

## Supplier Involvement in Product Development Process (PDP) and New Product Performance: The Mediating Role of New Product Advantage

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### Abstract

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The aim of this study is to investigate the effects of supplier involvement in product development process (PDP) on the new product performance. It is hypothesized that the relationship is mediated by new product advantage. To test the hypotheses, data from 103 electronics and electrical companies were collected and analyzed. Regression results indicate that supplier involvement had a positive influence on new product performance and this relationship is indeed mediated by new product advantage. Companies should involve suppliers in partnerships to continuously improve and enhance new product advantage, which would ultimately enhance new product performance. The proficiency of this collaboration effort, and by extension the ability to sustain the process of an ongoing collaboration, is the key for the creation of new product advantage.

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**Keywords:** Supplier Involvement in PDP, New Product Advantage, New Product Performance, Resource-Based View

### 1.0 Introduction

New products are the lifeblood of an organization. Their success in the market contributes to the growth of the companies (Bhuiyan, 2013). The maintenance continuous product development and innovation sustains customer loyalty (Patrick, 2012). The competitive advantage that organizations have achieved is due to product differentiation.

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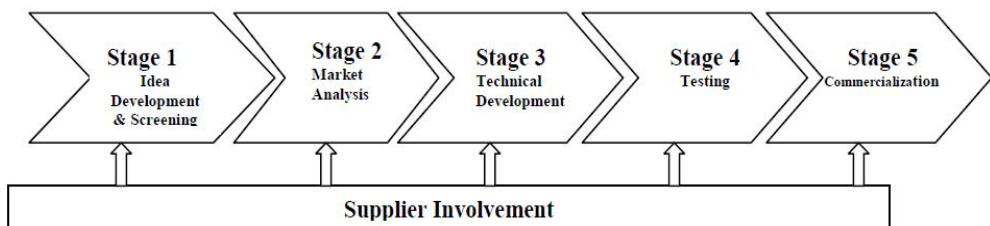
As such, Product Development Process (PDP) is equally considered as a fundamental concern for companies wishing to become more competitive and thus due consideration must be given right from the initial stage of correctly identifying the market opportunities to the final stage of launching the new products. The success of this process would also depend on strategic collaboration with all stakeholders of Product Development Process, including effective suppliers.

Supplier Involvement in Product Development Process (PDP) has become part of the product development strategy for many companies by adding greater value to new products. They have also allowed the companies to keep focus on their businesses and help produce distinctive products in relation to their competitors. Literatures have shown the benefits from Supplier Involvement in PDP, companies are looking to their supply chains in two ways. First, they are looking at ways to reduce cost and are creating a more efficient value chain to remain cost competitive. Second, companies are looking at ways they can provide value-added services to meet the demands of more sophisticated customer (Hitachi Consulting Corporation, 2009)

This study aims to further establish the positive relationship between Supplier Involvement in PDP and New Product Performance, while concomitantly trying to further understand this relationship by exploring the mediating role of New Product Advantages.

## 2.0 Literature Review

Supplier's Involvement is also known as the works of resources, capabilities, information, knowledge, and ideas that suppliers contribute through the tasks and responsibilities that they carry during the NPD for the benefit of a buyer's product development projects (Echtelt, 2008). An illustration and a detail description of Supplier's Involvement are provided in Figure 1 and Table 1 respectively.



**Figure 1: Supplier's Involvement in the 5 Stages of NPD (Song & Parry, 1997)**

**Table 1: Supplier Involvement in the NPD Stage**

NPD stage	Supplier involvement
<b>Stage 1:</b> Idea development and initial screening	During idea development, supplier involvement can contribute heterogeneous ideas and know-how about products and the market (Chung & Kim, 2003). With high supplier involvement and direct participation in the customer's product development team they can be entrusted with especially developing and screening product ideas (Handfield et al. 1999). In addition, supplier involvement in product concept development would provide (1) technological capabilities and expertise, (2) advice in identifying new materials and new products, and (3) manufacturing advice to the concept (Mohamad et al. 2007).
<b>Stage 2:</b> Business and market analysis	Supplier involvement in market study can advise the firm to exploit new market opportunities in the future, such that, the company can match its technological needs with the technological opportunities available in supplier markets (Handfield et al., 1999; Monczka et al., 2000).
<b>Stage 3:</b> Technical development	Supplier involvement in designing process would be able to supply (1) simplified product designs, (2) useful information for making decisions regarding the choice of product components, (3) the design/use of standard components, (4) component design that meets buyer specification, (5) designing resource, (6) tooling and equipment.  Supplier involvement in prototype development would be able to provide (1) timeliness and reliability in making prototypes, (2) information relating to modification carried out during prototyping stages, and (3) product or process technology to development. The supplier's involvement in – house product testing can enable the firm to gain Better information regarding the technical features of works which need improvement, so that suppliers can work on the product's technical features and improve it specification at a very early stage (Song & Parry, 1997).
<b>Stage 4:</b> Market Testing	Supplier involvement in product testing can help the firm to gain better information about the customer needs of and make changes that could increase customer satisfaction as early as possible (Song & Parry, 1997).
<b>Stage 5:</b> Commercialization	Supplier involvement during product commercialization would provide market information specially in launching products tat are new to the market in which new technology is incorporated in them, because suppliers have more knowledge regarding new technology in the target market, due to their experience with the use of technology in other applications.

