THE DETERMINANTS OF NEW PRODUCT ACCEPTANCE IN INDUSTRIAL CHANNELS

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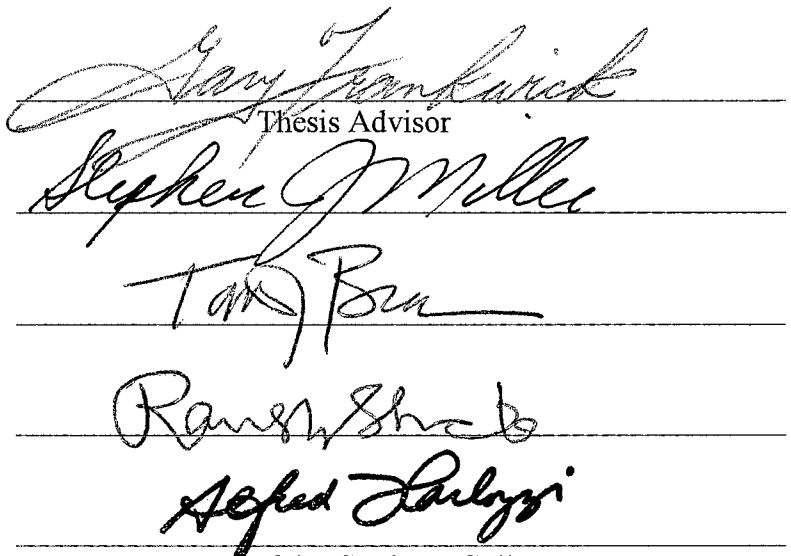

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CHAPTER I

INTRODUCTION

New product development (NPD) has become increasingly important to the competitive postures of companies within many industries. In a recent survey of 1,800 corporate executives sponsored by the American Advertising Federation, product development was ranked as the most important marketing tactic, surpassing even strategic planning (Neuborne 1999). A number of trends have contributed to this increased importance of and reliance on innovation and NPD. New product development takes place in an environment that is characterized by increased competition both domestic and global, the continuous introduction of new products and processes and changing customer requirements that shorten product life cycles, rising product development costs, and an increased reliance on collaboration in the NPD and commercialization processes (Gupta and Wilemon 1990; Wheelwright and Clark 1992).

Effective NPD requires a collaborative effort among a variety of personnel both inside the developing organization and outside. One key source of input to the development process is the customer. A fundamental tenet in marketing, the marketing concept, holds that "the key to achieving organizational goals consists in determining the needs and wants of target markets (customers) and delivering the desired satisfaction more effectively and efficiently than competitors" (Kotler 1984, p.22). Thus, the

participation of customers in the NPD process is an essential requirement for new product success.

The increasing importance of relationship marketing has been called both a "fundamental reshaping of the field" (Webster 1992) as well as a genuine paradigm shift in marketing (Day and Wensley 1983; Grönroos 1994). The movement away from arm's length exchanges in favor of long-term relational exchanges will continue as companies refine their own core competencies and rely more on those of outside partners. These relationships extend into and should enhance the NPD process. A majority of dyadic channel relationship research has focused on the relational benefits that accrue to the customer (e.g., Lusch and Brown 1996; Noordewier, John and Nevin 1990). This study investigates the benefits of channel relationships that accrue to the supplier in terms of customer acceptance of their new product.

New Product Development

Technologies continue to change. While this technological change tends to make existing products obsolete, it also provides opportunities for new products. Over 50 years ago, this increasing pace of technological change and the subsequent obsolescence of products was referred to as a "perennial gale of creative destruction" by Schumpeter (1950, p. 68). The pace continues, driving the need for more and better new products.

As the demand for new products continues to accelerate, many companies remain dissatisfied with their level of new product success. Hopkins found that nearly two-thirds of industrial firms view their new product success rate as "disappointing" or "unacceptable" (Hopkins 1980). If new product success is defined as meeting original

criteria when commercialized, more recent evidence from the Product Development Management Association shows that new product success rates for manufacturing firms in the United States are between about fifty-five and sixty percent (Griffin 1997). One of the more important reasons for the disappointing success rates for new products is the lack of customer participation in the design of the new products (Cooper and Kleinschmidt 1987).

Though technology continues to change, current trends regarding the evolving climate for innovation show that the driving force for new products is not so much science and technology—aspiring to technological excellence—as it is satisfying the customers for whom the product is intended—the necessity to create customer value (Gupta and Wilemon 1996; Zirger and Maidique 1990).

Relationship Marketing

If relationship marketing is truly a paradigm shift in marketing, then it should have an impact on all facets of marketing including NPD. But based on an extensive review of the literature, the effect of close relations with customers on the likelihood of their acceptance of a new product has been little studied. Issues such as the participation of customers in the NPD process have been studied (e.g., Ciccantelli and Magidson 1993), but not in the context of important relational variables such as trust, satisfaction, and continuity expectations.

Purpose of This Study

This study seeks to address the following research question: How does the level of participation of an industrial customer (user) in a supplier's NPD process impact the likelihood of that participant accepting the new product from the supplier? Delineation of the terminology used in this dissertation is necessary. The term "participation" refers to the amount of input by the customer in terms of the level of communication with the supplier during the NPD process.

In addition to investigating the effect of design participation on new product acceptance, the study also evaluates the direct and moderating effects of two other sets of important constructs: relationship quality and product characteristics. The study methodology also allows the comparison of effect sizes between the different predictor variables, giving an indication of the differential contributions of these factors to successful NPD.

Summary of Contributions

This dissertation makes substantive contributions to the field of marketing in a number of areas. A model of industrial new product acceptance is developed. Existing research is reviewed and extended, pertinent constructs are developed and refined, and the conceptual relationships between them are empirically tested. The results of the study have important implications in the following areas:

New Product Development

This study contributes to the NPD literature in a number of ways. First is the finding that relationship quality has a significant positive effect on user acceptance of a

new product. This is the first study that could be identified that has included a global measure of interfirm relationship quality as a determinant of new product acceptance.

The development of two new formative scales also contributes to the NPD literature. The scale of intercompany NPD participation takes a view of participation based on all forms of communication methods during the NPD process. The scale of user acceptance is the first known to take a multi-item measure of new product acceptance from the customer's perspective.

Relationship Marketing

Showing that relationship quality has a significant positive effect on user acceptance of new products offers further support for the concept of relationship marketing and is a contribution to that field.

Sales Management

Sales managers and field salespeople hold great responsibility for building relationships with customers (Weitz and Bradford 1999; Jap 2001a). The positive effect of relationship quality on new product acceptance will provide impetus for salespeople to build closer relationships with their customers in order to increase the likelihood of new product acceptance.

Outline of the Dissertation

This dissertation is organized into five chapters. This first chapter is an introduction to the dissertation and provides an overview of the basic concepts entailed within the study and the purpose and substantive contribution of the dissertation. The second chapter serves to provide a more in-depth review of the independent variables in

the proposed model—user participation in NPD, relationship quality, and product innovativeness—and their relationship to the dependent variable—new product acceptance. A review of moderating effects in the proposed model is also included. Finally, this section includes the research hypotheses and the proposed model. Chapter 3 presents the research design and methodology used to test the model including the operationalization of constructs. Chapter 4 presents the results of the analysis of the data including the testing of the hypotheses. Finally, chapter 5 discusses the implications of the study results including limitations and suggestions for future research.

CHAPTER II

LITERATURE REVIEW AND HYPOTHESES

New Product Development Success

The importance of NPD for companies has been noted. Thus, it is not surprising that there has been a great amount of research performed regarding the elements of successful NPD. It is also not surprising that many studies have substantiated the importance of integrating user requirements into the NPD process (Bailetti and Litva 1995).

Studies of NPD success have been categorized as either *generalist*—studying many determinants of success, or *specialist*—studying relatively few determinants (Gruner and Homburg 2000). This section will briefly review the generalist studies of new product success. The next section, User Participation in New Product Development, will review those specialist studies that have included user participation as a determinant of new product success.

One of the earliest sets of generalist studies was the SAPPHO project (Rothwell et al. 1974). This series of studies concluded that an understanding of users' needs was the most important discriminator between new product success and failure. Cooper and Kleinschmidt have performed a number of studies that link new product success with effective project protocol—the up-front understanding of users' needs and preferences (cf. Cooper 1988; Cooper and Kleinschmidt 1987; Cooper and Kleinschmidt 1994).

Clark and Fujimoto (1990) refer to *external integrity*, "the consistency between a product's performance and customers' expectations" (p. 108), as the single most important task for NPD. In the first two phases of their three-phase, seven-year study of over 330 new products in the electronics industry, Zirger and Maidique (1990) found that new product success was greater when the firm had an in-depth understanding of its customers and the marketplace. In a survey of 151 companies in both high- and non-high-tech industries, Karakaya and Kobu (1994) asked respondents to evaluate the importance of sources of new product ideas. In both types of industries, the respondents evaluated users as the most important source of new product ideas.

The participation of users in the NPD process is clearly necessary for the developing firms to gain the necessary knowledge of their customers' needs and wants. Together, these studies demonstrate the importance of understanding customer needs to successful industrial NPD.

A meta-analysis on NPD success factors (Montoya-Weiss and Calantone 1994) offers further support for the link between user participation in NPD and new product success. In their meta-analysis, Montoya-Weiss and Calantone reviewed forty-seven empirical studies on new product performance. Criteria for inclusion of the studies in their analysis was that they have (1) a dependent variable measuring the commercial performance of a new product, project or program, and (2) one or more explanatory factors (independent variables). Though the authors noted concerns with inconsistent methodologies and incomplete statistics in the studies reviewed, they were able to identify eighteen factors that were significant discriminators of new product success. Within these eighteen success factors, four stood out. These were not only the four most

frequently studied explanatory variables, but they were also identified by the authors as being primary discriminators between success and failure in previous qualitative reviews of published research on new product performance.

The four primary discriminators of new product success identified by Montoya-Weiss and Calantone (1994) were:

- Proficiency of technical activities
- Proficiency of market-related activities
- Product advantage
- Protocol

The key factor relating to the current study is *protocol*, which "refers to the firm's knowledge and understanding of specific marketing and technical aspects prior to product development; for example, (1) the target market, (2) customer needs, wants, and preferences, (3) the product concept, and (4) product specifications and requirements. This factor includes 'origin of idea' measures as well" (Montoya-Weiss and Calantone 1994, p. 415). The capability of a firm to demonstrate excellent protocol is dependent on its ability to secure input from the user. The significance of protocol as a primary discriminator of new product performance indicates that user participation in the NPD process should increase the likelihood of user acceptance of the new product.

Generalist research on NPD success since the Montoya-Weiss and Calantone meta-analysis continues to demonstrate the importance of user participation in the NPD process. Song and Parry (1997), in a study of 788 Japanese new products, found that the level of competitive and market intelligence was positively related to new product success. The competitive and market intelligence construct includes the following item:

"During the development of this product, we understood the customer's purchase decision well—the 'who, what, when, where and how' of his (or her) purchase behavior for this selected product" (Song and Parry 1997, p. 74). Finally, a more recent meta-analysis of 41 studies found that the developing firm managers' perceptions of the new product meeting the customers' needs was a dominant driver of new product success (Henard and Szymanski 2001). Thus, there is ample evidence that participation of users in the NPD process that results in greater knowledge of their needs increases the likelihood of new product success.

In the current study, new product success is defined in terms of new product acceptance by the user. New product acceptance is defined from the perspective of the customer. Since no studies could be identified that view acceptance by the customer in other than a dichotomous manner (i.e., accept/not accept), this study seeks to broaden the conceptualization. New product acceptance is therefore represented by four interrelated variables: (1) the level of satisfaction with the new product; (2) the likelihood of future purchases of the new product; (3) the percent of total business for a particular product application given to the new product offering; and (4) the percent of total business that the purchasing firm would like to give to the new product if they were unencumbered by any prior commitments.

User Participation in New Product Development

This section reviews the literature more specific to the effect of customer participation on new product success. There are two contexts for marketing channel member participation in NPD. These contexts are delineated in terms of the channel

member that is designing the new product and is responsible for performing the NPD process. The first is supplier participation in the NPD process of the manufacturer. There has been a considerable amount of research into supplier participation in manufacturer NPD going back at least 30 years when Myers and Markquis (1969) noted the contribution of supplier participation in NPD to early resolution of problems in the development process. More recent work has been conducted by Ragatz, Handfield and Scannell (1997), McGinnis and Vallopra (1998), and Bidault, Despres and Butler (1998). But it is the second context that the present study seeks to investigate—the participation of customers (i.e., users) in their supplier's NPD process.

Each of the studies cited in the previous section (New Product Development Success) deals with a relatively broad range of determinants of new product performance of which user participation is but one. Several of these studies pointed to the importance of user participation by showing the importance of up-front activities in the NPD process. But none focused on user participation or attempted to operationalize it. Following is a review of those specialist studies that have dealt more explicitly with the concept of user participation as a determinant of new product success.

