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Concurrent engineering implementation assessment: A case study in an Indonesian manufacturing company

Putu Dana Karningsih^{a*}, Dewanti Anggrahini^b, Muhammad Imam Syafi'i^c

^{a,b,c} Department of Industrial Engineering, Sepuluh Nopember Institute of Technology, Surabaya 60111, Indonesia

Abstract

Concurrent Engineering or Simultaneous Engineering has been utilized by companies since 1980s as an approach to design a new product in integrative manner. It replaces traditional product development method which is a serial process with little coordination between different functions and lack of product life cycle perspectives. Concurrent Engineering (CE) offers opportunity for creating new products in short time while maintaining the highest quality at lowest cost which is considered to answer today's market demand. While benefit of CE is promising, implementing CE is not easy. There are a vast amount research that uncover difficulties during CE implementation. However, study of CE implementation in Indonesian company is only a few. One of them is conducted in 1998 at company X, one Indonesian high technology industry. Thus, this research aims to re-evaluate progress of CE implementation in company X today. In this research, CE implementation achievement level in company X is assessed by using Simultaneous Engineering Gap Analysis (SEGAPAN) and Analytical Hierarchical Process (AHP). The result shows that management's role, cultural change, and the cross functional team are three factors that have the least level of CE implementation compliance. In other words, these three factors are the most difficult barrier to implement CE successfully in company X. Next, Five Whys method is utilized to investigate the root cause of these impediments and some recommendations are proposed to reduce or to eliminate these CE implementation impediments accordingly.

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* Corresponding author. Tel.: +6283830692292; fax: +0-000-000-0000.
E-mail address: dana@ie.its.ac.id

1. Introduction

Concurrent Engineering is a collaborative approach to develop product and processes which is conducted concurrently by cross functional team including external organization representatives, and by taking into consideration the whole stage of product life cycle [1]. Concurrent Engineering (CE) has been seen as a better approach for developing a new product due to its promising benefits (i.e. shorter time to market while maintaining the highest quality at the lowest cost). Reference [2] stated that Concurrent Engineering is comprised of three fundamental elements namely: collaboration, process and information technology. Since market needs become more complex, rapid development of technology capability and globalization, has made CE gaining a broad acceptance in industries since 1980s. CE had been implemented for developing various types of products, from electronics to aircraft and from domestic household to military equipment [3,4].

Eventhough CE has been implemented in many industries around the world for almost 30 years, it is not easy for any company to change its product development process from a serial to parallel activities by involving of several inter and intra organisational divisions. According to [5,6,7,8] there are several difficulties in CE implementation, namely: (1) Lack of in-house expertise, (2) Lack of training, (3) Lack of management support, (4) Lack of communication, (5) Inadequate reward system, (6) Improper company culture, etc.

There are many studies of CE implementation in USA [4,9], Europe [10,11,12,13], Australia [14,15]. However, there are only few study of CE implementation in industries located in Asia including Indonesia . One of them is conducted by [16] that present some findings from CE implementation in company X, an Indonesian industry that manufactures aircraft as well as aircraft components. This study is published approximately 17 years ago when this company starting using CE approach to develop a new product which is a mid sized civil aircraft. Preliminary finding of this research shows some problems in CE implementation which most of them are similar with result of other studies, such as: poor communication, and shortage of competent specialist/resources limitation. Yet, there is a specific issue that is happened in this company during that time; that is incomplete of company restructurization. Futhermore, methodology to gather information in this study is not elaborated.

In this research, implementation of CE in company X today is re-examined by using Simultaneous Engineering Gap Analysis (SEGAPAN) method and Analytical Hierarchical Process (AHP) . The objectives of this study are three folds, they are: (1) to quantify CE implementation level in company X after approximately 15 years of practicing this approach, (2) to identify difficulties in CE implementation facing by company X today, and (3) to provide a case study in CE implementation in Asian/Indonesian industry setting.

2. Literature review

2.1. Concurrent Engineering and its implementation

Concurrent Engineering (CE) is defined as ‘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” [1]. According to [17], there are 8 basic elements in Concurrent Engineering. They are categorized into two main aspects namely: (1) Man and Management aspect, which includes team development, leadership and organization philosophy, and (2) Technological aspect, which includes technology to design, communication, coordination and develop a standard.

Some potential benefits can be expected when a company implement CE, for instance: less development time and time to market, fewer engineering changes, reduction of defect, rework and scrap, higher quality and return on assets [18]. Moreover, [19] reports that CE implementation in three companies (Boeing's Ballistic System Division, NCR, McDonnell Douglas) has successfully improving manufacturing cost around 40%. As implementation CE in any company is not an straight forward process, some factors should be available to ensure successfullness of its implementation, for example: (a) Top management support, (b) Conducive company culture, (c) Provide training and education for employees at all levels, (d) Effective project management, and (e) Multidisciplinary teamwork [20, 21].

In general, there are seven steps to implement CE in an organization according to [22]. These steps are as follows (figure 1): Step 1: Develop a strategy by top management; Step 2: Assessment organization's existing condition by using a particular assessment tools such as benchmarking, questionnaires and performance metrics; Step 3: Create a

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