Shared Workspace for Collaborative Engineering

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EXECUTIVE SUMMARY

In the broad context of the collaborative research center project IMPROVE (Information Technology Support for Collaborative and Distributed Design Processes in Chemical Engineering), the presented case study has been concentrating on the provision of appropriate communication technology, specifically shared workspace means, to enable collaborative working between distributed engineering teams. Issues like distributed developer meetings, sharing common data, or even sharing entire workspaces including off-the-shelf tools being used for the development process are the driving forces for the studies on how to provide appropriate technology means in collaborative engineering. The considered case in the field of chemical engineering and development represents a difficult candidate for collaborative engineering due to the variety of proprietary data and tools to be integrated in a shared workspace. Furthermore, common aspects of cooperative working among development teams have to be considered as well. The resulting architecture–based on the findings of the current stage of the case –is presented, trying to use as many existing software as possible. Drawbacks and challenges being encountered during the case study due to the *a-posteriori* approach are outlined, leading to a revised architecture proposal to be used in the future as a common platform for the information technology support within the context of the research project. Expected benefits and problems of the introduction of the new architecture are drawn.

BACKGROUND

The collaborative research center project 476 IMPROVE (Information Technology Support For Collaborative and Distributed Design Processes in Chemical Engineering), sponsored by the German Research Foundation, is a cooperation between chemical engineers and computer scientists to improve development processes in chemical and plastic engineering and to study information technology aspects to support development processes by means of evolving multimedia, planning, and modeling tools.

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A development process in chemical and plastic engineering is concentrating on designing a new or revising an existing production process, including its implementation (Nagl & Westfechtl, 1999). A development process in process engineering, similar to other engineering sciences, is divided into different phases. In a first phase, the requests for the material products are determined on the basis of a market analysis. Afterwards, the concept design and the basic engineering take place, finally leading to a definition of the basic data of the engineering process. It follows the detail engineering, deepening the data determined in the basic engineering. Then it is transferred into apparatuses, machines, piping including measuring technique, control engineering and automatic control. Finally, the development process is finished, and the procurement of all units, the assembly of the system, their line-up and the system operation take place.

As outlined in Nagl & Marquadt (1997), the first phases of a development process, i.e., basic and detail engineering, are of utmost importance due to several reasons. Firstly, around 80 percent of the production costs are defined in these phases. Secondly, the complexity of these phases is fairly high due to the different aspects of the production process to be considered. Hence, a proper support of these phases by appropriate methodologies as well as information technology is crucial to guarantee a successful completion of the development process.

SETTING THE STAGE

The focus of the research project IMPROVE is on some subtasks of the concept design, which seem particularly important, to improve and accelerate future development processes. Typical characteristics, among others, of these subtasks are the following (Nagl & Westfechtl, 1999):

- *Number and background of developers*: Different tasks of the concept design are usually solved by different developers and development teams. The number and size of these teams as well as the personal background of the individual team members usually complicates information exchange and understanding of solutions, additionally caused by different terminology and lack of command tool support.
- *Geographical and institutional distribution*: Due to the globalization of institutions, the aspect of geographically distributed teams becomes more and more important. Intra- and interteam meetings become a challenging task for the supporting information technology since arranging physical meetings at a single place adds significant overhead to the development process in terms of additional journeys. Hence, appropriate synchronous as well as asynchronous communication means are desired to support the widely dispersed developer teams.
- *Team coordination and planning of development process*: Planning and management tools are desired for team coordination and planning purposes inherently supporting the dynamic nature of a development process.
- *Cooperation and information exchange*: Information of all sorts, such as documents and planning information, has to be exchanged among all developers while ensuring the information's consistency. This task places a burden on the supporting information technology, specifically on the version and database management of the project.
- *Reusability*: Due to the desire to reduce development costs, reusing well-known techniques becomes more and more important. Specific techniques as well as generalized patterns for solutions are typical candidates for reusability. Appropriate modeling and documentation means are required for this issue.

Within IMPROVE, a chemical development process is used as a specific case of the different tasks to be covered by the project. The project is divided into four main parts which are further divided into subtasks. The first part is dealing with development processes for chemical engineering, the second one covers methods and tools to support development processes, while the third one is investigating the mapping onto new or existing information technology platforms. Finally, the fourth part is responsible for integrating the project to disseminate the results towards industrial partners.

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