There is an extensive literature on the impact of user participation on information systems development success (e.g., Hunton 1996; Ives and Olson 1984; McKeen and Guimaraes 1997). One of the important distinctions noted in this literature is the difference between *involvement* and *participation*. Whereas many researchers have used the term *involvement* to describe the inclusion of various parties (e.g., customers, suppliers, internal functional areas) in the NPD process, Barki and Hartwick (1989) noted that there should be a distinction between these two terms. They made two

recommendations: (1) to use the term *user participation* instead of *user involvement* when referring to the assignments, activities, and behaviors that users or their representatives perform during the systems development process, and (2) to use the term *user involvement* to refer to a subjective psychological state reflecting the importance and personal relevance that a user attaches to a given system. This literature will be revisited when the user participation construct is operationalized in the following chapter.

The information systems development literature has generally found that user participation contributes to increased user satisfaction, acceptance, and use of the information system. There has also been a considerable amount of research into the beneficial effects of individuals' participation in decision-making processes (e.g., Ashmos, Duchon and McDaniel 1998; Oswald, Mossholder and Harris 1997). But in each of these cases, the studies focus on *intra-organizational* interactions as opposed to *external* user relations (Gales and Mansour-Cole 1995). Since the current study focuses on external user participation in the NPD process, these literatures will not be further reviewed.

Some of the earliest and most well-known work in studying user participation in NPD was conducted by von Hippel (1978). In this article, von Hippel presented his Customer-Active Paradigm (CAP) and contrasted it with the Manufacturer-Active Paradigm (MAP). In the CAP, "it is the role of the would-be customer to develop the idea for the new product; select a supplier capable of making the product; and take the initiative to send a request to the selected supplier." (von Hippel 1978, p. 40) His conclusion was that the CAP was a better fit to the requirements of industrial new product idea generation than the MAP. Von Hippel's original and subsequent (e.g., von

Hippel 1988) emphasis has been on the user as the "functional source of innovation." This refers to a particular set of customers ("lead users") as being not only the source of the new product idea, but also performing up-front design tasks on their own when they perceive that the economic rents are attractive.

If the performance measure of NPD success is reduced NPD project cycle time, a number of studies have shown the benefits of customer particiption in NPD. In their study of 31 high-technology firms, Karagozoglu and Brown (1993) found that customer participation tied with the use of cross-functional teams were the factors contributing most to reduced NPD project cycle times. Gupta and Souder (1998) also found a positive relationship between customer participation and reduced cycle time in their study of 110 high-technology new products. But even though the conventional wisdom states that reduced cycle time results in greater likelihood of new product success and improved organizational performance, there is evidence to the contrary. In their study of two industries (automobiles and computers) in four countries (Canada, Germany, Japan, and the United States), Ittner and Larcker (1997) found no support for the performance-enhancing effects of reduced cycle time in NPD. Thus the remainder of the studies cited here use more traditional commercial measures of new product success.

Gales and Mansour-Cole (1995) used an information processing approach in their conceptualization of user participation. They measured the number of users contacted and frequency of user contact by NPD managers. In their study of 44 innovation projects, they found a significant positive relationship between user participation and project success.

Li and Calantone (1998) investigated the effect of "customer knowledge process" on NPD success. Customer knowledge process is a broad concept entailing not just customer information acquisition, but interpretation and integration as well. They found a significant and positive relationship between customer knowledge process and new product advantage, one of the key discriminators of new product success cited previously.

Souder, Sherman, and Davies-Cooper (1998) studied R&D/customer integration as a determinant of NPD effectiveness. They found that R&D/customer integration was significantly positively associated with three different measures of NPD effectiveness: prototype development proficiency, product launch proficiency, and market forecast accuracy. In a previous study of customer-driven NPD, Souder, Buisson, and Garrett (1997) found that understanding user needs through tactics such as spending long periods of time at customer sites was positively related to new product success.

The most recent study identified as focusing on user participation in NPD was conducted by Gruner and Homburg (2000). Their operationalization of user participation was similar to Gales and Mansour-Cole's (1995) in that it emphasized the number of users contacted and the frequency of these contacts. They found that the intensity of user participation has a significant and positive effect on new product success in the early (idea generation, concept development) and late (prototype testing, market launch) stages of the NPD process but not the intermediate stages (project definition, engineering).

In spite of the research summarized above, the evidence for the benefits of user participation in NPD is not unanimous. In their study of 88 industrial firms active in NPD, Campbell and Cooper (1999) found that there was no significant difference in new product performance (on a variety of measures) between *partnership* and *in-house*

innovation projects. However, the authors chose to differentiate between *partnership* and *in-house* projects by letting the respondent choose based on a set of definitions. A *partnership* project was defined as "a formal working relationship in which both partners worked closely together and shared both the costs and benefits of the project;" *in-house* development was defined as "an internal development with either minimal, or some contact with multiple customers undertaken at arms length and not with any one lead customer" (Campbell and Cooper 1999, p. 512). The analysis was conducted based on this dichotomy instead of a continuous variable. The current study uses a continuous formative operationalization of user participation.

Campbell and Cooper (1999) evaluated a number of project and partnership characteristics to explain the insignificant results. Of the six project characteristics studied, only one—target market concentration—was significantly different between project types suggesting that the developing firms may enter into partnership projects for marketing reasons instead of pursuing the best possible partner resources. Interestingly, of the six partnership characteristics studied, only one—ongoing participation by the customer—was a significant discriminator of project success in terms of financial impact. This ongoing participation construct was measured with two items: past interactions and intent for future interactions with the customer in new product projects. Thus, even though the authors found no significant differences in new product performance based upon their dichotomous operationalization of user participation, they did find that a history of customer participation on innovation projects and future intentions to work with a customer on new product projects did have a significant impact on new product performance. This ongoing participation construct taps the same conceptual domain as

the user participation construct offering some support for the benefits of user participation despite the main findings of the study.

Finally, a recent meta-analysis found that while customer input was not a significant driver of new product performance, it did find that having a product that meets customer needs *was* a dominant driver (Henard and Szymanski 2001).

The role of functional integration or the joint participation of the internal functions of the firm (especially marketing and R&D) in contributing to the success of the NPD process has been studied extensively (e.g., Griffin and Hauser 1996; Gupta, Raj and Wilemon 1986; Kahn 1996). But very limited attention has been directed at *customer* integration or participation in the NPD process as a means to increase new product success (Gruner and Homburg 2000). The current study seeks to help remedy this deficit.

While research to date has demonstrated the importance of user participation in NPD, there has been criticism that industrial firms in particular are not emphasizing user knowledge and participation in NPD process to the degree that they should (Clark and Fujimoto 1990; Cooper 1988; Parkinson 1985; von Hippel 1978). The current study explores whether industrial firms are moving toward greater participation of users and hopes to offer more empirical evidence of the importance of user participation in NPD.

User participation in the current study is defined as the level of interaction between the user and the developing firm in terms of project-related communication during the NPD process *for a specific product*. It is a project-level construct. It is operationalized as a formative measure based on the level of communication between the user and the supplier during the specific NPD process. It is expected that user

participation in a developing firm's NPD process will be positively associated with the user's acceptance of that specific new product:

H1: User participation in a supplier's specific NPD process will be positively related to user acceptance of that new product.

Relationship Quality

Marketing Channel Relationships

It has been noted that relationship marketing represents a new paradigm in marketing (Day and Wensley 1983; Grönroos 1994). Anderson and colleagues stated that "In business-to-business settings, dyadic relationships between firms are of paramount interest" (Anderson, Håkansson and Johanson 1994, p. 1). This section will offer a brief overview of the relationship marketing literature in general. The following section will present a more specific review of research that has investigated the impact of inter-firm relationships on industrial NPD success.

Relationship marketing has been defined as "all marketing activities directed toward establishing, developing, and maintaining successful relational exchanges" (Morgan and Hunt 1994). Morgan and Hunt also identified ten different types of marketing relationships that a focal firm can have. These relationships were broken down into supplier partnerships, lateral partnerships, buyer partnerships, and internal partnerships (Morgan and Hunt 1994). This broadening of the concept of relationship marketing beyond the initial emphasis on a "customer relations" conceptualization may in part be responsible for the lack of consensus on just what relationship marketing is (Bejou 1997; Morris, Brunyee and Page 1998). This lack of agreement on the definition

of relationship marketing and the application of the concept to more and different types of relationships require that one carefully delineate the type and context of the relationships under study. For example, a great deal of empirical research has been directed at relationships within the context of marketing channels. These relationships would fall under buyer and supplier partnerships in Morgan and Hunt's typology. But even within industrial marketing channels, there are many different types of relationships.

The vast majority of research into marketing channel relationships has addressed two contexts: (1) supplier and manufacturer (e.g., Cannon and Perreault 1999; Doney and Cannon 1997; Dorsch, Swanson and Kelley 1998); and (2) manufacturer and agent or merchant intermediary (e.g., Boyle et al. 1992; Johnson 1999; Weitz and Jap 1995). This review and the current study will focus on supplier and manufacturer (i.e., customer, user) relationships in industrial channels.

Research dealing with the performance implications of manufacturer-supplier relationships takes one of the two perspectives. From the perspective of the buyer, the underlying reasons for pursuing relationships with suppliers include increased cost efficiency, increased effectiveness, enabling technologies, and increased competitiveness (Sheth and Sharma 1997). The majority of the literature on channel relationships takes the perspective of the buyer by emphasizing the benefits to them of closer relationships with fewer suppliers (e.g., Cannon and Homburg 2001).

The current study takes the perspective of the seller in terms of the benefits to them of closer channel relationships. Most of the studies addressing the performance implications of channel relationships from the seller's perspective are from the sales management literature. For example, in their study of 126 buyers, Biong and Selnes

(1996) found that a salesperson has a substantial influence on a buyer's motivation to continue in their relationship and that this desire to continue in the relationship should result in increased long-term sales for the salesperson. Leuthesser (1997) studied 454 relationships and found that for longstanding relationships, the quality of the relationship had a significant effect on the supplier's share of business. In a recent review of relationship marketing in personal selling and sales management, Weitz and Bradford (1999) describe the evolving partnering role of the salesperson and reiterate the performance benefits to be achieved when the sales function emphasizes building relationships rather than making short-term sales. But little research from the sales management literature emphasize the importance of the buyer-supplier relationship on new product acceptance by the buyer (Anderson 1996).

One study outside of the sales management literature that took the perspective of the supplier investigated whether suppliers benefit from long-term relationships with customers. In this study, Kalwani and Narayandas (1995) found that suppliers in long-term relationships are more profitable (measured by return on investment) than suppliers with multiple short-term contracts. And while the authors discuss the increased understanding and responsiveness to the customer that come about as a result of these relationships, they do not specifically address the impact of the relationships on the likelihood of customer acceptance of new products.

Some of the research on the performance implications of channel relationships has investigated both sides of the dyad. In a longitudinal study of over 220 channel dyads, Jap (1999) concluded that the dyads' mutual investments and efforts to exploit the unique characteristics of their relationship resulted in improved profit performance and

competitive advantages. Finally, Cannon and Perreault (1999) developed a taxonomy of business relationship types based on relationship profiles of over 400 buyer-supplier relationships. They concluded that "More effective buyer-seller relationships help both parties manage uncertainty and dependence, increase efficiency by lowering total costs, and enhance product development and market orientation through better knowledge of customers and their needs" (Cannon and Perreault 1999, p. 458). It is this last benefit of relationships—enhancing product development—that is the emphasis of the current study. The following section will review the literature that has investigated the impact of channel relationships on the NPD process.

Channel Relationships and New Product Development

Before proceeding with this section, it is necessary to clarify and distinguish the meaning of *relationship* used in this study. There has been very little research investigating the impact of channel relationships on the NPD process. The research that has been conducted (e.g., Athaide and Stump 1999; Campbell and Cooper 1999; More 1986; Parkinson 1985) invariably takes a broad view of the definition of relationships that includes collaboration on NPD. These studies confound the two key independent variables of the current study, namely user participation in a specific NPD project and relationship quality between the user and supplier firms.

In the current study, the measure of the channel relationship is *relationship quality*. The measure of relationship quality is a higher-order construct that encompasses trust, satisfaction, and continuity expectations. It is a global measure of the relationship between the firms—a firm-level construct. In contrast, the measure of user participation is specific to the activities during a particular NPD process—a project-level construct.

No previous research could be identified that specifically investigated the relationship between a global measure of the channel relationship quality and new product success. But the studies reviewed in the previous section (Marketing Channel Relationships) do support the performance implications of channel relationships in general. Since new product success plays a key role in overall organizational performance (Brown and Eisenhardt 1995; Wheelwright and Clark 1992), it follows that better relationships should be related to new product success. Thus, it is expected that higher relationship quality between the user firm and the supplier firm will be positively associated with user acceptance of a new product:

H2: The quality of the relationship between the user and the supplier firm will be positively related to the user's acceptance of a new product offering by the supplier.

No studies could be identified that propose any type of moderating effect of relationship quality in a model of new product acceptance or success. As has been noted previously, there has been little research conducted on the direct effect of channel relationships on new product success. Nonetheless, there is face validity in the supposition that a higher quality relationship between the supplier and customer firms should strengthen the positive relationship between the customer's participation in the NPD process and their acceptance of that new product. A higher quality relationship means that the firms have worked well together in the past and trust each other. This history and experience will interact with the level of participation in a particular NPD project to increase the likelihood that they will accept the new product. Thus, as the quality of the relationship between the firms increases, there should be a stronger relationship between user participation and user acceptance of a new product:

H3: The greater the relationship quality between the user and the supplier firms, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

Product Innovativeness

Product innovativeness in this study refers to the level of newness of the product to the purchasing firm. Past research on the relationship of product innovativeness to new product success has been inconclusive, though a positive relationship has received the greatest amount of support (Henard and Szymanski 2001). In the majority of studies, though, the innovativeness of the product is assessed by the developing firm. In the current study, innovativeness is as perceived by the user of the new product.

