

# Structural factors of NPD (new product development) team for manufacturability

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Received 2 May 2008; received in revised form 29 September 2008; accepted 11 November 2008

## Abstract

We explore whether structural factors of NPD (new product development) team such as its physical co-location and team composition are still relevant and important in enhancing manufacturability as part of NPD performance in this highly virtualized coordination era as much as in the past before the Internet. We also examine how the analysis result is affected by the product's innovativeness as well as other control variables like project duration and product type. In order to answer the research questions, we collected data on 127 projects of new product development at a global consumer electronics company. Based on our analysis, we conclude that whether the NPD members are physically co-located throughout the product development process and whether the team membership is balanced have profound implications for enhancing manufacturability.

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*Keywords:* NPD (new product development); CFT (cross-functional team); Manufacturability

## 1. Introduction

Developing a new product *successfully* is an important competitive advantage for a firm. For successful new product development (NPD), a firm must be able to *develop* an innovative product that appeals to the customer and *manufacture* it in large quantity in order to reap profit from the mass market [40]: its ability to manage the ramp-up production effectively, i.e., manufacturability, is essential to the eventual success of new product development. Manufacturability is a quality of new product development that ensures the product can be produced efficiently and reliably in the manufacturing process. It is measured by the time required to ramp-up production to desired volume levels, by production yields, or by product cost and quality levels [33]. That is, a major link between developing a new product and manufacturing lies in the ability to restore the production system to high productivity and low yield loss as

quickly as possible following the new product's introduction [39,37].

From an operations strategy perspective, therefore, reducing the defect rate during the ramp-up production process is an important measure for introducing the new product to the mass market *fast and reliably*. In this research, our primary focus is on such *manufacturability*: we explore *how structural variables such as NPD team's physical co-location and composition affect manufacturability*. These variables represent structural characteristics of the NPD team, distinct from more qualitative, behavioral factors.

In the past, especially during 1980s and early 1990s, i.e., before the concept of 'virtual coordination' was fully developed, researchers identified key variables, *behavioral and structural*, that could determine the cross-functional team (CFT) performance in new product development: physical proximity [29] and balanced composition [2] of the CFT membership were two of the most important structural variables, proposed in the literature. More recently, notably since mid 1990s, however, there have been fundamental

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changes in organizations, relating to emergence of virtual organizations [13]: researchers [5] suggested that these virtual organizations would be logical forms for organizations in the future, weakening or even nullifying some of the research outcomes in the past. In this context, our research was motivated by a question, whether the structural variables such as physical proximity and CFT composition still remain relevant and important in deciding the NPD performance in this highly virtualized coordination era as much as in the past before the Internet. To answer the question, we collected and analyzed actual data on 127 new product development projects conducted in 2006 and 2007 at a global consumer electronics company.

The paper is structured as follows. In the next section, we survey relevant literature. Then, we formally develop the research framework, explain the data and their collection process in detail, and suggest key hypotheses. In Section 4, we present data analysis and major outcomes from the analysis: the primary methods are multivariate and stepwise regression analysis and path analysis. Based on the analysis result, we derive managerial implications and discuss conclusions along with potential contributions of this research to the literature.

## 2. Literature and theoretical foundation

New product development (NPD) is an important firm capability. Since a successful new product must satisfy diverse market as well as technological requirements, the NPD process in general involves various functions in the organization. As a result, coordination between those functions is considered as essential to ensuring successful new product innovation [6,16,18,23,25].

As an effective way to ensure such coordination, firms utilize cross functional teams [16]: a cross functional team (CFT) is often a temporary task team with time limit [15], consisting of representatives from various functional backgrounds [12], i.e., members of different departments and disciplines throughout the organization. The cross functional makeup in the CFT is supposed to provide advantages of multiple sources of communication, information, and perspectives [3]; contacts outside a particular project group [2]; inclusion of downstream concerns in upstream functions [4]; enhanced visibility to the customer [22]; and high speed to market [11], all of which are critical to sustaining competitive advantage of the firm [21]. In particular, an NPD team must be able to integrate diverse expertise from people with varied functional backgrounds as well as experiences: [12] proposed two conditions for effective NPD, (i) the requisite diversity of viewpoints, disciplines, and functional specialties is represented in a team, and (ii) the team's ability to span organizational boundaries and integrate the functional expertise represented by team members.

Another attribute of CFT in affecting effectiveness of the NPD activity is the physical co-location of CFT members. If the CFT members are physically located in the same

place, there will be enhanced interaction as well as idea sharing through brainstorming among the team members. In the perspective of organizational behavior, long distance between group members is prone to making face-to-face communication inconvenient and leading to ineffective decision-making: Allen [1] stated that physical isolation worsens the problems of separate cultures, jargons, and perceived differences in team members. Holland et al. [20] further put forth that communication does increase with team co-location. It was also found that co-locating cross functional product development teams correlates with increased marketplace success [14,17].

Since mid 1990s when the Internet technology became widely available, however, there have been fundamental changes in organizations. One of such significant changes was concerned with emergence of virtual organizations. DeSanctis and Monge [13] defined a virtual organization as a collection of geographically distributed, functionally and/or culturally diverse entities that are linked by electronic forms of communication and rely on lateral, dynamic relationships for coordination. They also predicted that the virtual organization will be a prominent form of organizing in the near future. Black and Edwards [5] also put forth that virtual organizations are logical forms for organizations. From these studies, one might infer that virtual coordination can be more effective than that of physical proximity in this most recent form of organization, weakening or even nullifying some of the research outcomes in the past, many of which are reviewed in this section.

## 3. Research framework and hypotheses

### 3.1. NPD process at SSE

We have developed a research framework (Fig. 1) through theoretical reasoning and empirical observation of the case company, a large global company in the consumer electronics industry, which we call SSE: see Appendix 1 for a detailed profile of the company. We posit there are two different types of knowledge involved in the NPD project, *NPD-process knowledge* and *product-specific knowledge*: the NPD-process knowledge is procedural expertise about how to manage the various product devel-

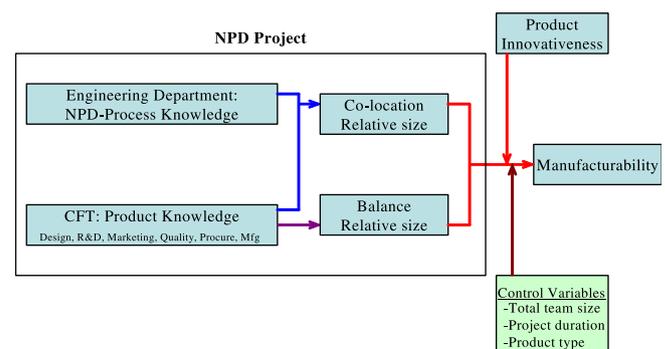


Fig. 1. Research framework.

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