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Barriers and challenges in employing of concurrent engineering within the Norwegian construction projects

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Abstract

The desirability to deliver construction projects within the schedule or more even longer ahead of it is questioned. Nevertheless, most of the construction projects are delivered behind of schedule and even exceed it to more than conceived. So the necessity to find new methods, processes and techniques to challenge the delivery time of the construction projects becomes more than a simple requirement. Overlapping the sequential activities is one way to reduce the delivery time of the project. The manufacturing industry has predicted this fact and established concurrent engineering principles. This paper will inspect the initiative done to involve concurrent engineering principles in the Norwegian oil and gas projects then in the construction projects. It will investigate the work done in the theory, and practice in construction projects compared to the oil and gas projects that have been conducted by a construction firm in Norway.

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1. Introduction

The construction industry is notoriously fragmented with a typical project involving up to six or more different professional disciplines. This has led to numerous problems including, *inter alia*, an adversarial culture; the fragmentation of the design and construction data (with data generated at one stage not being automatically available for re-use “down-stream”) and the lack of the true life-cycle analysis of projects (Anumba et al., 1997). During the past few decades, organizations have increasingly focused on how to structure their project delivery (Morton et al., 2006). There are many methods used to reduce the project delivery time, this met by abandoning the classic serial planning methods, which are simpler, to new methods like fast-tracking or parallel planning. However, these two last are unstructured, less trustworthy, difficult, generates errors, changes and more risks. Thus the idea to investigate new approach, which is the concurrent engineering method. It is now recognized that the adoption of the new business processes based on Concurrent Engineering principles will provide a means of overcoming these problems, and improving the competitiveness of the industry (Anumba et al. 2000).

This paper addresses the barriers and challenges behind uncompleted achievement to employ concurrent engineering within the whole project life cycle in the Norwegian construction industry; relatively to the oil and gas industry, concurrent engineering methodology has been used since decades.

The specific research questions addressed in this paper are: (1) What are the criteria behind the success of using concurrent engineering methods in the Norwegian oil and gas industry (2) To what extent concurrent engineering methodology has been implemented in the Norwegian construction industry (3) what can we learn from the oil and gas industry and apply the lessons learned on the construction industry.

This research paper is a small part of “SpeedUp” research project, which focuses on large complex projects. The main objective of this research project is to develop and test the knowledge base that can contribute to the reduction of the total implementation time of complex projects with a minimum of 30 to 50% compared with 2013 levels.

2. Theoretical framework

The term Concurrent Engineering (CE) was coined in the late 1980s to explain the systematic method of concurrently designing both the product and its downstream production and support processes (Winner et al., 1988). CE was proposed as a means to minimize product development time (Prasad, 1996). This was necessitated by changes in: manufacturing techniques and methods, management of quality, market structure, increasing complexity of products and demands for high quality and accelerated deliveries at reduced costs. These changes resulted in a shift in corporate emphasis with the result that, the ability to rapidly react to changing market needs and time-to-market became critical measures of business performance (Constable, 1994). The earliest definition of CE by Winner et al. (1988) refers to ‘integrated, concurrent design of products and their related processes, including manufacture and support’ with the ultimate goal of customer satisfaction through the reduction of cost and time-to-market, and the improvement of product quality. CE embodies two key principles: integration and concurrency. Integration here is in relation to the process and content of information and knowledge, between and within project stages, and of all technologies and tools used in the product development process. Integrated concurrent design also involves upfront requirements analysis by multidisciplinary teams and early consideration of all lifecycle issues affecting a product. Concurrency is determined by the way tasks are scheduled and the interactions between different actors (people and tools) in the product development process (Anumba et al., 2007).

The benefits of CE derive from the fact that it is focused on the design phase which determines and largely influences the overall cost of a product: as much as 80 per cent of the production cost of a product can be committed at the design stage (Dowlatshahi, 1994). Addressing all life-cycle issues up-front in the design stage and ensuring that the design is ‘right-first-time’ should therefore lead to cost savings, products that precisely match customers’ needs, and which are of a high quality. The adoption of CE can also result in reductions in product development time of up to 70 per cent (Evbuomwan et al., 1994). The success of CE in manufacturing, which is due to the benefits arising from its use, is one of the main motivations for adopting CE in construction (de la Garza et al., 1994). It is also based on the assumption that because construction can be considered as a manufacturing process, concepts which have been successful in the manufacturing industry can bring about similar improvements in the

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