The relationship of innovativeness to user acceptance will be positive:

H4: The innovativeness of the new product offering will be positively related to the user's acceptance of that new product offering by the supplier.

The innovativeness of the new product offering is also expected to moderate the relationship between user participation and user acceptance of the new product. In their study of 45 NPD projects from 12 firms, Olson, Walker and Ruekert (1995) found that more participative structures (e.g., teams) contribute to greater effectiveness and timeliness of the development process when the product being developed is more innovative. They note that when the product is more innovative, it creates greater dependencies and the need for greater information flows between the functional areas engaged in the NPD process. Though they did not study customer participation in the development process, the same increased need for participation should be present and

lead to a greater likelihood of new product success. Thus it is expected that as innovativeness increases, there should be a stronger relationship between user participation and user acceptance of a new product:

H5: The greater the innovativeness of the new product offering, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

Product Criticality

Product criticality refers to how important the new product or component is to the purchasing firm. Bello, Lohtia and Dant (1999) hypothesized that the more critical the component, the more likely it would be for an original equipment manufacturer (OEM) to collaborate with their vendors in the development of component parts. Because they did not find a statistically significant relationship between criticality and collaboration in their sample of electronics manufacturers, they expressed concern about their operationalization of criticality as "importance." In addition, their operationalization was specific to *entering goods* (i.e., subassemblies and/or components) which were part of a larger assembly or product.

Cannon and Perreault (2001) used a very similar construct that they called *supply importance*. Their operationalization of the construct focused on the importance of a specific product to the purchasing firm but was not specific to entering goods. In their study of 428 buyer-supplier relationships, they did find support for a relationship between the importance of a product and the likelihood of operational linkages and information exchange.

While the previously cited studies have focused on the relationship between the product importance and level of collaboration between buyers and sellers, the present study is concerned with the moderating effect of product criticality on the relationship between user participation in NPD and the user's acceptance of that new product. It must also be noted that criticality is not believed to have a main effect on user acceptance in this study—it is a moderator only. This is because there is no reason to believe that the criticality of a product will have any impact on the likelihood of acceptance because criticality should not vary between the different suppliers' offerings. It reflects only the relative importance of that particular product to the purchasing firm.

Though no studies could be found investigating this moderating effect of product criticality, Athaide and Stump (1999) found that *bilateral* collaborations (ongoing interactions between buyer and seller) during successful NPD are more common with customized products. If it is reasonable to believe that a more customized product indicates a more critical product, then it is expected that as a component becomes more critical to the user, there should be a stronger relationship between user participation and user acceptance of a new product:

H6: The greater the product criticality, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

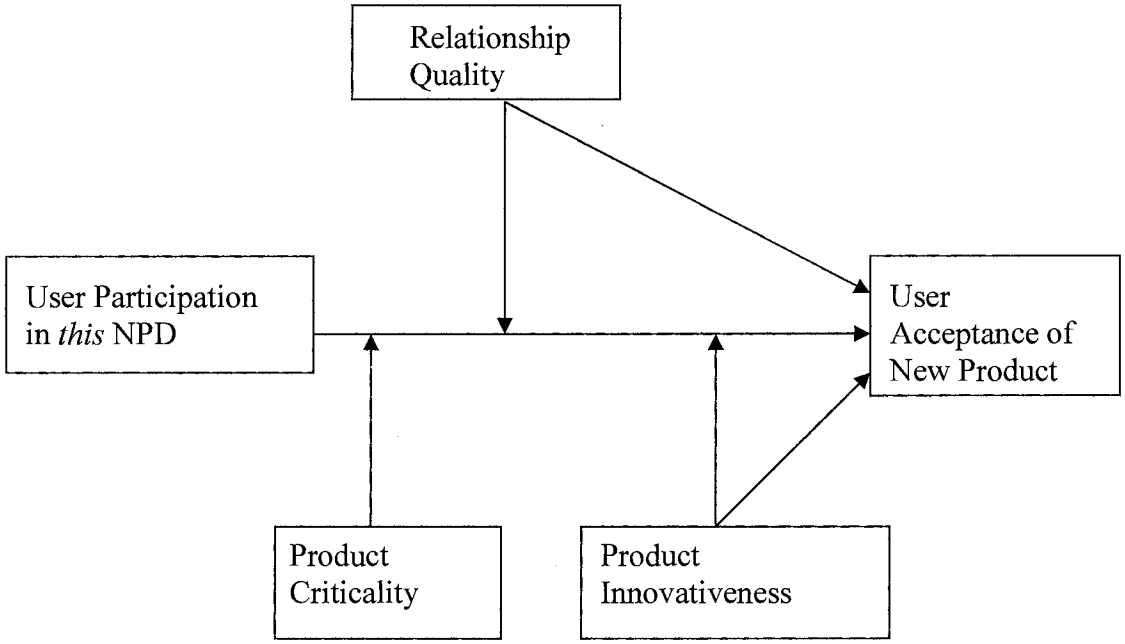
Model of User Participation in Industrial New Product Development

The proposed model of user participation in industrial NPD including the constructs used in this study are shown in Figure 1. The unit of analysis for the study is a particular instance of a new product offering to the buying firm. This study investigates

the direct effects on new product acceptance of user participation in the NPD process for the particular product offering, the quality of the relationship between the user and supplier, and the innovativeness of the product offered. Moderator effects of relationship quality, product criticality, and product innovativeness on the relationship between user participation and user acceptance are also investigated. The hypotheses deriving from the model are summarized below it.

FIGURE 1

MODEL OF USER PARTICIPATION
IN INDUSTRIAL NEW PRODUCT DEVELOPMENT



H1: User participation in a supplier's specific NPD process will be positively related to user acceptance of that new product.

H2: The quality of the relationship between the user and the supplier firm will be positively related to the user's acceptance of a new product offering by the supplier.

H3: The greater the relationship quality between the user and the supplier firms, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

H4: The innovativeness of the new product offering will be positively related to the user's acceptance of that new product offering by the supplier.

H5: The greater the innovativeness of the new product offering, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

H6: The greater the product criticality, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

CHAPTER III

RESEARCH METHODOLOGY

Field Study

To test the proposed hypotheses, a field survey of purchasing department key informants was conducted to obtain information on the determinants of their new product acceptance. The unit of analysis was a particular instance of a new product offering to the buying firm.

Survey Approach

The present study employs a survey methodology to assess the relationships between constructs. The survey approach has been widely used to conduct research in the marketing field. A search of the last two full years (2001-2002) of three respected marketing journals (i.e., *Journal of Marketing, Journal of Marketing Research,* and *Journal of the Academy of Marketing Science*) revealed more than 30 articles using a key informant survey approach. Campbell (1955) notes that key informants are able to provide reliable assessments of organizational phenomenon provided that they hold positions which make them knowledgeable about the issue under investigation and are willing to participate in the research project. While the multiple informant approach may be generally preferable (Kumar, Stern and Anderson 1993), resource constraints and the

difficulty identifying additional informants with the requisite knowledge on all aspects of the questionnaire make a single informant approach justifiable (Cannon and Perreault 1999; Heide and John 1990).

Sample Selection

To assess the relationships between constructs, a large representative sample was required. Because of the sample size required to provide sufficient statistical power, a cross-sectional field study method of data collection was employed. The sampling frame consisted of 2,100 names from a list of purchasing professionals provided by the National Association of Purchasing Management (NAPM). Many studies of interorganizational relationships have successfully employed purchasing professionals as key informants (e.g., Cannon and Perreault 1999; Doney and Cannon 1997; Heide and Stump 1995; McGinnis and Vallopra 1998; Noordewier, John and Nevin 1990; Sriram, Krapfel and Spekman 1992). In addition, the sales personnel with whom purchasing professionals interact have been shown to be the most important source of customer information, including their desires for and reactions to new products (Gordon et al. 1997). The sampling frame contained only manufacturing organizations from the 2-digit SIC codes 35, 36, and 37 (industrial and commercial machinery and computer equipment; electronic and other electrical equipment and components; and transportation equipment) representing OEMs involved with purchasing new products from suppliers (Heide and John 1990). The number from each SIC code in the sampling frame was proportional to the membership in NAPM.

Data Collection

Pilot Study

One hundred names were drawn randomly from the 2100-name sampling frame. A three-step data collection process was employed. First, each of the 100 key informants was mailed a cover letter, questionnaire, and postage-paid envelope. Then, at two subsequent two-week intervals, all non-respondents were mailed a reminder letter, questionnaire, and postage-paid envelope. Such follow-up mailings have been shown to significantly increase overall response rates (Brennan 1992), particularly in industrial mail surveys (Jobber 1986; Yammarino, Skinner and Childers 1991). One other method was employed to maximize response rate. A *help-the-sponsor* appeal was used in the cover letter since it has been shown to significantly increase response rate under university sponsorship (Schneider and Johnson 1995).

Twenty-one total responses were received (21% response rate). Of these 21 surveys, 15 were usable. Of the six that were unusable, 4 respondents stated that the survey did not apply to them and 2 were unemployed. The completed surveys indicated that the instrument was well-understood by the respondents and no modifications were made to the survey for the main study.

Main Study

The main study data collection was initially going to be conducted in the same manner as the pilot study, but circumstances dictated a change in procedure. The main study began with an initial mail wave just as the pilot study. Each of the 2,000 key informants was mailed a cover letter, questionnaire, and postage-paid envelope.

Approximately one month later, a second mailing containing the same items was sent to the 1,921 non-respondents from the first wave. A clerical error resulted in 596 of these surveys being sent to the wrong address, therefore a third mailing was sent to these.

From the total sampling frame of 2000, 181 (9.05% response rate) total responses were received. Combined with the pilot study, the total overall response rate was 202/2100 or 9.6%. The low response rate in the main study required further investigation and resulted in a change in the original data collection procedure. Instead of a third mailing wave to all non-respondents, a phone/fax follow-up campaign was initiated.

A random sample of 500 non-respondents was selected and phoned. If they were contacted, they were asked if the survey applied to them and if they would fill it out. If the survey applied to them and they agreed to complete it, the survey was faxed to them. If they were not contacted after five calls over three weeks, they were sent the survey via fax. (The Appendix contains all cover letters, phone scripts, fax transmittal sheets, and the survey instrument). Table 1 shows the breakdown of results from the 500 non-respondents in the phone/fax follow-up effort.

TABLE 1

RESULTS OF PHONE/FAX FOLLOW-UP

	Number	Percent
1. Contacted and agreed to complete survey (of these, 29 returned surveys)	39	7.8%
2. Offered new product, but didn't participate in development	72	14.4
3. Not offered new product	56	11.2
4. Not applicable (e.g., don't do that type of purchasing)	51	10.2
5. Unwilling to participate (e.g., no time)	18	3.6
6. No longer with company	122	24.4
7. Bad/wrong numbers	94	18.8
8. Unable to contact/never responded	48	9.6
Total	500	100%

These results help to explain the relatively low overall response rate. For many of the respondents (35.8%; items 2-4), the research question was not applicable to them. The large number of individuals no longer with the company as well as bad/wrong numbers and inability to contact (52.8%; items 6-8) can best be explained by aging of the list and an economic recession prior to and during data collection. If one looks only at items 1 and 5 as the sampling frame, an effective response rate of 50.9% (29/(39+18)) can be calculated. After all data collection was complete, there was a total of 169 usable surveys. See Table 2 for a summary of respondent companies.

TABLE 2

SUMMARY OF RESPONDENT COMPANIES

SIC code	No. in Frame	Percent	No. of Respondents	Percent
35: Industrial and Commercial Machinery and Computer Equipment	651	31.0	55	32.5
36: Electronic and other Electrical Equipment and Components	1134	54.0	77	45.6
37: Transportation Equipment	315	15.0	37	21.9

No. of Employees	No. of Companies	Percent
<100	24	14.2
100-249	31	18.3
250-499	21	12.4
500-999	34	20.1
1000-4999	32	18.9
5000 +	22	13.0
Not reported	5	3.0

Annual Sales	No. of Companies	Percent
< $250k	5	3.0
$250k – 1m	3	1.8
$1m – 10m	17	10.0
$10m – 100m	60	36.1
$100m or more	78	46.7
Not reported	6	3.5

Excluding the company information collected (number of employees; annual sales) there was a total of 22 respondents with missing data for a total of 63 missing items. For missing items within a scale, the average of the other items for that respondent was substituted. For missing scales, the average of other respondents was substituted. Missing data for any one item or scale did not exceed five percent, thus missing data in this study should not present a problem (Roth and Switzer 1999).

An analysis was performed to assess nonresponse bias by comparing respondents to non-respondents. This extrapolation method is based on the idea that "Persons who

respond in later waves are assumed to have responded because of the increased stimulus and are expected to be similar to nonrespondents" (Armstrong and Overton 1977, p. 397). A comparison was made between the first 29 surveys received in the main study and the last 29 surveys received as a result of the phone/fax follow-up. Those results are presented in Table 3.

