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Risk analysis models and risk degree determination in new product development: A case study

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ABSTRACT

This paper proposes a risk analysis model to determine the risk degrees of the risk factors occurring in product development processes. The model uses both fuzzy theory and Markov processes on a concurrent engineering (CE) basis. Fuzzy models determine the impact values of the risk factors, and Markov processes determine the probability of risk occurrences. The analysis model is used to compute the risk degrees by multiplying the probability of risk occurrences by the impact value. This study can be utilized for analyzing the influences of risk factors on product development projects and will contribute toward the development of a risk management framework (RMF) to defend against various risk factors. Implications and directions for future research are discussed.

1. Introduction

The product development process determines whether a company survives or fails in competitive markets because a product life is generally determined by its market share (Fig. 1). In order to ensure sustainable competitiveness, innovative efforts to develop new products must focus on substituting existing products or entering new markets. As new products must be introduced to the market periodically, the development process is a critical strategic issue at business level because the product life-cycle is becoming shorter (Kim, 2003a,b). However, about 80% of new product development (NPD) efforts have failed before project completion and more than 50% of the efforts have made no returns on the investment of money and time (Cooper, 2003). In other words, the product development process for new products is a complex and difficult business decision-making process because of the high

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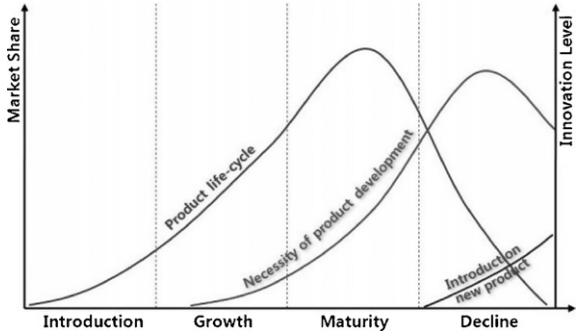

Fig. 1. Product life-cycle and innovation cycle.

capital investment required and exposure to low success probability. The critical explanations for the difficulty of the product development process are unexpected risks and their impact, and the inability of the firm to defend against those risks effectively and efficiently.

This paper suggests a new systematic risk management framework (RMF), as shown in Fig. 2. RMF determines risk degrees for risk factors and total risk degrees of the product development project, and shows effective and efficient responding activities. Especially, RMF suggests a risk analysis model under a concurrent engineering (CE) environment. CE is an approach to link all functional areas such as manufacturing, financing and marketing with the design process (Savic and Kayis, 2006). There is a multidirectional exchange of information among all functional areas for better, easier, and more economical product development. Therefore, either a high degree of collaboration or a high concurrency level (CL) is desirable to construct the CE environment. Furthermore, the fluent

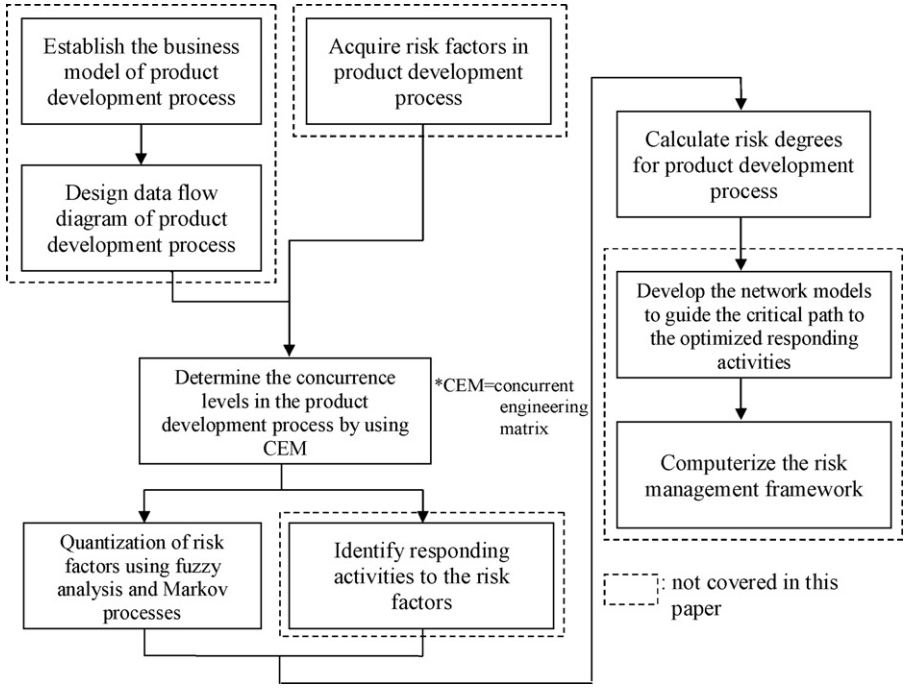

Fig. 2. The entire structure of the risk management framework (RMF) (Ahn et al., 2008).