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# Controlling Development Processes

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# Abstract

The development of an innovative product is a complex and highly dynamic process which has to be performed in a controlled way. Several dependencies exist between the defined tasks, the assigned resources, and the artifacts to be produced. In a development project, which is planned and executed according to a process definition, the time, budget, and available resources are limited. Controlling a development process involves monitoring the actual performance and analyzing whether it conforms to the plan. Poor performance, changing requirements, the detection of errors, and the creation or modification of key artifacts may require plan changes at process runtime. As a consequence of the inherent complexity of the task, software tool support is essential for controlling development processes.

Different insufficient solutions are nowadays applied in practice for this purpose. Project management systems support project planning and to some degree project controlling, but they do not support the execution of predefined processes. Workflow management systems on the other hand are commonly applied for process execution. However, they do not support the scheduling of tasks in a project, and they are not flexible enough for the management of development processes. As a consequence, both types of systems are insufficient when it comes to controlling development processes. Attempts for their integration fell short with respect to representing execution states in project plans and scheduling workflow instances.

This thesis describes a new concept for a process management system, which combines the strengths of the aforementioned tools and eliminates their deficiencies by substantial extensions. Starting point of the research were results of the collaborative research center (SFB) 476 IMPROVE. An integrated approach for the management of development processes has been extended with respect to task scheduling, progress measurement, and change management in development projects. In particular, an algorithm for the automatic generation of a project schedule has been developed which takes the execution states of the tasks into account. Subprocesses of a development process can be executed by a workflow engine, which interprets predefined workflow definitions. With respect to monitoring, specific progress measures for the degree of completion of tasks have been defined which rely on elements of the process model. In the case of plan changes at process runtime, the consistency of the plan with the execution state of the process is ensured.

The concepts have been implemented in the extension module PROCEED of the commercial life cycle asset information management system Comos of Siemens Industry Software. Comos is widely used in the plant engineering industries. Therefore, this thesis combines fundamental research results with a proof of concept implementation in an industrial context. The realization of PROCEED based on an industrial platform offers great opportunities for further evaluation of the provided functionalities in plant design projects in the plant engineering industries.