TABLE 3

COMPARISON OF FIRST RESPONDENTS TO LAST REPONDENTS: ESTIMATE OF NONRESPONSE BIAS

Variable	Mean		*p*-value
	First 29	Last 29	
Acceptance – Satisfaction	6.000	5.448	.021
Acceptance – Repurchase Intent	5.965	5.793	.624
User Participation	4.244	4.209	.920
Relationship Quality	5.791	5.465	.167
Product Criticality	6.336	5.957	.149
Product Innovativeness	4.035	3.851	.635
Product Advantage	5.043	5.017	.936
Vendor Scarcity	4.948	4.819	.779
Relationship Length	5.069	4.931	.696

With the exception of the user acceptance variable based on satisfaction, there were no significant differences between the variables in the study, indicating that non-response bias should not be a major problem.

Measurement

To meet the research objectives of the current study, measures of the constructs in the model of user participation in industrial NPD were identified. Wherever possible, existing measures were used. This was the case with all but the user participation and user acceptance constructs, which are new formative measures. Details of scale development are presented in appropriate parts of this section.

The survey was first given to two academic experts for review. Face validity, comprehensiveness, clarity, and flow were checked. After revision, two professional buyers reviewed the instrument for face validity, comprehensiveness, clarity, and a test of completion time. After minor modifications, the instrument was retested on a random sample of 100 informants from the initial sampling frame of 2,100. The responses to this pilot study indicated that there were no interpretation or other problems associated with the instrument. The following sections describe how each variable in the study was measured.

User Acceptance of New Product

Because the vast majority of research on NPD success studies the developing firm, the measurement of NPD success has relied most often on commercial measures such as sales and profit (Montoya-Weiss and Calantone 1994). Some studies have also used a dichotomous operationalization of success: adopt/non-adopt (Ayers, Dahlstrom and Skinner 1997; Tornatzky and Klein 1982). Since the current study uses the customer firm as the key informant, a customer-based measure of new product acceptance is

required. Also, since a variety of different industries are surveyed in this study, the measure must not be specific to a particular product (e.g., automobile).

Griffin and Page (1996) studied a number of success measures at the product level and concluded that *customer satisfaction* and *customer acceptance* are two of the best measures of customer-based NPD success. But their study did not identify any specific operationalizations of these constructs. The current study seeks to broaden the concept of acceptance from the customer's perspective. Whereas most studies of new product acceptance from the customer's perspective measure acceptance as a dichotomous (adopt/non-adopt) variable, this study uses four separate items to measure new product acceptance: (1) the level of satisfaction with the new product; (2) the likelihood of future purchases of the new product; (3) the percent of total business for a particular product application given to the new product offering; and (4) the percent of total business that the purchasing firm would like to give to the new product if they were unencumbered by any prior commitments. These items are based on both the recommendations of Griffin and Page (1996) and on the Technology Acceptance Model (TAM) proposed by Davis (Davis 1989). Davis' key construct related to acceptance of information technology was intention to use which relates to the future purchase intention item.

There is an extensive literature on customer satisfaction. The majority of it is focused either on consumer markets (see Szymanski and Henard 2001 for a recent meta-analysis) or global channel member satisfaction if in the context of industrial markets (see Geyskens, Steenkamp and Kumar 1999 for a recent meta-analysis). The current study calls for a product specific measure of satisfaction in an industrial channel context.

Measures of product satisfaction can take two forms. They can either address a specific product (Mano and Oliver 1993) or be generalizable. Because the specific new products in the current study will vary between respondents, a generalizable measure is required. Though multi-item measures are generally preferable, Mittal, Ross, and Baldasare, Jr. (1998) justified their use of a single-item satisfaction measure by finding considerable precedent for such use in the context of large-scale satisfaction studies. They cite LaBarbera and Mazursky (1983) who discuss the issue of using single- versus multi-item scales for measuring overall satisfaction and conclude that, in large-scale survey research, the use of multi-item scales may actually decrease the quality of measurement rather than enhance it. They also cite Kekre, Krishnan, and Srinivasan (1995) who used a single-item measure for overall satisfaction in their large-scale study of drivers of customer satisfaction in the computer industry. Finally, in their meta-analysis, Szymanski and Henard (2001) state that aggregate (single-item) and attribute (multi-item) measures of satisfaction may diverge and that the aggregate measure may be a more accurate measure of customer satisfaction. The measure of satisfaction was a seven-level semantic differential scale with the anchors "Very satisfied" and "Very dissatisfied" in response to the question: "Based on your ownership experience, how would you rate your satisfaction with this new product?"

The second measure of new product success or acceptance recommended by Griffin and Page (1996) is *product acceptance*. Two single-item measures were used to capture this construct. The first is the likelihood of future purchase or purchase intentions. Mittal, Ross, and Baldasare, Jr. (1998) justified their use of a single-item future purchase intention scale in the same manner as they did for the satisfaction scale.

Mittal and colleagues have successfully employed single-item measures of both satisfaction and repurchase intent in subsequent studies (Mittal and Kamakura 2001; Mittal, Kumar and Tsiros 1999). The measure of satisfaction was a seven-level semantic differential scale with the anchors "Very likely" and "Very unlikely" in response to the question: "Based on your ownership experience, how likely are you to purchase this product from this supplier at your next purchase occasion?"

The second aspect of product acceptance is two items related to the amount of business given to the new product. The first is a single-item measure of the percentage of total business for the specific product application given to the new product offering and the second is the amount of business the purchasing firm would like to give to the new product if they were unencumbered by any prior commitments to other suppliers.

Studies of new product acceptance from the consumer's perspective that use a dichotomous adopt/non-adopt operationalization of success (e.g., Ayers, Dahlstrom and Skinner 1997; O'Callaghan, Kaufmann and Konsynski 1992; Tornatzky and Klein 1982), fail to capture the possibility of a company not giving all of their business for a particular product to a single supplier or the possibility of prior commitments. These possibilities are incorporated into the overall acceptance measure of the current study.

The resulting scale of user acceptance is a formative indicator. Unlike reflective measures, formative (or causal) indicators make up the latent variable—the latent construct is dependent on the indicators (Bollen and Lennox 1991). When there is an increase in one indicator of a formative scale, there is not necessarily an increase in any other.

User Participation in NPD

A variety of different operationalizations of this construct have been used in a number of different contexts. In interorganizational industrial NPD, all studies identified that evaluate user participation in NPD are from the perspective of the developing firm. Campbell and Cooper (1999) relied on their developer organization key informants to classify their NPD projects as either *partnership* or *in-house* and their analysis evaluated differences between the elements of this dichotomous operationalization. Others have relied on either a single-item measure of frequency of contact (Souder, Buisson and Garrett 1997) or multi-item scales that tap both frequency of interaction with and number of customers contacted (Gales and Mansour-Cole 1995; Gruner and Homburg 2000).

But the need to tap user participation at the different stages of the NPD process has been noted (Brown and Eisenhardt 1995; Clift and Vandenbosch 1999). There has been some research conducted on supplier participation in the customer's NPD process that incorporates the stages of the process (Bello, Lohtia and Dant 1999), but the majority of research on user participation that considers the stage of the NPD process comes from intraorganizational projects, primarily information systems design (e.g., Barki and Hartwick 1994; Leonard-Barton and Sinha 1993). In each of these cases, the researchers identified a number of activities within each stage of the information systems design process that were indicators of user participation. The study informants then either evaluated the intensity of each of these activities on a Likert-type scale or simply indicated whether or not they had occurred. In the former case, each activity represented a scale item, thus there was a scale for each stage (Bello, Lohtia and Dant 1999; Gruner and Homburg 2000). These items were then summed to generate a participation scale (Heide and John 1990). In the latter case, the multiple dichotomously measured

participation items are summed to develop a continuous participation measure (Barki and Hartwick 1994).

In all of the studies reviewed above, the key informants are participants in the NPD process from the developing organization. Since these informants are very close to the NPD process, they are in a good position to evaluate their customer's specific activities over the stages of the NPD process. In the context of the current study, there was concern that the purchasing professional key informants are not able to effectively evaluate a number of different activities in a number of different stages of the NPD process (Atuahene-Gima 1995a). Thus the measure of user participation in NPD employed in the current study focuses on NPD project-based communication by communication method for each stage of the NPD process. Like the scale of user acceptance, the resulting scale is a formative indicator. When there is an increase in one indicator of a formative scale, there is not necessarily an increase in any other. In the context of the current scale of user participation, this means that participation in one stage of the NPD process does not necessarily correlate with participation in any other stage of the NPD process.

Formative measures have been used to operationalize participation in previous studies. Gruen, Summers and Acito (2000) measured member participation in a professional association by using a number of items describing participative activities such as reading the association's trade magazine or attending meetings. Spake and colleagues (1999) measured advertiser's participation with ad agencies by having respondents indicate the frequency with which they participated in specific activities (e.g., meetings) with their agency. Summed scales were used in both cases.

In the current study, the respondents indicated the frequency of specific types of project-related communication over the stages of the supplier's NPD process. The types of communication are face-to-face, phone, US mail, e-mail, and other electronic means. This is similar to the formative scale of collaborative communication used by Mohr, Fisher and Nevin (1996). The descriptors for the 4 stages of the NPD process (Urban and Hauser 1993) were refined based on the interviews with purchasing professionals and the pretest of the entire survey instrument. These stage descriptors and the scale root are presented in Table 4. The response format was a seven-point semantic differential scale for each type of communication under each stage of the NPD process with the anchors: "None at all;" "A great deal." The items were summed to create the user participation scale.

TABLE 4

SCALE OF USER PARTICIPATION IN NPD

For each stage of your supplier's new product development process described below, rate the level of participation of your firm in that stage in terms of communication with the supplier using the communication methods listed.

1. Idea generation – prior to actual design being performed

2. Design – prototype or concept development

3. Testing – of a prototype or sample

4. Introduction – launch to the market

Relationship Quality

Relationship quality is a broad concept describing the overall quality of the relationship between two firms or individuals—its essence is a belief in the integrity and reliability of the other party (Jap 2001b). It has been measured with as few as 2 items (Johnson 1999) and as many as 73 items (Dorsch, Swanson and Kelley 1998). Most researchers have conceptualized relationship quality as a higher-order construct composed of any number of first-order constructs. But difficulty arises because there has not been agreement on just which first-order constructs to include. Table 5 summarizes the various studies in the marketing literature that have attempted to operationalize relationship quality. The table shows the study context and the first-order constructs used along with their corresponding number of items and reliability coefficients where available. In looking at these previous operationalizations, some patterns do arise. Of the sixteen studies summarized, all but one agrees that *trust* is a component of relationship quality. Next is *satisfaction* with nine out of sixteen followed by *continuity expectations* and *commitment* with four and three studies respectively. No other component of relationship quality is present in more than two studies.

TABLE 5

RELATIONSHIP QUALITY MEASURES IN THE LITERATURE

(listed chronologically)

Context (key informant listed first, if applicable)	**Items**	**# items**	**α**	**Source**
Auto dealership—manufacturer	• satisfaction • minimal opportunism • trust	4 5 4	.91 .79 .79	Dwyer & Oh, 1987
Consumer policy holder—life insurance salesperson	• *satisfaction* w/salesperson • trust in salesperson	3 9	.99 .89	Crosby, Evans and Cowles, 1990
Physician—pharmaceutical salesperson	• satisfaction • trust	5 5	.94 .86	Lagace, Dahlstrom and Gassenheimer, 1991
Consumer—service marketer (conceptual)	• satisfaction • trust • customer orientation/empathy • selling orientation/ salesperson pressure • expertise • ethics	NA	NA	Palmer & Bejou, 1994
Industrial channels (conceptual)	• solidarity/trust • flexibility • continuity expectations • goal compatibility	NA	NA	Robicheaux & Coleman, 1994
Auto dealership—manufacturer	• affective conflict • manifest conflict • trust (honesty) • trust (benevolence) • affective commitment • continuity expectations • willingness to invest	4 2 5 5 3 3 3	NR	Kumar, Scheer and Steenkamp, 1995
Consumer—marketer (conceptual)	• overall quality • trust • commitment	NA	NA	Hennig-Thurau & Klee, 1997

Industrial purchasing executive—vendor	• trust • satisfaction	5 5	NR	Leuthesser, 1997
Industrial purchasing executive—vendor	• satisfaction • customer orientation • opportunism • trust • ethical profile (5 separate scales) • commitment (2 1-item scales)	3 24 9 9 26 2	.99 .97 .89 .93 >.70 NA	Dorsche, Swanson and Kelley, 1998
Retail buyer—vendor (qualitative)	• trust • affective & manifest conflict • disengagement • continuity expectations	NA	NA	Jap, Manolis and Weitz, 1999
Salesperson—customer (conceptual)	• satisfaction • commitment • trust	NA	NA	Weitz and Bradford, 1999
Industrial distributor—supplier	• trust and fairness	2	.88	Johnson, 1999
Manufacturer—supplier (qualitative)	• trust • needs fulfillment • supply chain integration • power • profit	NA	NA	Naude & Buttle, 2000
Consumer durable manufacturer—dealer	• trust • commitment	3 3	.90+ .83+	Hibbard, Kumar and Stern, 2001
R&D collaboration (industry & government)	• outcome fairness • satisfaction • willingness to collaborate in the future	3 3 3	.86 .90 .94	Jap, 2001b
Insurance company representative—agent	• trust • satisfaction • expected future benefits • continuity expectations	6 4 2 2	.91 .92 .74 .89	Jap, van Osselaer and Weitz, under review

NA = not applicable; NR = not reported

Commitment concerns a party's intention to continue a relationship and thus represents a pledge of relational continuity (Scheer and Stern 1992). Thus the concept of commitment is closely related to that of continuity expectations as they both focus on the future of the relationship. The current study conceptualizes relationship quality as a

second-order construct comprised of the first-order constructs satisfaction, trust, and continuity expectations.