Source: Compilation by Authors

## 2.1 Supplier Involvement and New Product Performance

Koufteros et al. (2007) confirmed that supplier integration practices positively affect NPD performance. The firms' intention is to utilize the suppliers' specialized (mostly technological) knowledge. Such projects usually pertain to highly innovative products.

Supplier collaboration can have a positive effect on product innovation, which in turn to innovation performance (Un, 2010). The importance of supplier involvement as an appreciation for knowledge is located with key suppliers and their involvement through “know-how” projects. Suppliers are a source of technical knowledge in new product development which is not available in-house (Rosell, et al., 2011). Cooperativeness encompasses elements, such as the supplier's willingness to work with the buyer to find solutions as well as providing flexible and quick response to inquiries. The necessity to attain shorter time-to-market of new products and to achieve cost targets (product costs and R&D costs) are important drivers for supplier involvement in product development.

Greater supplier involvement in NPD improves the new product's performance and/or the manufacturer's financial performance (Sun et al., 2010). There is also a significant link between the extent of integration and perceived project performance (Parker et al., 2008). Hence, it is hypothesized that:

H1: There is a positive relationship between Supplier Involvement in PDP and New Product Performance in electrical and electronics companies in Thailand.

## 2.2 Product Advantage and New Product Performance

Product advantage is defined as the benefit of using that product compared to other similar products (Langerak et al., 2004). Henard and Szymanski (2001) and Montoya-Weiss and Calantone (1994) suggested that product advantage consistently appears as the most important product characteristic in explaining the adoption and success of the new product. Li and Calantone (1998) stated that previous researchers suggested new product attributes, such as new product quality, reliability, newness, and uniqueness, provides a concrete picture of a firm's ability to meet customer's needs. Healy (2012) provides evidence that new product advantage leads to superior product performance. Thus, the importance of product advantage to influence new product performance is also crucial to determine the company's success. Hence, it is hypothesized that:

H2: There is a positive relationship between New Product Advantage and New Product Performance in electrical and electronics companies in Thailand.

### 2.3 Supplier Involvement in PDP and New Product Advantage

The main advantages of Supplier Involvement in PDP are being able to reach the company's long term objectives through the improved supplier technology access and significant contributions to product differentiation (Santos et al., 2007). Hence, it is hypothesized that:

H3: There is a positive relationship between Supplier Involvement in PDP and New Product Advantage in electrical and electronics companies in Thailand.

### 2.4 The Relationship between Supplier Involvement, New Product Advantage and New Product Performance

Many studies found that supplier can directly improve new product performance (Danese & Filippini 2010; Kenneth et al., 2005). However there have also been discussions about the potential indirect effects of Supplier Involvement on New Product Performance (Narasimhan and Kim, 2002; Rosenzweig, Roth, & Dean, 2003; Vickery et al., 2003).

Day and Wensley's framework of sources of advantage, positional advantage, and performance (SPP) is among the most cited theoretical frameworks. In this study Supplier Involvement is considered as a source of sustainable competitive advantage (Dyer & Singh, 1998; Johnson, 1999). It could also help firm to gain product advantage.

As emphasized earlier, this research will attempt to establish Supplier Involvement in PDP as having direct influence New Product Performance and New Product Success. As such it will also explore the indirect relationship between these variables. This study will attempt to prove the mediating role of New Product Advantage between Supplier Involvement in PDP and New Product Performance (Figure 2). Hence, it is hypothesized that:

H4: New Product Advantage mediates the relationship between Supplier Involvement in PDP and New Product Performance in electrical and electronics companies in Thailand.



**Figure 2: Framework of the Relationship between Supplier Involvement, New Product Advantage and New Product Performance**

### 3. Research Method

The unit of analysis for this study is organization. Informants are R&D managers and marketing managers. To choose the companies to be included in the survey, the list of names of the companies in the directory of Thailand's Electrical and Electronics Institute, 2007 was referred. The list contains of 2,294 companies. However, the list of all companies that are involved in R&D and NPD is unavailable. To overcome the difficulties of finding firms which met the pre-screening, the firms were contacted by phone to be screened whether they have their R&D and marketing department. Based on these facts, the complete set of questionnaires would be sent to those firms which have both R&D and marketing department. Finally, the survey was administered and conducted to 201 chosen firms. Out of this, only 103 companies have returned fully completed questionnaires which mean 51.24% of usable response rate.

