WWW-enabled knowledge management for distributed engineering projects

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Abstract

This paper address problems related to distributed engineering projects (DEP) and how World Wide Web (WWW)-based technologies can improve projects' efficiency and success rate. The focus is on how WWW can improve project organisations to manage their knowledge, be it in the form of documents, formal communication or the tacit aspect of human interaction. In order to study the research hypotheses related to improved efficiency and leaner organisations resulting from networked operations, a layered framework is presented on organisational processes taking place in the distributed project business. This framework is applied to two industrial cases harnessing advanced networking technologies in their distributed operations. The cases have been picked to show diversity, the other one describes a global delivery process of complex investment goods and the other a smaller scale knowledge intensive company with rapid product release cycles. Basing on these cases the paper concludes that deploying advanced WWW-technologies to distributed engineering processes their punctuality, cost control and workflow can be improved. The cases indicate also, that the new tools enable the initiation of learning processes based on the quantitative information that accumulates in the network servers during the execution of the project. This information can be used to refine the organisation and focus the processes on the truly value-adding activities, which all support the research hypotheses set for the study.
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1. Preamble

Even seemingly simple products are actually complex when the diversity of the information, organisations and processes that jointly make them are considered. The order fulfilment process involves many partners from various locations and fields of expertise, that need to communicate efficiently to ensure timely and cost efficient delivery. The operational mode of project business has become prevailing in many industries, which previously were not recognised as companies running projects. At the same time traditional project businesses have become increasingly involved with services that maintain the products throughout their operational lifetime, including the eventual requirements related to recycling. These trends in industry have positioned project management skills into a central role in the overall business survival. Unfortunately, the success rates of running projects is not that good. A study by the Standish

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Group scanned more than 8000 projects and compared their anticipated results with the real outcome. According to this study, only 16% of the projects were able to meet the goals set in terms of time, budget and quality [1]. Several documentary research results on engineering projects indicate that by excluding the political difficulties the fundamental problems of not achieving the project goals originate from [2–4]:

1. Ignorance of what other project teams are doing—how are we and the others progressing in their tasks.
2. Lack of discipline in design change control—how should we fulfil and communicate our responsibilities.
3. Diverse views on what are the objectives of the project—what are our goals and how they translate into part of the overall project objective.
4. Rigid project planning and scheduling routines—how do we communicate and implement changes in the schedule.
5. Poor reactivity to sudden changes in the project environment—how to assess risks in a project with many partners.
6. Unforeseen technological difficulties.

Practically, all of the listed problems are related to the management of project information and how to communicate it over the distributed project organisation. Therefore, the focus of this paper is on engineering projects with complex deliverables and artefacts, and how to improve their performance with World Wide Web (WWW) based information and knowledge management applications. To avoid confusion, the differences between data, information and knowledge in the project business environment are further elaborated here (for more profound discussions see, e.g. [5], and more on the concerned topic see [6,7]. Without going into deep ontological discourse we define that project information concerns all pieces of human documentation that describes the product (drawings, models, specifications, etc.) and the project management with its processes (schedules, resource plans, quality manuals, organisational charts, minutes, reports, budgets, etc.). Project data is generated as a by-product from the creation, manipulation and sharing of the project information in a networked environment. Project information becomes project knowledge when it is linked with other information and put into the overall project context with its time dependent and other dynamical and organisational relationships. Here, the concept of context is used to signify the whole situation, background and environment relevant and characteristic to distributed engineering projects (DEP; see, e.g. [8]). To succeed in this and to induce learning between consecutive projects the project data plays a crucial role.

The fundamental prerequisite of this article is that WWW-technologies are providing project management with novel tools enabling them to improve their performance through better management of project information and through better understanding of the involved business processes. The new mode of ''WWW-enabled'' project management sets the scene for the present study, which shows how WWW-technologies can be used to glue and integrate distributed project processes by catalysing their interaction and communication. Following this spirit, the rest of the paper is structured in the following way. First, the detailed hypotheses for the paper are discussed and formulated, after which the conceptual framework of distributed and highly networked project business is built. In Section 4, this framework is applied to two real-world case studies. Finally, conclusions are drawn, with the focus on some implications the increased use of WWW has on networked project business paradigm.

2. Research hypotheses and methodology

The scope of the paper is distributed engineering projects with relatively complex deliverables and objectives. It should be emphasised here that with 'complex' we mean nothing but something, which requires considerable amount of documentation to be described properly. In addition, this paper concerns the potential positive implications that modern network applications can have, when properly implemented and exploited, on the project business. Keeping this in mind, the following research hypothesis is set for the study.

World Wide Web provides the integration medium and the technologies to link various partners, their operations and information sharing and manipulation needs in distributed engineering projects.