The satisfaction and trust scales were taken from Crosby, Evans and Cowles (1990). Both Crosby and colleagues and Dorsche, Swanson and Kelley (1998) used each of these scales in their operationalizations of relationship quality. The satisfaction measure is a three-item, seven-level semantic differential scale with the root "Our firm is _____ with/toward this vendor." The anchors are: "Satisfied—Dissatisfied;" "Pleased—Displeased;" and "Favorable—Unfavorable." Both previous studies using this satisfaction measure achieved a reliability (coefficient alpha) of 0.99.

Because both of the studies cited above addressed interpersonal trust, the trust scale items were modified based on Doney and Cannon (1997) to reflect a firm-level conceptualization. The reliability (coefficient alpha) achieved in these previous studies ranged from 0.89 to 0.94. The continuity expectations scale was taken from Kumar, Scheer and Steenkamp (1995) who used it in their operationalization of relationship quality. Though they did not report individual reliabilities (coefficient alphas) for their seven first-order factors, they did state that they ranged between 0.67 and 0.90. The response format for both the trust and continuity expectations scales was a seven-point Likert-type scale with the anchors: "Strongly agree;" "Strongly disagree."

The final relationship quality measure was constructed by averaging the three separate elements (equally weighted) (Noordewier, John and Nevin 1990). See Table 6 for the individual items for both the trust and continuity expectations scales.

TABLE 6

SCALES OF TRUST AND CONTINUITY EXPECTATIONS

Rate the extent to which you agree with each statement as it applies to the relationship your firm has with the vendor firm:

Trust in vendor firm:

- This supplier can be relied on to keep promises it makes to our firm.
- This supplier is trustworthy.
- We believe the information that this supplier provides us.
- This supplier is genuinely concerned that our business succeeds.
- When making important decisions, this supplier considers our welfare as well as its own.
- We trust this supplier to keep our best interests in mind.
- There are times when we find this supplier to be a bit insincere. [reverse coded]
- We find it necessary to be cautious when dealing with this supplier. [reverse coded]

Continuity expectations with vendor firm:

- We expect our relationship with this supplier to continue for a long time
- Renewal of our relationship with this supplier is virtually automatic.
- It is unlikely that our firm will still be doing business with this supplier in 2 years. [reverse coded]

Product Innovativeness

The vast majority of measures of product innovativeness reviewed for the current study are categorical scales derived from Booz, Allen and Hamilton's (1982) taxonomy of new product types (e.g., Kleinschmidt and Cooper 1991; Kotabe and Swan 1995; Sethi

2000). In addition, the vast majority of conceptualizations were from the perspective of the developing firm key informant and included items tapping the newness of the product to the developing firm (e.g., Olson, Walker and Ruekert 1995). Since the current study uses a customer key informant, product innovativeness is defined as newness to the customer. Only one study was identified that used a continuous, multi-item measure of product innovativeness from the customer's perspective (Atuahene-Gima 1995b). This measure was used after modifying the item wording to apply to a customer informant since Atuahene-Gima used a developing firm informant. He achieved a reliability (coefficient alpha) of 0.78 in that context. The response format was a seven-point Likert-type scale with the anchors: "Strongly agree;" "Strongly disagree." These items are presented in Table 7.

TABLE 7

SCALE OF PRODUCT INNOVATIVENESS

Rate the extent to which you agree with each statement as it applies to the new product?

- The item was complex.
- The item required a major learning effort by us.
- The item took a long time for us to understand its full advantages.
- The product concept was difficult for us to evaluate or understand.
- The item required considerable advance planning for us to use.
- The item involved high changeover costs.

Product Criticality

Product criticality refers to how important the new product or component is to the purchasing firm. Previous operationalizations of this construct have been tailored to a specific category of new product such as entering goods (Bello, Lohtia and Dant 1999). Since the current study requires a non-specific measure of criticality, a scale of supply importance from Cannon and Perreault (1999) was used. Like the current study, these researchers also employed purchasing professional key informants. The root for this seven-level semantic differential scale is "Compared to other purchases that your firm makes, this product is:" and the anchors are: "Important—unimportant;" "Nonessential—essential;" "High priority—low priority;" and "Insignificant—significant." The reliability (coefficient alpha) achieved by Cannon and Perreault (1999) was 0.85.

Control Variables

Three measures were identified that represent potentially influential variables outside the main focus of the study. Two of these control variable have been shown to play an important role in the context of channel relationships. The first variable is history effects or *relationship length* which relates to the ability of the parties to align their interests and impacts the overall assessment of the relationship (Heide and John 1990). New product acceptance is considered more likely in a long-term relationship. This variable was measured by the time period over which the purchasing firm has been purchasing from the supplier. The second control variable was the availability of alternative suppliers for the particular product application—*vendor scarcity* (Bello, Lohtia and Dant 1999). Few supply alternatives may be a source of uncertainty and dependence for the buying firm (Cannon and Perreault 1999). If there are relatively few

alternative suppliers available for a particular new product application, the likelihood of acceptance of any one supplier's new product is increased. The scale for this measure was adapted from Bello, Lohtia, and Dant (1999) who achieved a reliability (coefficient alpha) of 0.85. The response format was a seven-point Likert-type scale with the anchors: "Strongly agree;" "Strongly disagree." The items are presented in Table 8.

TABLE 8

SCALE OF VENDOR SCARCITY

Rate the extent to which you agree with each statement as it applies to the supply situation for the new product?

- There were few potential suppliers from whom we could have sourced this item.
- There were hardly any other suppliers who were qualified to supply this item.
- We had limited choices among alternative suppliers who could have supplied this item.
- There was very little competition among suppliers to supply this item.

The third control variable is a primary discriminator of NPD success (Montoya-Weiss and Calantone 1994; Henard and Szymanski 2001)—*product advantage*. It reflects the relative advantage of the new product over competitive offerings in the marketplace. The scale for this construct is based on the product competitive advantage scale used by Song and Parry (1997) who achieved a reliability (coefficient alpha) of 0.89. One item was reworded to incorporate the concept of lower cost as an aspect of product advantage.

The response format was a seven-point Likert-type scale with the anchors: "Strongly agree;" "Strongly disagree." The items are presented in Table 9.

TABLE 9

SCALE OF PRODUCT ADVANTAGE

Rate the extent to which you agree with each statement as it applies to the new product?
• This item was clearly superior to competing items in terms of meeting our needs.
• This item permitted us to do a job or do something we could not presently do with what was available.
• This item was higher quality than competing items—tighter specifications, stronger, lasted longer, or more reliable.
• This item had superior technical performance relative to competing items.
• This item had a lower cost relative to competing products.

Data Analysis

This study addresses the following research question: How does the level of participation of an industrial customer (user) in a supplier's NPD process impact the likelihood of that participant adopting the new product from the supplier? It also seeks to investigate the direct effects of relationship quality and product innovativeness on new product acceptance as well as the moderating effects of relationship quality, innovativeness, and product criticality on the relationship between user participation and user acceptance.

To meet these objectives, a model and hypotheses have been presented that propose specific relationships between the predictor variables user participation in NPD, relationship quality, product characteristics, and the criterion variable, new product acceptance.

In the next chapter, the reliability of the scales measuring the model constructs is assessed. In addition, the hypotheses based upon the theoretical model are investigated through the use of moderated multiple regression which allows for the examination of the influence of the independent variables on new product acceptance by customers. In addition, the moderating effects of relationship quality, product criticality, and product innovativeness on user participation are evaluated while controlling for the length of the relationship with the supplier, the availability of alternative sources of supply, and the superiority of the product.

CHAPTER IV

RESEARCH FINDINGS

This chapter presents the empirical results for the hypothesized relationships in the conceptual model. These findings are presented in three sections. The first section presents descriptive statistics for the data. An assessment of the reliability of the model constructs is presented in the second section. Finally, hypothesis testing is presented in the third section.

Descriptive Statistics

Preliminary regression analysis of the data indicated that outlier observations may have unduly influenced the estimated coefficients. Following an analysis of studentized deleted residuals, centered leverage values, standardized dfbetas and partial regression plots, a total of four cases were identified as outliers (Cook and Weisberg, 1982). Further examination of the actual survey instruments returned by respondents supported their removal from the data set. In addition, one respondent indicated that they did not participate at all in their supplier's new product development process. Since the instructions asked respondents to refer to their "most recent experience participating in the development of a new offering from a supplier", that observation was also deleted. The analyses that follow reflect the deletion of these five observations which resulted in a final sample size of 164.

User Acceptance of New Product

The composite score for user acceptance of new product is the mean of the scores for its four dimensions. Since two of the four items were recorded as percentages between zero and one hundred, these were rescaled to a seven-point scale before averaging. Table 10 summarizes the number of items, mean, standard deviation (s.d.), range, minimum, and maximum for all of the study constructs. The dispersion in the study variables indicates that enough variation exists to test the hypothesized relationships in the study model. The mean for user acceptance of new product is more than one standard deviation higher than the scale midpoint. This and the fact that the minimum is 1.62 indicate that the products in the study had a relatively high level of acceptance.

TABLE 10

DESCRIPTIVE STATISTICS OF STUDY VARIABLES

Variable	No. of Items	Mean	s.d.	Range	Min.	Max.
Criterion variable:						
User Acceptance of New Product*	4	5.39	1.18	5.37	1.62	7.00
Predictor variables:						
User Participation*	20	4.11	1.30	5.80	1.20	7.00
Relationship Quality	14	5.55	1.10	6.00	1.00	7.00
Product Innovativeness	6	4.09	1.28	6.00	1.00	7.00
Product Criticality	4	6.14	0.92	4.75	2.25	7.00
Control variables:						
Relationship Length	1	5.14	1.58	6.00	1.00	7.00
Vendor Scarcity	4	4.76	1.65	6.00	1.00	7.00
Product Advantage	4	4.87	1.30	6.00	1.00	7.00

* indicates formative measure

Predictor Variables

Summary statistics for the predictor variables in the model are also presented in Table 10. Each variable is calculated as the mean summate of its individual items. Two variables have values greater than one standard deviation above the scale midpoint. These means for both relationship quality and product criticality indicate a high level of these characteristics in the study. Since the survey instrument stipulated some level of participation in the supplier NPD process, this could account for higher relationship quality. The mean for product criticality exceeds the midpoint by more than two standard deviations, thus products in the study were generally deemed very important to the customer companies.

Control Variables

Table 10 also presents the summary statistics for the control variables in the study: relationship length, vendor scarcity, and product advantage. Each is calculated as the mean summate of its individual items.

Correlation Analysis

Table 11 presents the correlation matrix for all variables in the study. In general, these correlations are supportive of the results reported later.

TABLE 11

CORRELATION MATRIX OF STUDY VARIABLES

		UA	PTN	RQ	INN	CRT	RL	VS	PA
UA	User acceptance	-							
PTN	Participation	.020	-						
RQ	Relationship quality	.422a	.088	-					
INN	Innovativeness	.050	.372a	-.021	-				
CRT	Criticality	.184b	.175b	.126	.265a	-			
RL	Relationship length	.121	-.127	.161b	.032	.158b	-		
VS	Vendor scarcity	.083	.099	.036	.270a	.183b	.062	-	
PA	Product advantage	.109	.217a	.278a	.345a	.129	-.017	.226a	-

a $p \leq .01$; b $p \leq .05$

Scale Reliabilities

User Acceptance of New Product

User acceptance, the dependent variable of the theoretical model, was measured with a formative indicator and as such is not subject to validation techniques applied to reflective measures. There are, though, a number of steps recommended for evaluating the construction of a formative index. The following assessment is based upon the recommendations of Diamantopoulos and Winklhofer (2001).

The first issues of formative index construction are content and indicator specification. For the user acceptance indicator, this study seeks to expand the typical dichotomous operationalization (accept/not accept) to include four separate indicators of

new product acceptance: (1) the level of satisfaction with the new product; (2) the likelihood of future purchases of the new product; (3) the percent of total business for a particular product application given to the new product offering; and (4) the percent of total business that the purchasing firm would like to give to the new product if they were unencumbered by any prior commitments to other suppliers.

The next issue in formative indicator construction is that of indicator collinearity. Unlike reflective scales, excessive collinearity in a formative scale is undesirable. To analyze the issue, the four indicators were regressed on the relationship quality construct. Multicollinearity did not appear to be a problem as the highest variance inflation factor was 1.627, which is well below the common cut-off limit of 10 (c.f. Kleinbaum, Kupper, and Miller 1988). See Table 12.

