



# Supplier integration into new product development: coordinating product, process and supply chain design

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## Abstract

In many industries, firms are seeking to cut concept to customer development time, improve quality, reduce the cost of new products and facilitate the smooth launch of new products. Prior research has indicated that the integration of material suppliers into the new product development (NPD) cycle can provide substantial benefits towards achieving these goals. This involvement may range from simple consultation with suppliers on design ideas to making suppliers fully responsible for the design of components or systems they will supply. Moreover, suppliers may be involved at different stages of the new product development process. Early supplier involvement is a key coordinating process in supply chain design, product design and process design.

Several important questions regarding supplier involvement in new product development remain unanswered. Specifically, we look at the issue of what managerial practices affect new product development team effectiveness when suppliers are to be involved. We also consider whether these factors differ depending on *when* the supplier is to be involved and *what level of responsibility* is to be given to the supplier. Finally, we examine whether supplier involvement in new product development can produce significant improvements in financial returns and/or product design performance. We test these proposed relationships using survey data collected from a group of global organizations and find support for the relationships based on the results of a multiple regression analysis.

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## 1. Introduction

Research in new product development (NPD) has shown that a number of factors are important to the creation of successful new products. Two of these

more firm-centric factors include *design for quality* and *design for manufacturability* (Hauser and Clausing, 1988). If we extend our scope of vision beyond the individual firm, we must then recognize the importance of *design for supply chain* (Appleyard, 2003; Hillebrand and Wim, 2004; Hult and Swan, 2003; Joglekar and Rosenthal, 2003; Petersen et al., 2003). Although extensive research has focused on integrating *customer* requirements into new product development efforts (Griffin and Hauser, 1996), it is only relatively recently that *supplier* integration has received significant attention (Primo and Amundson, 2002; Spina et al., 2002; Stump et al., 2002). Congruent with the need to integrate multiple linked processes in the supply chain, theoretical research advocates that early and extensive supplier involvement results in a faster development process (Dyer and Singh, 1998; Handfield et al., 1999; Monczka et al., 1998; Petersen et al., 2003). Despite the criticality of this subject to managers, mechanisms for successfully coordinating the decisions of how products are designed, how they are manufactured and/or delivered, and how the supply base can support the manufacturing/delivery of such a design are still largely undetermined. Moreover, supply chain design is effectively determined during the product development stage—when product, process and information systems decisions are specified and determined. The nature of relationships between customers, manufacturers and suppliers are often established early in the new product development process as well (Handfield and Bechtel, 2002; Ragatz et al., 2002). It is at this stage that critical decisions are made, not only with respect to the functionality of the product for the customer, but indeed the packaging, the logistical channels, the source of materials, as well as the selection of product and process technology that will provide the end user with the desired functionality. In the words of a senior purchasing executive at a major automotive company interviewed during this research: “unless you can impact the sourcing early in product development, you have almost no impact on the resulting design of the supply chain”.

Despite the importance of this relationship, many managers we spoke with, as well as other researchers, characterized the execution processes for integrating suppliers into NPD projects as a “black box” (Handfield et al., 1999; Monczka et al., 2000). Prior

research suggests that the participation of these outside constituents is important, but that many of the processes associated with integration of third parties (suppliers) into the process are lacking (Corswant and Fredriksson, 2002; Corswant and Tunalv, 2002; Petersen et al., 2003; Ragatz et al., 1997). Additional research into managerial actions and performance metrics to increase the likelihood of successful supplier integration is needed. We propose that early supplier integration (ESI) is an important coordinating mechanism for decisions that link product design, process design, and supply chain design together. Several elements of ESI act as coordinating mechanisms in this context.

One area that is of importance to managers relates to the critical elements required to develop and manage the business relationship with suppliers. A second area of importance is the extent to which such supplier integration efforts have a meaningful financial benefit, as pursuing them is certainly not without a substantial investment of time and resources.

One North American manager we interviewed explained this challenge using an interesting metaphor:

Suppliers are like fish in the ocean. We (the buyers) are the fishermen. The key challenge facing us is how to put out the right bait, so that we can pull up the right suppliers at the right time and get them to help us develop our products. There are several problems associated with fishing: How do we know we are using the right bait? How do we know the right kinds of fish are in the water? Most importantly, when we catch a fish, how do we know whether it is the right fish, and whether we should keep it or throw it back in the water? Finally, how do we know the fish will follow through with its commitments if we decide to keep it?

Other issues that arise in supplier integration include tier structure (supply chain design), degree of responsibility for design, specific responsibilities in the requirement setting process, *when* to involve suppliers in the process, inter-company communication, intellectual property agreements, supplier membership on the project team and alignment of organizational objectives with regard to outcomes.

The *first goal* of this study was to identify specific ESI strategies/processes that when employed, resulted in improved product designs and improved manufac-

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