Chapter XVI

Interactive Models for Virtual Enterprises

Håvard D. Jørgensen
Computas, Norway

John Krogstie
SINTEF and NTNU, Norway

ABSTRACT

This chapter presents a novel approach to the development, integration, and operation of virtual enterprises (VEs). The approach is based on the idea of interactive models. An interactive model is a visual model of enterprise aspects that can be viewed, traversed, analyzed, simulated, adapted, and executed by the participants of the VE. The approach has been developed in several research projects, where experiences from industrial case studies are used as a basis for validation and further enhancement. A major result of this work is the model-driven infrastructure that integrates and supports VEs. The main innovative contributions of this infrastructure include concurrent modelling, metamodelling, management and performance of work, integrated support for ad hoc and structured processes, and customizable model- and process-driven integration.

INTRODUCTION

Business environments are becoming increasingly dynamic and knowledge intensive. Cooperation across traditional organizational boundaries is increasing, as outsourcing and electronic business are enabled by the Internet and other information systems. In VEs, each partner company contributes unique and complimentary compe-
tence vital for the success of the joint project. When interorganizational cooperation moves beyond the buying and selling of goods and well-defined services, there is thus a need for flexible infrastructures that support not only information exchange but also knowledge creation, evolution, and sharing.

While computerization automates routine procedures, knowledge-based cooperation remains a challenge. Paradoxically, studies conclude, “simple and adaptable technologies enable more complex virtual collaboration” (Qureshi & Zigurs, 2001). Low-level tools like e-mail are used far more frequently than sophisticated coordination systems. VE process management tools are currently regarded as “obtuse and inaccessible to the vast majority of knowledge workers” (Delphi Group, 2001). This chapter aims to demonstrate that information and communication technology (ICT) infrastructures controlled by enterprise models can offer rich, but at the same time simple, and comprehensible support to VEs.

**BACKGROUND**

A VE is defined as “a customer solution delivery system created by a temporary and ICT enabled integration of core competencies” (Tølle, Bernus, & Vesterager, 2002, p. 1). Infrastructures developed for VEs face three highly intertwined challenges:

- **Heterogeneity**, incommensurable perspectives, software infrastructures, working practices etc., among the partner companies
- **Flexibility**, due to need for learning, change, and exception handling
- **Complexity**, the richness and uncertainties of interdependencies among partners, their activities, resources, skills, and products

Heterogeneity, change, and complexity must be managed at different levels:

- **Knowledge**, the skills needed for problem solving and work performance, the shared language and frames of reference needed for communication, etc.
- **Process**, the planning, coordination, and management of cooperative and interdependent activities and resources
- **Infrastructure**, the information formats, software tools, and interoperability approaches of the participating companies

The resulting problem space is summarized in Table 1. Each level is elaborated upon below. For networks of small and medium-sized enterprises (SMEs), these challenges are amplified, as resources are scarcer and high entry costs are prohibitive.

**Process Structure, Diversity, and Evolution**

Unstructured creative activities are often most important for the competitiveness of an enterprise. Even in seemingly routine work, exceptions and uncertainties permeate the environment. Workers reflect upon and manage these problems in a sophisticated manner (Wenger, 1998). To some extent, most work can thus be regarded as knowledge intensive. On the other hand, most work processes also have routine parts that can be structured and automated. Many companies have prescribed quality management procedures for administration, audit, approval, etc. Systems must thus integrate support

Copyright © 2005, Idea Group Inc. Copying or distributing in print or electronic forms without written permission of Idea Group Inc. is prohibited.