TABLE 12:

USER ACCEPTANCE INDICATOR ITEM COLLINEARITY

	VIF
Acceptance-satisfaction	1.286
Acceptance-repurchase intent	1.209
Acceptance - % purchased	1.539
Acceptance - % like to purchase	1.627

The final issue in formative indicator construction is external validity. Diamantopoulos and Winklhofer (2001) note that this issue in the context of formative indicators is not fully resolved. They suggest that the researcher evaluate the correlation of the formative indicator to a global construct that "summarizes the essence of the construct that the index purports to measure (Diamantopoulos and Winklhofer 2001; p.

272). In the case of the current study, there was no other global measure of new product acceptance available as one of the purposes was to broaden the concept of new product acceptance.

Predictor and Control Variables

With the exception of the user participation scale, all of the predictor variable scales in this study were taken from previous studies. These data were factor analyzed and support for the *a priori* scales was found. Table 13 presents the results of the principle component analysis with varimax rotation. To assess the internal reliability of the scale items, coefficient alphas and item-to-total correlations were also calculated. These items are presented in the following sections.

TABLE 13

PREDICTOR AND CONTROL VARIABLE FACTOR ANALYSIS LOADINGS

CONSTRUCT ITEMS	COMPONENT					
	1	2	3	4	5	6
Innovativeness		.534				
		.801				
		.824				
		.775				
		.731				
		.573				
Product criticality			.843			
			.857			
			.836			
			.892			
Relationship Quality subscales:						
Satisfaction w/vendor	.891					
	.903					
	.852					
Trust of vendor	.873					
	.881					
	.824					
	.832					
	.864					
	.903					
	.741					
	.802					
Continuity expectations	.589					.636
						.746
						.707
Control variables:						
Vendor scarcity				.802		
				.874		
				.884		
				.856		
Product advantage					.801	
					.603	
					.846	
					.839	

Absolute values less than 0.4 suppressed.

User Participation. Like the user acceptance dependent variable discussed above, user participation was measured with a formative indicator. This scale consisted of a total of twenty items—five for each phase of the new product development process. Again, the recommendations of Diamantopoulos and Winklhofer (2001) were followed in construction of this index.

The first issues of formative index construction are content and indicator specification. In establishing the domain of the user participation construct, communication between a customer and supplier new product developer was established as the means through which any type of participation must occur. Thus, respondents were asked to evaluate the extent to which various types of communication were used between the supplier and customer specifically related to the development of a particular new product. This included all forms of communication that could occur: face-to-face, phone, postal/express mail, e-mail, and other electronic means.

The second issue of indicator collinearity was evaluated by regressing the formative indicator items against another study variable—in this case, user acceptance. Table 11 presents the variance inflation factor data for items in each stage of the new product development process. In this case, the highest variance inflation factor is 2.172 which is well below the suggested cut-off point of ten noted previously.

TABLE 14

USER PARTICIPATION INDICATOR ITEM COLLINEARITY

	VIF		VIF
Stage 1: Idea generation		*Stage 2: Design*	
• Face-to-face	1.580	• Face-to-face	1.470
• Phone	2.172	• Phone	1.887
• Postal/Express mail	1.298	• Postal/Express mail	1.299
• E-mail	1.939	• E-mail	1.948
• Other elec. means	1.546	• Other elec. means	1.535
Stage 3: Testing		*Stage 4: Introduction*	
• Face-to-face	1.451	• Face-to-face	1.615
• Phone	1.756	• Phone	1.893
• Postal/Express mail	1.175	• Postal/Express mail	1.273
• E-mail	1.981	• E-mail	2.045
• Other elec. means	1.592	• Other elec. means	1.733

The third issue of formative index construction is external validity. In this case, one other global reflective measure of user participation was measured. This was a scale of intensity of customer interaction (Gruner and Homburg, 2000). The correlation between the formative measure of user participation and this global measure is 0.689 and is significant at the $p < 0.01$ level. All of the above factors indicate that the formative operationalization of user participation in this study is a valid measure.

Relationship Quality. Relationship quality was measured as a second-order construct consisting of the three first-order constructs of satisfaction, trust, and continuity expectations. These items capture the broad concept of the overall relationship between the developing and customer firms. As can be seen in factor analysis results in Table 11, the only crossloading greater than 0.4 was for a single item in the continuity expectations

construct. Given that relationship quality is conceptualized as a single global measure of the relationship between firms, this crossloading is not of concern. Table 15 presents the items, coefficient alpha, and item-to-total correlations for the three first-order constructs of relationship quality. These indicate reliability of the existing scales. Coefficient alpha for all fourteen items together in the relationship quality scale is .95

TABLE 15

RELATIONSHIP QUALITY SCALES:
SATISFACTION, TRUST, AND CONTINUITY EXPECTATIONS
COEFFICIENT ALPHAS AND ITEM-TO-TOTAL CORRELATIONS

	Item-to-Total Correlation
Satisfaction: Coefficient alpha = .97	
Root: Describe your overall level of satisfaction with the supplier firm:	
1. Dissatisfied — Satisfied	.93
2. Displeased — Pleased	.95
3. Unfavorable — Favorable	.92
Trust: Coefficient alpha = .95	
1. This supplier can be relied on to keep promises it makes to our firm	.85
2. This supplier is trustworthy	.88
3. We believe the information that this supplier provides us	.79
4. This supplier is genuinely concerned that our business succeeds	.82
5. When making important decisions, this supplier considers our welfare as	.84
6. We trust this supplier to keep our best interests in mind	.90
7. There are times when we find this supplier to be a bit insincere	.73
8. We find it necessary to be cautious when dealing with this supplier	.79
Continuity Expectations: Coefficient alpha = .76	
1. We expect our relationship with this supplier to continue for a long time	.70
2. Renewal of our relationship (contracts) with this supplier is virtually automatic	.56
3. It is unlikely that our firm will still be doing business with this supplier in 2 years	.57

Product Innovativeness. Product innovativeness was measured using an existing six-item scale which applied to the developing firm. The scale was adapted to measure the newness of a product from the view of the customer firm. The product innovativeness scale's items, coefficient alpha, and item-to-total correlations from the current study are presented in Table 16. The relatively high coefficient alpha and item-to-total correlations indicate reliability of the existing scale.

TABLE 16

PRODUCT INNOVATIVENESS SCALE:
COEFFICIENT ALPHAS AND ITEM-TO-TOTAL CORRELATIONS

	Item-to-Total Correlation
Innovativeness: Coefficient alpha = .83	
1. The item was complex	.46
2. The item required a major learning effort by us	.67
3. The item required a long time for us to understand its full advantages	.66
4. The product concept was difficult for us to evaluate or understand	.63
5. The item required considerable advance planning for us to use	.66
6. The item involved high changeover costs	.54

Product Criticality. Criticality was measured using an existing four-item scale of supply importance that captures the overall importance of the new product to the purchasing firm. The scale's items, coefficient alpha, and item-to-total correlations from the current study are presented in Table 17. The relatively high coefficient alpha and item-to-total correlations indicate reliability of the existing scale.

TABLE 17

PRODUCT CRITICALITY SCALE:
COEFFICIENT ALPHAS AND ITEM-TO-TOTAL CORRELATIONS

	Item-to-Total Correlation
Criticality: Coefficient alpha = .90	
Root: Compared to other purchases your firm makes, this specific product application is:	
1. Important — Unimportant	.76
2. Nonessential — Essential	.74
3. High priority — Low priority	.78
4. Insignificant — Significant	.84

Control Variables. There were three control variables used in the present study. The first, relationship length, is a single-item measure not subject to validation procedures. The other two variables are vendor scarcity and product advantage. Vendor scarcity was measured with a four-item scale designed to capture the availability of alternative sources of supply for the specific new product application. Product advantage was measured using a five-item scale adapted from an existing product competitive advantage construct. The item that was modified to take new product cost into consideration had a very low item-to-total correlation of .05 (scale coefficient alpha of .71) and was dropped from the analysis. Items, coefficient alpha, and item-to-total correlations from the current study for both vendor scarcity and product advantage are presented in Table 16. The relatively high coefficient alpha and item-to-total correlations indicate reliability of the existing scale.

TABLE 18

CONTROL VARIABLE SCALES:
VENDOR SCARCITY AND PRODUCT ADVANTAGE
COEFFICIENT ALPHAS AND ITEM-TO-TOTAL CORRELATIONS

	Item-to-Total Correlation
Vendor Scarcity: Coefficient alpha = .89	
1. There were few potential suppliers from whom we could have sourced this item	.72
2. There were hardly any other suppliers who were qualified to supply this item	.82
3. We had limited choices among alternate suppliers who could have supplied this item	.83
4. There was very little competition among suppliers to supply this item	.70
Product Advantage: Coefficient alpha = .82	
1. This item was clearly superior to competing items in terms of meeting our needs	.65
2. This item permitted us to do a job or do something we could not otherwise do with what was available	.50
3. This item was higher quality than competing items—tighter specifications, stronger, lasted longer, or more reliable	.71
4. This item had superior technical performance relative to competing items	.75

Hypotheses Testing

The tests of the six hypotheses presented in the theoretical model were conducted using moderated regression analysis according to Aiken and West (1991) and Irwin and McClelland (2001). The significant interaction in the model was examined through simple slope analysis, a technique that overcomes the need to create subgroups from continuous independent variables (Aiken and West 1991). All independent variables were mean-centered to minimize multicollinearity between the interaction terms and their constituent terms in the regression model (Aiken and West 1991). The criterion variable for each of the hypotheses is user acceptance of the new product. The results of the moderated regression analysis are presented in Table 18. All variables were entered simultaneously. The overall regression model is significant ($F = 4.519$, $p < .001$) with an R^2 indicating that 22.8% of the variation in user acceptance of the new product is explained by the predictor variables.

TABLE 18

MODERATED REGRESSION ANALYSIS OF
PREDICTOR VARIABLES WITH USER ACCEPTANCE OF NEW PRODUCT

	Variable	Expected Sign	Unstandardized Coefficients	t	Prob. t
	Constant		5.396	60.132	.000
H1	User Participation	+	-.033	-.466	.642
H2	Relationship quality	+	.456	5.514	.000
H4	Product Innovativeness	+	.016	.215	.830
	Product Criticality		.193	1.934	.055
H3	Participation X relationship quality	+	-.148	-1.998	.048
H5	Participation X innovativeness	+	-.026	-.449	.654
H6	Participation X criticality	+	.124	1.527	.129
Control variables:					
	Relationship length		-.004	-.074	.941
	Vendor scarcity		.044	.826	.410
	Product advantage		-.039	-.539	.591

Model F	=	4.519
Prob. F	=	.000
R^2	=	.228
Adj. R^2	=	.178

Hypothesis 1: User Participation

In reference to user participation, it was hypothesized that:

H1: User participation in a supplier's specific NPD process will be positively related to user acceptance of that new product.

This hypothesis postulates that the level of the user's participation in their supplier's new product development process will have a positive relationship to their acceptance of that new product from the supplier. The multiple regression results presented in Table 18 indicate that this hypothesis is not supported (B = -.033; t = -.466; p = .642).

Hypothesis 2: Relationship Quality

In reference to relationship quality, it was hypothesized that:

> H2: The quality of the relationship between the user and the supplier firm will be positively related to the user's acceptance of a new product offering by the supplier.

This hypothesis postulates that the quality of the relationship between the user and supplier will have a positive relationship with the user's acceptance of a new product from the supplier. The multiple regression results indicate a high level of support for this hypothesis (B = .456; t = 5.514; p < .001).

Hypothesis 3: Relationship Quality as Moderator

In reference to relationship quality as a moderator, it was hypothesized that:

> H3: The greater the relationship quality between the user and the supplier firms, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

This hypothesis postulates that a higher quality relationship between the user and supplier will result in a stronger positive relationship between the user's participation in the supplier's new product development process and the user's acceptance the supplier's new product. The regression analysis supports a moderator effect, but the direction of the effect is opposite from that hypothesized (B = -.148; t = -1.998; p = .048). As

recommended by Aiken and West (1991), simple slope analysis was conducted to better understand the nature of this interaction. This technique overcomes the need to create subgroups from continuous independent variables. Simple slope analysis involves creating one low (i.e., one standard deviation below the mean), one moderate (i.e., mean), and one high (i.e., one standard deviation above the mean) conditional value of the moderator variable. After substituting the values of relevant unstandardized regression coefficients from the trimmed regression model, the equation is solved for the slope of the independent variable (user participation) at the different levels of the moderator (relationship quality). The simple slopes at low, moderate, and high levels of relationship quality were 0.121, -0.028, and -0.177 respectively. These values indicate that at low levels of relationship quality, there is a slight positive relationship between user participation and that user's acceptance of the new product. But as the level of relationship quality increases, that positive relationship becomes a negative relationship.

Hypothesis 4: Product Innovativeness

In reference to product innovativeness, it was hypothesized that:

H4: The innovativeness of the new product offering will be positively related to the user's acceptance of that new product offering by the supplier.

This hypothesis postulates that the innovativeness of the new product offering from the supplier will have a positive relationship with the user's acceptance of a new product from the supplier. The regression analysis does not support this hypothesis (B = .016; t = .215; p = .830).

