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## Operating NPD innovatively with different technologies under a variant social environment

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### Abstract

Under the increasingly competitive global market, a firm simply can not survive without new products developed under network cooperation, especially for high-tech industries. Even though new product development (NPD) can be carried out in customer–supplier collaboration, only some products can be developed successfully at the end. Therefore, how to increase the possibility of having more successful NPD is a critical issue for a firm. This paper, by reviewing literature and analyzing theories, first analyzes the characteristics of strategic project of NPD, including knowledge creation model, development process, product and technology maturity. Then, three-dimension elements, consisting of knowledge management methods, linkage adjustment positioning and development process differentiation, are proposed to be adopted in the NPD process in order to obtain an optimal integration effect in network cooperation. As a result, an innovative, efficient and effective NPD can be elevated and achieved. Finally, the balanced scorecard (BSC) associated with fuzzy analytic hierarchy process (FAHP) is used to evaluate the effectiveness of the proposed method.

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*Keywords:* New product development (NPD); Fuzzy analytic hierarchy process (FAHP); Balanced scorecard (BSC); Knowledge management (KM)

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## 1. Introduction

To survive in a highly competitive high-tech industry, a firm should consider strategies to collaborate with or compete with suitable firms within a network in the NPD process [1]. As buyer–supplier collaboration focuses on rationalizing, coordinating, and reducing variance and repetitive processes, it may improve efficiency and effectiveness at the expense of innovation [2]. In addition, inefficient communication and slow response resulted from differences in leadership and management, IT infrastructure and organizational culture among network participants, will result in poor performance of NPD. Therefore, how to exploit existing knowledge, distribute new knowledge and then create new knowledge is critical under buyer–supplier collaboration of NPD. The purpose of this paper is to propose three-dimension elements to achieve an optimal integration effect in network cooperation. First, to develop new products efficiently and innovatively, a suitable development process differentiation needs to be adopted according to knowledge creation mode and maturity level of products. Second, to capture and distribute new knowledge, a network linking needs to be adjusted and applied according to the particular environment. Third, to encourage knowledge creation and exploit existing knowledge in the NPD process, a suitable knowledge management (KM) method needs to be analyzed and designed based on the purpose for which knowledge is being managed [3].

The performances of NPD process before and after the implementation of the three-dimension elements must be examined to show the validity of the proposed method. A balanced scorecard (BSC) associated with fuzzy analytic hierarchy process (FAHP) is constructed to fulfill the task. A case is applied to first implementing the three-dimension elements, and the BSC with FAHP model is used to evaluate the performances before and after the implementation.

This paper is organized as follows. In Section two, the characteristics of developing new products in a network are introduced. A balanced scorecard (BSC) associated with fuzzy analytic hierarchy process (FAHP) model is constructed in Section 3, and a real case is examined in Section 4. Some conclusion remarks and discussions are provided in the last section.

## 2. The characteristics of developing new products in a network

New product development (NPD) for a firm is crucial to survive because of pressures from global competition, the fragmentation of markets into smaller segments, and the rapid pace of technology change in many industries [4]. Since the involvement of suppliers and partners in an NPD has been shown to have a positive effect on the fundamental business drivers, time, cost, and functionality of a product [5,6], developing new products in a network has become the main trend in the industry [1]. Firms are focusing on their knowledge generating competencies since knowledge is increasingly important for competitive advantage. In addition, new knowledge is necessary to create an ongoing stream of new products and processes, and to grow a firm's capabilities [7].

Knowledge management can not be successful by only constructing advanced computer system with huge capital investment or by appointing some senior managers in charge of promoting projects [8]. Apart from constructing information technology system and organizational team, issues, including organizational culture, staff's recognition of knowledge management, supporting reward system, consistent support from high-leveled managers, interdependence and mutual trust, flexible adjustment of organization framework, and scope driven by knowledge management, should all be considered in knowledge management [9,10]. Porter once examined a firm's capability from the viewpoint of value chain and took it

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