1988). It is the property of a company and resembles a part

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