

## Chapter 3

# Visualizing Design Project Knowledge on a Collaborative Web 2.0 Platform

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### ABSTRACT

*The chapter reports the implementation and validation of the knowledge process visualization technology that extends the basic capabilities of the Semantic MediaWiki platform. The Design Project Visualizer has been developed in the ACTIVE Integrating Project of the Seventh Framework Programme of the European Union for the case study in the engineering design in Microelectronics and Integrated Circuits. The concept of knowledge process visualization is based on the paradigm of project navigation. The knowledge workers in this domain are design project managers, designers, and design support engineers. The visualization suggests optimized performance, points to the bottlenecks in executions, and fosters collaboration in development teams. The authors describe the software prototype architecture and implementation. The components and the solution for process knowledge transformation between ontological representations as well as the visualization are presented in detail. Validation results indicate that the solution is helpful in providing expert assistance to design project managers performing their typical tasks of project planning and execution management.*

### INTRODUCTION

In the knowledge economy (Powell & Snellman, 2004) knowledge workers (Drucker, 1969) are central to an organisation's success—yet the tools they use often stand in the way of increasing their

performance. A remedy to the defects of those tools has recently become in demand across industries. This is why it became a major research and development theme in the ACTIVE project<sup>1</sup>—the three case studies in consulting, telecommunications, and engineering design have been driven

DOI: 10.4018/978-1-4666-2494-8.ch003

by this requirement. In this chapter, we focus on presenting our accomplishments in developing a collaborative tool for the knowledge workers who manage projects and take part in performing informal processes (Warren, et al., 2009) in microelectronic engineering design (MIC). This case study has been lead by Cadence Design Systems GmbH ([www.cadence-europe.com](http://www.cadence-europe.com)), a provider of software, hardware, IP, and Services in MIC domain.

The goal of the case study is providing a software tool for design project managers that will articulate and facilitate sharing knowledge about good development practices in this domain. An objective of a project manager as a knowledge worker is finding a reasonable balance between the available and the achievable in order to meet the requirements of a customer and accomplish development in his project with the highest possible productivity. The complexity of this task in modern design environments is beyond the analytical capabilities of even an experienced individual. A manager has to find an optimum in a solution space that has many facets: product structure comprising possibilities for block reuse; the compositions of the development team involving required roles and capabilities of the available individuals; the choices of the tools for performing design and corresponding design methodologies; the resources available for the project; project constraints and business policies; etc. One more complication may appear in the course of the execution of the—the circumstances may change because of external events. Hence, a previously good plan may turn out to be not acceptable for the follow-up. Re-planning may therefore be required at any moment.

Project managers use their working experience and intuition for taking planning decisions under these complex conditions. In fact, they rely on following good practices and exploiting the suggested development methodologies that they used in the past and which constitute their tacit working

knowledge of project management. Our working hypothesis in this research was that offering a software tool for making the tacit knowledge of project managers within a company explicit will decrease the complexity of making decisions and increase the robustness of knowledge work.

For checking this hypothesis, the software tool prototype of a Design Project Visualizer has been developed in the case study. The tool implements a project navigation metaphor. Project navigation helps a knowledge worker decide about a productive execution path through the state space of an engineering design project—very similarly to the decisions made by a driver using a car navigation system.

The Design Project Visualizer, like a car navigation system, provides the visualized views of the basic “terrain” map. These views are product structures, methodology flows that are either generic or bound to a particular product structure, Work Breakdown Structures (WBS). These representations are essentially provided by a project manager in a top-down fashion when he plans and kicks-off the project. The tool also assists in finding out where the project is on the “terrain” at a specific point in time. The knowledge about the execution of the project is mined from the available project log datasets, transformed to the terms of the used ontology, stored to the knowledgebase, and superimposed onto the project execution plans.

Unlike a car navigation system the Design Project Visualizer is a tool for team work. It provides the infrastructure and the functionality for moderated discussions attached to a visualized representation of any kind of a project constituent. By that, it facilitates making more informed decisions that are also more transparent to the team members and are elaborated and approved with their active participation.

The tool we developed in ACTIVE goes beyond the existing performance management solutions by providing the functionalities of the following two kinds: (1) at the back-end, the learning of design

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