

Current practice of engineering change management in Hong Kong manufacturing industries

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Abstract

This paper aims at investigating the current state of engineering change (EC) problem and examining the present industrial practice in managing ECs. The study draws the findings from the interviews that were conducted within four Hong Kong manufacturing companies in 1999. The current state of the EC problem has been examined in the aspects of volume, sources, and effects while the present industrial practice in managing ECs have been investigated in terms of documentation, organisation, and activities. The study has highlighted two general findings. One is that EC is a noticeable problem that cannot be underestimated in the competitive environment facing the manufacturing industries. This indicates that more effort is required to process ECs effectively and efficiently. Another finding is that the management of ECs is unsatisfactory in the companies surveyed. This indicates that a good engineering change management (ECM) system including guidelines, methodologies, and/or techniques is necessary for better dealing with ECs in the product development process.

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1. Introduction

Engineering changes (ECs) are the changes and/or modifications in dimensions, fits, forms, functions, materials, etc. of products or constituent components after the product design is released. An EC usually induces a series of downstream changes across a company where multi-disciplines work together dealing with these induced changes. Various functions across the manufacturing company have to adjust their activities in order to deal with ECs and their impacts.

Yee [1] carried out an extensive review of the ECM literature as listed in Refs. [2–19]. There were two main observations. The first observation is that EC is an inevitable problem that cannot be underestimated in the competitive environment of manufacturing industries. The second observation is that the management of ECs is costly and time consuming in most industrial companies. These two observations prompted the authors to conduct an interview survey to investigate the subject of ECM in the present manufacturing industries.

This paper reports on the findings of the interview survey conducted in Hong Kong manufacturing industries in 1999. Firstly, the methodology of the interview survey is presented in order to give an overall picture on how the entire survey was carried out from beginning to end. Then,

the findings from this survey are discussed. Lastly, a summary concludes the implications that can be drawn from the findings of this survey.

2. Methodology of the survey

The aim of the survey is two-folded: the investigation into the present state of the EC problem and the examination of the current practice in managing ECs. Additionally, it was hoped to explore a number of potential areas for research, and more importantly, to gain valuable insight into developing a framework that is able to suit the needs of the manufacturing industries.

The design of this survey was mainly based on the ECM literature review and the preliminary investigation. The balance between the number of questions included in the interview and the time to answer the questions in the interview was considered with intense care. It was therefore attempted to design the questions so that they simple and quick to answer in order to obtain meaningful data that was able to achieve the aim of the survey. Most questions were of “multiple choice” type for the interviewees to select and several “open-ended” questions were for the interviewees to give their comments. After careful consideration, six questions were designed for the interview with the hope of their being answered within 30 min. The questions are shown in [Appendix A](#) for reference.

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Regarding the scope of the EC problem, questions were set to ask about the volume, sources, and effects of ECs. As far as the ECM industrial practice is concerned, questions were set on the aspects of documentation, organisational structure, and activities.

The Directory of Hong Kong Industries (1998) was used to search for relevant industrial companies. Three criteria were set for the search. The first criterion was the size of the companies. Due to the scope of this survey, large-sized manufacturing companies, in the sense of the number of staff, were selected. The second criterion was the industrial sections. Some industrial sections, for example, electronics toys, torches, machinery, and so on, were included. The last criterion was industrial achievement. Only those companies that have already achieved ISO 9001 and/or ISO 9002 were chosen.

After the search, 11 companies were selected. Preliminary telephone contacts with the engineering managers or someone who were involved in or familiar with the ECM process or configuration management of these selected companies were made. Through each phone contact, the aim of this survey was explicitly introduced. As required by some companies, the questions for the interview were electronically mailed or faxed for their consideration. For the companies that were interested in being interviewed, further contacts were subsequently made to arrange the time and venue for the interview.

As a result of the telephone contacts, several companies showed interest in participating in the interviews the rest did not respond to the invitation. Two companies were unable to have time for interview although they showed their enthusiasm for the survey.

Eventually, four companies were interviewed. Deductions can be drawn from these four interviews. Two analyses were carried out with the raw data derived from the four companies included in the interview survey. The first analysis was to explore the present state of the EC problem. The findings under this analysis are reported in terms of the volume, sources, and effects. Another analysis was about examining the current practice in managing ECs. The findings are presented on the aspects of documentation, organisational structure, and activities. This chapter focuses on these two analyses: the present state of EC problem and the current practice of ECM.

3. Findings of the survey

This section presents the findings obtained from the interview survey on the present state of EC problem and the current practice of ECM within the manufacturing industries in Hong Kong. The state of EC problem is presented in terms of volume, sources, and effects while the industrial practice of ECM examines the aspects of documentation, organisational structure, and activities. Before proceeding any further, it is necessary to give a word of caution about the validity of data collected by the interviews. Many compa-

nies did not record the relevant data and as such were unable to provide the data accurately and integrally, as required during the interviews. In addition, the ECM process and the associated system(s) used for recording and analysing the data were different from one company to another. This led to some distortions when the collected data were converted and compared. Further, the names or terms used on the aspects of documentation, organisational structure, and activities of ECM varied from one company to another although some of the names or terms might or do refer to the same meanings. Therefore, for the purpose of consistence, this paper unifies the names and terms when necessary.

3.1. Present state of EC problem

3.1.1. Volume of ECs

There are three measures that were selected to assess the volume of ECs. The first one is the number of active ECs processed at any time that ECs are recorded under consideration or implementation, but excluding those that have already been implemented or rejected for further consideration or implementation. Another measure is the calendar time that an EC is dealt with from its initiation to implementation, including the time spent for processing and implementation. The last one is the effort time in person-days that employees expend in handling an EC from its initiation to implementation, but excluding the time spend on processing and implementation.

In this survey, the number of active ECs at any time ranged from as few as 5 to as large as 60. One of the respondents strongly stated that the number of ECs was so enormous to the point that it was unable to be estimated. The calendar time per EC was as short as 2 days to as long as the end of the product. The effort time per EC varied from as few as 2 to nearly 3 dozen person-days. To make a comparison between the findings of the calendar time and the effort time, it is discovered that a clear and wide time gap exists in managing ECs. This appears to indicate that there is room for improvement in reducing the time for the processing and the implementation of ECs. Therefore, there is need of more effort to improve the system used in managing ECs.

3.1.2. Sources of ECs

ECs may originate from numerous sources along the product development process. Typically, an EC may have originated internally from various disciplines within the company. It may also have arisen externally from suppliers and customers outside the company. For this reason, a number of typical origins was listed to ask in the interviews in order to identify the major sources of ECs.

As anticipated, design office, shop floor workshop, and customers were the three main sources of ECs. This shows that communication problems may exist between the customers, production engineers/shop floor staff, and design engineers in discussing and handling the issues relevant to the product design.

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