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A. Albers / C. Sauter / M. Meboldt

Interdisciplinary development based on a comprehensive process model

Abstract

Successful development of products depends increasingly on the ability to cope with complexity. There are various causes for complexity like products themselves and the dynamics of globally interrelated markets. The ability to successfully handle complexity is critical to the competitiveness of a company. This is difficult for many companies as complexity is somewhat similar to entropy – it can't be destroyed. If it disappears in one place, it will show up again in another place. So companies need to handle complexity. A necessary prerequisite for handling complexity and successful cooperation is the ability to create inter-subjective models.

In this article we present a comprehensive process model for product development which supports handling of complexity and knowledge in product development processes. The model provides a holistic view on product development and describes the complex interrelations in it through a model language and logic. The model is based on the ideas of general systems theory according to Stachowiak [1] and systems theory of technology according to Ropohl [2].

With increasing complexity, companies need to handle knowledge in new ways [3]. A common understanding through shared inter-subjective models facilitates the efficient reuse of knowledge. We show how the comprehensive process model can help to structure, find and reuse existing knowledge in development processes. We illustrate how semantic wikis [4] [5] [6] can be applied as a flexible, user friendly and low cost tool for the support of knowledge management based on the comprehensive product model. The popularity of wikis for private and corporate use has increased over the last years as they allow for easy collaboration and formation of opinion, easy documentation and editing, easy cross-linking inside the wiki and to external sources. Most wikis are free and open source. So no expensive software licenses are needed and customization is relatively easy. Semantic wikis provide the same functionalities as normal wikis.

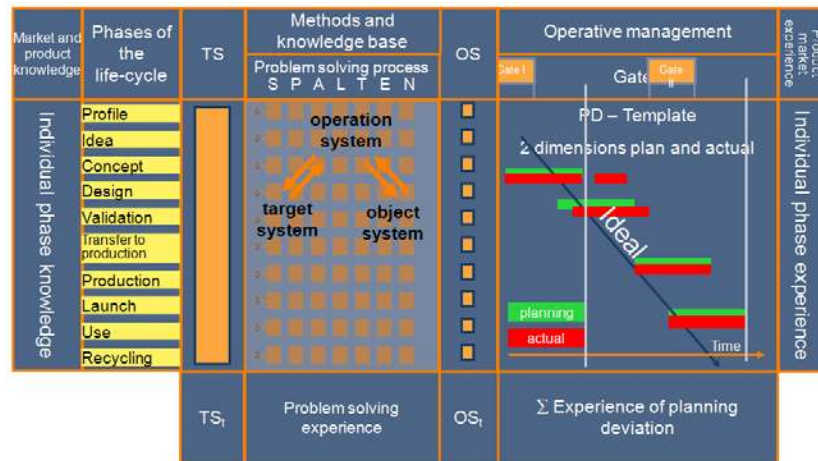


Figure 1: Overview of main elements of process model

Beyond that they offer the possibility to add metadata to wiki pages in an easy and user friendly way. Export functionalities to standards for the semantic web like RDF or OWL allow the reuse of the metadata also outside the wiki. Few wikis also allow the import of ontologies. So if a process model is at least partially expressed in an ontology, the concepts and other elements of the ontology can be used as metadata for structuring the wiki contents. This approach allows users to formulate semantic queries according to the ontology and therefore gives the possibility to access knowledge not only through keyword search, bookmarks or following normal links, but also in a more context specific way which increases the quality of the search results. The development of the humanoid robot ARMAR III [7] in the collaborative research center 588 „humanoid robots“ will be used as an example to illustrate one possible application of the process model for the development of a complex product in an distributed interdisciplinary project.

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Authors:

Prof. Dr.-Ing. Albert Albers
 Dipl.-Ing. Christian Sauter
 Dipl.-Ing. Mirko Meboldt

IPEK Institute of Product Development,
 Kaiserstraße 10
 76131 Karlsruhe
 Phone: 0721 608 2371
 Fax: 0721-608-6051
 E-mail: {albers, sauter, meboldt}@ipek.uka.de