Chapter XIV
Functional Product Development Challenges Collaborative Work Practices

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ABSTRACT

Developing service-laden products in a virtual extended enterprise implies a wider distribution of resources and product development (PD) team members than what is the case today. In this setting, the challenge is getting a cross-disciplinary distributed team to collaborate effectively over distance using not only the tools available today, but also new tools and approaches. One such activity-based approach, based on an actual Volvo Aero service-provision process, is presented in this article. Supplying a physical product as part of a service contract within an extended enterprise demands increased speed and quality of the predictions the supplier wants to make in order to keep track of the product functionality, its cost effectiveness and lifecycle cost. One approach that has been proven in engineering is modeling and simulation, here implemented as activity-based simulation of an actual industrial work process that provides a maintenance service. The activity-based simulation approach is realized in the industry standard simulation environment MATLAB. It is created as a demonstrator of one of several future tools that may help a virtual extended enterprise to face the challenge of supplying function or services to the customer more effectively. Conclusions regarding Collaborative Working Environments include new requirements on quality of tools for supporting functional product development regarding knowledge availability, usability, security and interoperability. Conclusions also support the suggested approach concerning development of distributed, modular activity-based process simulation models as a suitable approach for supporting functional product development.

FUNCTIONAL PRODUCT DEVELOPMENT CHALLENGES TODAY'S COLLABORATIVE WORK PRACTICE

This paper discusses demands on Collaborative Work and Collaborative Working Environments (EC, 2005) (CWE) originating in companies' transformation from hardware providers to function providers. An activity-based modeling and simulation approach to Functional Product Development (FPD) is suggested as part of a simulation-driven CWE approach to meet the new demands that are placed on tools and methods used in industrial product development due to this transformation.

A shift in view, captured in the concept of functional products, is found within the manufacturing industry. Traditionally, the manufacturing industry has focused on providing excellent goods, i.e., hardware. Services occur on an aftermarket, as add-ons to the developed hardware, and much of the profit is made on activities such as maintenance and spare parts. Nergård (2006) indicates that competition has increased in the manufacturing industries' aftermarket activities; one trigger for the concept of functional products according to information from the case discussed below is seen in the interest to control aftermarket activities associated with the developed hardware. By supplying functions, with hardware components as the core product, instead of merely selling the hardware, companies can control the aftermarket. The responsibility and availability of the functions provided by hardware remains with the service provider, as does the responsibility for maintenance and spare parts. This approach is a response to a necessity for business-to-business collaborators to gain economy-of-scale partnerships in the extended enterprise and ultimately to be able to develop competitive offers, as discussed by Löfstrand, Larsson & Karlsson (2005) and Alonso-Rasgado, Thompson & Elfström (2004) Hence, the shift in view is a move towards providing services while taking a lifecycle commitment for the hardware as well as optimizing the availability of its function in the customer's system. The redirection from hardware development to a process where the development of functions, comprised of hardware, software and services, or total offers is in focus is hereafter referred to as Functional Product Development (FPD), an area in which technology processes (hardware) and business processes (service add-ons) merge. The function provider needs some partners to act as sub-function suppliers in an extended enterprise fashion. Based on information from the workshops discussed below, this calls for closer collaboration than what is normally the case in a project aimed at hardware development only. Different team members with different functions (e.g., engineering design, production, management, finance and marketing) must be able to share relevant function-specific information while doing distributed collaborative work. O'Donnell (2005) suggests using an approach based on systems thinking for handling business models. This might be carried out by team members in management or economy-related roles.

Product development literature provides a broad view of how to understand customer needs, develop and sell products and includes discussions concerning best practices, (Ulrich & Eppinger, 1995; Wheelwright & Clark, 1992; Cross, 2000) For example, Smith & Reinertsen (1997) offer a general view and aim to describe methods for generating a product (hardware or service) to meet customer needs. Within the hardware product development domain numerous tools have been developed to support the creation of excellent goods; Computer Aided Engineering for geometric representation (LaCourse, 1996) and Finite Element Method for stress calculation. Typically, this work has been about making knowledge explicit and expressible and support tools have over time been developed to aid the creation of the hardware.