Hypothesis 5: Innovativeness as Moderator

In reference to innovativeness as a moderator, it was hypothesized that:

> H5: The greater the innovativeness of the new product offering, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

This hypothesis postulates that a higher level of product innovativeness will result in a stronger positive relationship between the user's participation in the supplier's new product development process and the user's acceptance the supplier's new product. The hypothesis is not supported by the regression analysis (B = -.026; t = -.449; p = .654).

Hypothesis 6: Product Criticality as Moderator

In reference to product criticality as a moderator, it was hypothesized that:

> H6: The greater the product criticality, the greater the positive relationship between user participation in a supplier's specific NPD process and user acceptance of that new product.

This hypothesis postulates that a higher level of product criticality will result in a stronger positive relationship between the user's participation in the supplier's new product development process and the user's acceptance the supplier's new product. The regression analysis does not support the hypothesis (B = .124; t = 1.527; p = .129).

Summary of Research Findings

The purpose of this study was to evaluate determinants of user acceptance of new products. The empirical results offer limited support for the research hypotheses and some unexpected findings. Table 19 presents the moderated regression analysis for a trimmed model. Figure 2 presents the model and significant relationships.

TABLE 19

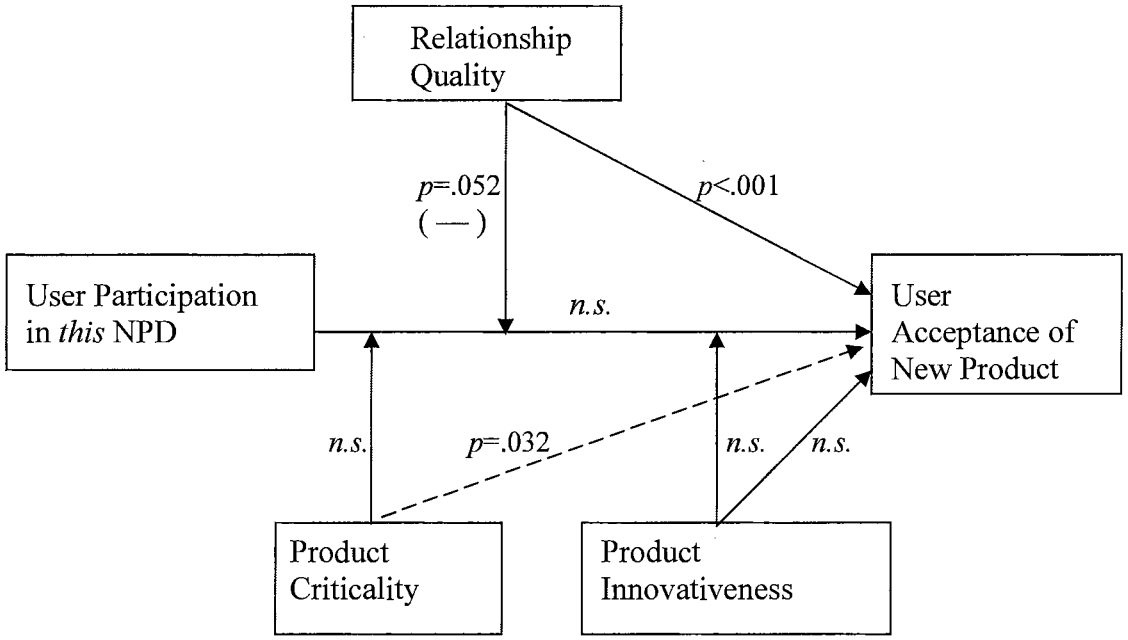
MODERATED REGRESSION ANALYSIS OF TRIMMED PREDICTOR VARIABLES WITH USER ACCEPTANCE OF NEW PRODUCT

	Variable	Expected Sign	Unstandardized Coefficients	t	Prob. t
	Constant		5.382	64.380	.000
H1	User Participation	+	-.028	-.432	.666
H2	Relationship quality	+	.443	5.807	.000
	Product Criticality		.199	2.159	.032
H3	Participation X relationship quality	+	-.135	-1.958	.052
H6	Participation X criticality	+	.104	1.548	.124

Model F	=	9.039
Prob. F	=	.000
R^2	=	.222
Adj. R^2	=	.198

FIGURE 2

SIGNIFICANT RELATIONSHIPS IN MODEL OF USER PARTICIPATION IN INDUSTRIAL NEW PRODUCT DEVELOPMENT



As shown in these results, the hypothesis with respect to the main effect of relationship quality was supported. While there was a significant interaction of relationship quality with user participation, the direction was opposite of that hypothesized. In addition, a main effect of product criticality on user acceptance was discovered that was not expected. The findings are discussed in detail in the following chapter.

CHAPTER V

DISCUSSION

The discussion of this study is presented in five parts: First, the supporting literature is reviewed. This is followed by a discussion of the research findings. Third, the implications for theory and practice are developed. Fourth, the limitations of the study are investigated. Finally, recommendations for future research are presented.

Overview of Supporting Literature

The primary objective of this study was to assess the effect of user participation in the new product development (NPD) process of their supplier on the likelihood of the user accepting the supplier's new product. It also investigated the effects of relational and product characteristics on user acceptance.

User Participation

Both generalist and specialist studies have established that a key to new product success is meeting customer expectations (Clark and Fujimoto 1990; Montoya-Weiss and Calantone 1994). A recent meta-analysis by Henard and Szymanski (2001) found that one of the dominant drivers of new product performance is that the product meet customer needs. An obvious way to understand and meet customer needs is to allow them to participate in the new product development process.

Relationship Quality

Research on dyadic relationships in industrial channels has focused on the relational benefits that accrue to the customer firm (e.g., Lusch and Brown 1996; Noordewier, John and Nevin 1990). Most research investigating the benefits of channel relationships that accrue to the supplier firm come from the sales management literature and show positive benefits (e.g., Biong and Slenes 1996; Leuthesser 1997). Research investigating the effect of relationships on new product success have taken a broad view of relationships that entails collaboration on NPD. This confounds the two key predictor variables of the current study—user participation in a specific NPD project and the global relationship quality between the user and supplier firm. No previous research was found that isolates these two related factors.

Product Characteristics

The majority of research on the contribution of product innovativeness to new product success has found a positive relationship, but the evidence is mixed (Henard and Szymanski 2001). There is evidence that the greater information flows necessary during the development of an innovative product make collaboration between groups involved in the development more important (Olson, Walker and Ruekert 1995). Thus a more innovative product should increase the positive relationship between user participation and user acceptance. A similar argument is made for the moderating effect of product criticality. Athaide and Stump found that collaboration between buyer and seller during successful NPD was more common with customized (i.e., critical) products.

Summary of Findings

There were three primary research objectives for this study. The first was to determine how the level of user participation by an industrial customer in a supplier's NPD process affects the likelihood of that participant accepting the new product from the supplier. The second objective was to evaluate the direct and moderating effects of relationship quality on new product acceptance. The third was to evaluate the direct and moderating effects of the product characteristics innovativeness and criticality on new product acceptance.

To accomplish these objectives, hypotheses were formulated to test each of the relationships. In addition, new formative scales were developed for user participation and user acceptance. These scales were developed and validated in accordance with the recommendations of Diamantopoulos and Winklhofer (2001). All other scales in the study were identified from previous research. These were subjected to reliability testing and factor analysis prior to hypotheses testing and support for each of the scales was found. This minimized the likelihood of misinterpretation of the hypotheses testing due to invalid or unreliable measures.

A questionnaire containing measures of user participation, user acceptance, relationship quality, product innovativeness, product criticality as well as 3 control variables was mailed to 2000 members of the National Association of Purchasing Management in 2 waves. This was followed by a phone and fax effort directed at nonrespondents. A final total of 164 surveys were used in the data analysis.

Hypothesis 1 suggested that a user's participation in the NPD process for a particular new product and their acceptance of that new product will be positively

associated. Support was not found for this relationship. This suggests that user participation in a supplier's specific NPD process is not positively related to the user's acceptance of that new product. Such a non-intuitive finding may be partially explained by the recent meta-analysis of Henard and Szymanski (2001). They found that *customer input* was a non-significant driver of new product success. But they also found that *manager's perceptions of product meeting customer needs* was a dominant driver of new product success. Combined with the mixed results of other research on customer participation in NPD cited earlier, all of these findings indicate that the process by which new product developers ensure that new products meet customer needs is not well understood.

Hypothesis 2 stated that the quality of the relationship between the user and the supplier firm will be positively related to the user's acceptance of the new product offering by the supplier. This is the strongest and most significant relationship in the study. It implies that suppliers who pursue high quality relationships with their customers are more likely to have those suppliers accept their new product offerings.

Hypothesis 3 investigated the moderating effect of relationship quality on the relationship between user participation in the NPD process and user acceptance of the new product. The hypothesis suggested that when there is a higher quality relationship between user and supplier, there will be a stronger relationship between user participation and user acceptance. An opposite relationship was found, though the magnitude of the effect was relatively small. The findings suggest that when there is a lower quality relationship between user and supplier, there is a positive effect on the relationship between user participation and user acceptance. But when relationship quality increases,

this turns into a negative effect on the relationship between user participation and user acceptance. An explanation could be that at low levels of relationship quality, there is a positive association between user participation and user acceptance because the benefits of the participation offset any negative effect from the low relationship quality. This would be particularly true during the beginning stages of a relationship when the low quality is due to a lack of familiarity. At high levels of relationship quality, the negative association between participation and acceptance could be due to the old adage that familiarity breeds contempt. There is some support for this contention. A national survey found that less face-to-face contact an organization had with their customers, the happier the customers were (Smith 1996). Thus if the relationship quality is already high, the added exposure of the user to the supplier during development could reduce their likelihood of accepting the new product. Another possible explanation for the negative relationship between participation and acceptance is that when relationship quality is high, the customer might not want to be viewed as "being in bed" with the supplier and thus is less likely to accept the new product.

According to hypothesis 4, innovativeness of the new product offering will be positively related to the user's acceptance of that new product. Support was not found for this hypothesis. There are two possible explanations for this finding. First, virtually all of the previous studies indicating a positive relationship between innovativeness and new product performance were based on the developer's perceptions of both product innovativeness and new product success. The current study measures innovativeness and new product acceptance from the perspective or the new product user. Thus from the new product user's perspective, innovativeness may not have any impact on their

acceptance of the new product. Second, there has been some limited support in the past for a curvilinear relationship between innovativeness and new product success (Cooper and Kleinschmidt 1991).

Hypotheses 5 and 6 investigated the moderating effect of product innovativeness and product criticality respectively on the relationship between user participation in the NPD process and user acceptance of the new product. Neither of these hypotheses was supported. This indicates that these two product characteristics do not affect the relationship between user participation and user acceptance.

There was one unexpected finding. In order to properly evaluate the moderating effect of product criticality on the association between user participation and user acceptance, each component of the product term had to be included (Irwin and McClelland 2001). The regression results showed a significant positive relationship between product criticality and user acceptance of the new product. When originally formulating hypotheses, the potential for this relationship was not considered because criticality should not vary between different suppliers' offerings for the same product application and thus should not affect acceptance. It reflects only the relative importance of the product to the purchasing firm. But there does appear to be a positive effect of criticality on user acceptance. This could be because on critical items, customers may be more likely to solicit from a smaller group of more reliable suppliers thus increasing the probability of any one supplier's new product being accepted. There is some support for this in that when vendor scarcity is controlled for in the full model, the beta and significance for the criticality (B = .193; p = .055) are less strong than when vendor scarcity is not controlled for in the trimmed model (B = .199, p = .032).

Implications

The findings from this study make contributions to the fields of marketing, industrial channel relationships, and new product development in both theory and practice. These contributions are discussed in the following sections.

Theoretical Implications

From a theoretical perspective, the present study:

1. Extends and links existing research in the areas of channel relationships, new product development, and sales management.
2. Introduces and operationalizes the formative constructs user participation in NPD and user acceptance of new product.
3. Empirically examines the conceptualized relationships in the theoretical model of user participation in NPD from the customer's perspective.

Relationship quality is a global measure of the quality of a channel relationship. The effect of relationship quality has been ignored as a determinant of new product acceptance in the literature. This study extends the research in NPD and integrates it with that of channel relationships. And since the study found a strong relationship between relationship quality and new product acceptance, there are implications for sales management. Salespeople are boundary-spanners who contribute greatly to the quality of the relationship with their customers (Weitz and Bradford 1999; Jap 2001a).

The second theoretical implication is the new formative measures of user participation and user acceptance of new product. The measure of user participation expands the concept of customer participation to include all possible means of communication during the NPD process. The measure of user acceptance brings the

customer's perspective to the evaluation of new product success. Most studies have measured new product success based only upon managers' perceptions or financial outcomes in the developing organization. The new measure introduced in this study considers 4 separate aspects of user acceptance from the customer's perspective: (1) the level of satisfaction with the new product; (2) the likelihood of future purchases of the new product; (3) the percent of total business for a particular product application given to the new product offering; and (4) the percent of total business that the purchasing firm would like to give to the new product if they were unencumbered by any prior commitments to other suppliers.

The final theoretical implication relates to the empirical investigation of the relationships in the conceptual model. The development and testing of this model adds to and helps integrate the theoretical foundations of industrial channel relationship research with that of new product development.