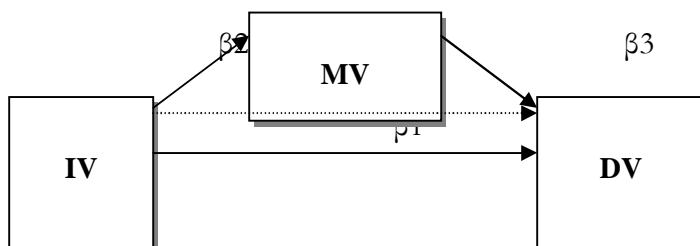
Before the survey proper was administered, however, a pilot study was first conducted with 10 companies, face to face interview of marketing managers, R&D managers, and senior management. The purpose was to refine and validate the contents of the questionnaire items in terms of clarity, wording, ambiguity, sequencing, timing, and relevance to the industry practices.

R&D managers answer the question for the degree of supplier involvement in PDP (a. idea development & initial screening and b. technical development) and product advantage. Marketing managers answer the question for the degree of supplier involvement in PDP (a. business and market opportunity analysis, b. market testing, c. product commercialization) and new product performance in terms of market and financial performance.

#### 4. Analysis

Baron and Kenny (1986) have recommended four steps to test the mediation impact as follows:

- 1) The independent variable (IV) must influence the dependent variable (DV) significantly ( $\beta_1$  must be significant).
- 2) The independent variable (IV) must influence the mediating variable (MV) significantly ( $\beta_2$  must be significant).
- 3) The mediating variable must influence the dependent variable significantly ( $\beta_3$  must be significant).
- 4) To establish whether the mediator has full mediation or partial mediation has occurred, the following conditions must be fulfilled. When full mediation occurs, the effect of IV on DV, controlling for MV,  $\beta_4$  is insignificant, whereas when partial mediation occurs,  $\beta_4$  is significant but its value has decreased. Both step 3 and step 4 are estimated in the same equation.



**Figure 3: Baron and Kenney's (1986) Mediation Structure**

#### 5. Results

As was expected, supplier involvement in PDP and product advantage was found to be significant positively effect on new product performance (Hypothesis 1 supported:  $P < .05$ ; Hypothesis 2 supported:  $P < .001$ ).

Further, supplier involvement in PDP is significant positively effect on new product advantage (Hypothesis 3 supported:  $P < .05$ ).

**Table 2: The Relationship between Supplier Involvement in PDP and New Product Performance**

Independent variable	Value
Supplier involvement in PDP	.24*
F value	5.95*
R <sup>2</sup>	.06
Adjusted R <sup>2</sup>	.05

\*p < .05, \*\*p < .01, \*\*\*p < .001

**Table 3: The Relationship between New Product Advantage and New Product Performance**

Independent variable	Value
Supplier involvement in PDP	.55***
F value	42.93***
R <sup>2</sup>	.30
Adjusted R <sup>2</sup>	.29

\*p < .05, \*\*p < .01, \*\*\*p < .001

**Table 4: The Relationship between Supplier Involvement in PDP and Product Advantage**

Independent variable	Value
Supplier involvement in PDP	.21*
F value	4.64
R <sup>2</sup>	.05
Adjusted R <sup>2</sup>	.04

\*p < .05, \*\*p < .01, \*\*\*p < .001

The hierarchical regression results below showed that Product Advantage **fully** mediates the relationship between Supplier Involvement in PDP and New Product Performance. Thus, H4 is supported.



This would mean the effectiveness of supplier involvement in determining the success of a new product would be contingent upon making the product more distinctive (over other competing products). Manufacturers must focus on strategic (long-term) collaborative effort with supplier in order to ensure 'differential advantage' through more innovative products. The highly significant impact of Product Advantage on the relationship could be seen by the huge increase in  $R^2$  (from 4% to 31%) after it is included in the regression model.

**Table 5: Mediation Effect of Product Advantage on the Relationship between S Supplier Involvement in PDP and New Product Performance**

Variable	Criterion: New product performance	
	Model 1	Model 2
<i>Step 1: Independent Variables</i>		
Supplier involvement in PDP	.21*	.11
<i>Step 2: Mediating Variable</i>		
New product advantage		.53***
$R^2$	.043	.31
F Value	4.50*	22.42***

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

## 6. Conclusion and Recommendation

The finding regarding the relationship between Supplier Involvement in PDP and New Product Performance identified the essential role of product advantage in improving new product performance. This finding suggests that companies should involve suppliers in partnerships to continuously improve and enhance new product advantage, which would ultimately enhance new product performance. The proficiency of this collaboration effort, and by extension the ability to sustain the process of an ongoing collaboration, is the key for the creation of new product advantage. Future study in this area could be to include all the stages of Supplier Involvement. A multi-dimensional construct of New Product Advantages could also give deeper insights of its imperative roles. The relevant dimensions of New Products Advantage might include newness, productivity, and reliability, and uniqueness, ease-of-use, functionality and compatibility.

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