Managerial Implications

From a managerial perspective, the present study provides guidance for firms engaged in NPD to help them increase acceptance of their new products by users. By far, the most significant result is the positive association between relationship quality and user acceptance of a new product. Thus it is important for firms engaged in new product development to foster good relationships with their customers. This has major implications for sales management.

A smaller effect was found that indicates developing firms will garner greater new product acceptance through user participation in the NPD process when the quality of their relationship is low, but not as much when the quality of the relationship is high.

This means that when suppliers are beginning a relationship or have not built a strong relationship with a customer, they should pursue a high level of customer participation in their NPD process. But when a supplier already has a good relationship with their customer, bringing that customer into the NPD process may lessen the likelihood of their new product being accepted. This has major implications for NPD managers.

Finally, firms involved in new product development should work toward determining how critical specific new product applications are to their customer. Results of the study indicate that their new products are more likely to be accepted when they are critical to the user.

Limitations

There are a number of limitations with respect to this study. The first is the relatively low overall response rate of 9.6%. Even though calculations from the phone/fax follow-up indicate the actual effective response rate may be as high as 50%, generalizability of the study findings may be limited. Also limiting generalizability may be that the study drew from only three specific SIC codes. But these codes represent a wide variety of products and industries (Heide and John 1990).

Time and resource constraints dictated the use of a single key informant for each new product development project. This may have presented problems in that some of the purchasing professionals surveyed were not fully informed on all of the study variables with respect to a single NPD project. In addition, the study results are subject to common method variance.

Another limitation of the study is the external validity of the user acceptance scale. Due to the lack of a global indicator of user acceptance, the scale was unable to be correlated as recommended by Diamantopoulos and Winklhofer (2001).

As this was a cross-sectional study, no causal ordering of the variables in the model was investigated. Though there was theoretical justification for the relationships in the conceptual model, others are possible. For example, relationship quality could be an antecedent of user participation or vice versa. This indicates that different methodologies could be used to examine the theoretical relationships.

Future Research

The findings of the current study provide a basis for future research. First, as mentioned above, different methods could be used. Longitudinal research would aid in identifying causal relationships and mediating effects as would alternative statistical analyses such as path analysis or structural equation modeling.

Second, the whole issue of customer participation and customer knowledge in the NPD process needs to be delineated. This study found no association between user participation in an NPD project and the user's acceptance of the new product. The recent meta-analysis of Henard and Szymanski (2001) found that customer input was a non-significant driver of new product success. But the same study found that managers' perceptions of a new product meeting customer needs was a dominant driver of new product success. There is still much to be learned regarding how best to both determine and incorporate customer knowledge into the NPD process as well as its effects on new

product success. Another related issue is *when* participation in the NPD process (which stage) is most effective in increasing acceptance.

Third, the most significant finding of the study—the association of relationship quality with new product acceptance—deserves further research. This is the first known finding connecting these two important concepts.

Finally, the reasons underlying the significance of product criticality as a determinant of new product acceptance could be further investigated.

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APPENDIXES

APPENDIX A:

COVER LETTERS AND FAXES

Initial Mailing Cover Letter

[Missouri Southern State College letterhead]

August 1, 2001

«FullName»
«Company»
«Address1»
«Address2»
«City», «RegionOrStateCode» «ZipCode»

Dear «FullName»:

I am a Ph.D. student conducting research for my dissertation on manufacturer-supplier relationships in new product development. I would like to ask your help by taking a few minutes to complete the enclosed questionnaire.

Your decision to participate in this survey is completely voluntary. This is an anonymous survey; no one will have access to the raw data (except for myself). Your responses should lead to a better understanding of customer participation in the business-to-business new product development process and allow the generation of valuable guidance for purchasing professionals in managing their new product adoption process.

Please respond to each of the questions and return the completed questionnaire through the U.S. mail in the enclosed postage-paid return envelope as soon as possible. If you have any questions concerning any of the items in the survey, please feel free to call me at 417-625-9609 or e-mail me at: cragin-s@mail.mssc.edu. If you have not been offered a new or improved item by a supplier recently, please pass the survey on to a colleague who has.

I sincerely thank you for your time and help. The survey should take less than 10 minutes to complete. If you would like a summary of the results, please enclose a business card with the survey.

Sincerely,

Scott Cragin

Enclosures

Second Wave Cover Letter

[Missouri Southern State College letterhead]

September 11, 2001

«FullName»
«Company»
«Address1»
«Address2»
«City», «RegionOrStateCode» «ZipCode»

Dear «FullName»:

Approximately 4 weeks ago, you received a survey as part of my dissertation research on customer involvement in supplier new product development. If you have completed and returned the survey, I want to thank you very much. If you have not, I would like to ask your help by taking a few minutes to complete the enclosed questionnaire.

Your decision to participate in this survey is completely voluntary. This is an anonymous survey; no one will have access to the raw data (except for myself). Your responses should lead to a better understanding of customer participation in the business-to-business new product development process and allow the generation of valuable guidance for purchasing professionals in managing their new product adoption process.

Please respond to each of the questions and return the completed questionnaire through the U.S. mail in the enclosed postage-paid return envelope as soon as possible. If you have any questions concerning any of the items in the survey, please feel free to call me at 417-625-9609 or e-mail me at: cragin-s@mail.mssc.edu. If you have not been offered a new or improved item by a supplier recently, please pass the survey on to a colleague who has.

I sincerely thank you for your time and help. The survey should take less than 10 minutes to complete. If you would like a summary of the results, please enclose a business card with the survey.

Sincerely,

Scott Cragin

Enclosures

Phone/Fax Follow-Up Phone Script and Spreadsheet Coding

Hi, ____. My name is Scott Cragin and I'm currently a doctoral candidate at Oklahoma State University... Toward the end of last year, you probably received a survey or two from me regarding *customer involvement in supplier NPD*... Unfortunately, my response rate wasn't what the pilot study predicted and in order to have a large enough sample to complete my dissertation, I need some additional participants... Now the survey is very short—I would fax to you—and it may or may not even apply to you... Can you tell me if you've been offered a new or improved item from a supplier recently where your firm participated to some degree in the *supplier's* NPD process for that new item—anywhere from idea generation to product launch?...

Yes → Would you be willing to complete my survey if I fax it to you? It shouldn't take more than 10 minutes to complete and it would *really* help me out. It's completely voluntary and anonymous...?

Yes → Thank you *very much*. Let me double-check your fax #... **[End—fax survey]**

No → I understand. Do you mind if I ask you *just a couple of questions* to help me better understand nonrespondents?

Yes → (ask questions below)

No → I understand. Have a nice day.

1. First, approximately how many employees are there in your business unit?...

2. What are the approximate annual sales of your business unit?
   1--<$250,000 2--$250K-$1 million 3--$1-10 million
   4--$10-100 million 5-->$100 million

Other possible responses (see Dissertation Call Status below), e.g., "So would you say that you haven't been offered a new or improved item recently or that you have, but just did not participate in the supplier's development process?"

Dissertation Call Status (coding for spreadsheet)

C = call cannot be completed as dialed/disconnected/wrong #
Number = unsuccessful attempts to contact (not in, line busy (B), no answer (NA))
Date = date survey faxed; assumes that offered NP with some level of participation
L = no longer with company
NO = not offered a new product recently
NP = offered new product, but didn't participate to any degree
NA = not applicable
- d = don't do that type of purchasing/no longer in purchasing
- r = retired
- Others, e.g., did participate, but not recently or product didn't make it to market or it is still in development

U = unwilling to participate
- t = no time
- r = rude or simply decline

Phone/Fax Follow-Up Fax Coversheet

Missouri Southern State College

Fax transmittal

To:	**From:** Scott Cragin
Fax:	**Pages:** 6 including this page
Ph:	**Date:** April 2, 2002
Re: New Product Development Survey	

Thank you so much for agreeing to complete my survey. Your help will allow me to complete my dissertation and achieve my Ph.D. from Oklahoma State University. It is appreciated.

When you have completed the survey, please fax it back to me. I have included a cover sheet that you can use if you wish. My fax number is 417-625-9604.

If there are any problems or questions, please contact me at 417-625-9609 or via e-mail at cragin-s@mail.mssc.edu. If you have trouble reaching me via phone (I am spending a lot of time on it lately), you can leave a message with our secretary, Becky Wiley at 417-625-9371 and I will return your call ASAP. Again, thank you.

Phone/Fax Follow-Up Fax Reminder Coversheet

Missouri Southern State College

Fax transmittal

To:	«FullName»	**From:**	Scott Cragin
Fax:	«BusFax»	**Pages:**	6 including this page
Ph:	«BusPhone»	**Date:**	April 2, 2002
Re:	New Product Development Survey		

On «Status» I spoke with you about my dissertation survey and faxed it to you. I have not received the completed survey via return fax and just wanted to follow up with you. If you have not had time to complete the survey or have misplaced it, I have included another copy. With your help I will be able to complete my dissertation and achieve my Ph.D. from Oklahoma State University. When you have completed the survey, please fax it back to me. I have included a cover sheet that you can use. My fax number is 417-625-9604. If there are any problems or questions, please contact me at 417-625-9609 or via e-mail at: cragin-s@mail.mssc.edu.

If you find that the survey does not apply to you or you simply do not have the time to complete it, please reply to the 3 questions on the return transmittal sheet (the next sheet in this fax) and fax that back to me. This will allow me to better analyze non-respondents. Whatever help you can offer is much appreciated.

Phone/Fax Follow-Up Fax Reminder Return Coversheet

Fax transmittal

To:	Scott Cragin	**From :**	«FullName»
Fax:	417-625-9604	**Pages:**	_____ including this page
Phone:	417-625-9609	**Date:**	
Re:	New Product Development Survey return		

Please check the box that applies to your situation:

☐ The completed survey follows. [*Thank you!*]

I am unable to complete the survey because:

☐ I do not have the time.

☐ I have not been offered a new or improved item from a supplier recently.

☐ I have been offered a new or improved item from a supplier recently, but my firm did not participate in the suppliers development process to any degree.

☐ Other (please briefly explain): _____

_____

_____

If you are unable to complete the survey, please answer the following two questions:

1. Approximately how many employees are there in your business unit? _____|

2. What are the approximate annual sales of your business unit? (circle appropriate number)?

   1. <$250,000 2. $250K-$1 million 3. $1-10 million
   4. $10-100 million 5. $100 million

APPENDIX B:

SURVEY INSTRUMENT

INSTRUCTIONS

This questionnaire is designed to examine manufacturer-supplier relationships in the development of new materials, parts and components (i.e., new products). As you complete the questionnaire, refer to your ***most recent experience participating in the development of a new offering*** from a supplier. The item may be entirely new to your organization or an improved version of a previously purchased item. Select an item with which you have experience. Please respond to all questions.

Please tell us, in layman's terms, what the new or improved item is: _____

A. Description:

1. Check the box adjacent to the best description of the product application:
   θ Raw or semi-finished material θ Operating or maintenance supply θ Other:
   θ Part or component θ Capital or accessory equipment _____
2. Compared to other purchases your firm makes, this specific product application is:

Unimportant	1	2	3	4	5	6	7	**Important**
Nonessential	1	2	3	4	5	6	7	**Essential**
Low priority	1	2	3	4	5	6	7	**High priority**
Insignificant	1	2	3	4	5	6	7	**Significant**

B. Overall acceptance:

1. Of your total purchases for this specific application from all suppliers, please note the approximate percent that is purchased from *this* particular supplier. Write that percent (1-100%) ***here***: _____
2. Please note the approximate percent that you ***would like to*** purchase from *this* particular supplier if you had no prior commitments to *alternate* suppliers. Write that percent (1-100%) ***here***: _____
3. Based on your firm's experience, how would you rate your satisfaction with this new item?

Very dissatisfied	1	2	3	4	5	6	7	**Very satisfied**

4. Based on your firm's experience, how likely are you to purchase this item from this supplier at your next purchase occasion?

Very unlikely	1	2	3	4	5	6	7	**Very likely**

C. The specific new item:

Rate the extent to which you agree or disagree with each statement as it applies to the new product offering by circling the appropriate number:	**Strongly disagree**						**Strongly agree**
1. The item was complex	1	2	3	4	5	6	7
2. The item required a major learning effort by us	1	2	3	4	5	6	7
3. The item required a long time for us to understand its full advantages	1	2	3	4	5	6	7
4. The product concept was difficult for us to evaluate or understand	1	2	3	4	5	6	7
5. The item required considerable advance planning for us to use	1	2	3	4	5	6	7
6. The item involved high changeover costs	1	2	3	4	5	6	7
7. Compared to competitive items, this item offered some unique features or attributes	1	2	3	4	5	6	7

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	Strongly disagree						Strongly agree
8. This item was a minor improvement in a current technology	1	2	3	4	5	6	7
9. This item has changed the market conditions	1	2	3	4	5	6	7
10. This item is one of the first applications of a technological breakthrough	1	2	3	4	5	6	7
11. This item is based on a revolutionary change in technology	1	2	3	4	5	6	7
12. This item incorporated a large new body of technological knowledge	1	2	3	4	5	6	7
13. This item has changed the nature of the competition	1	2	3	4	5	6	7
14. This item was clearly superior to competing items in terms of meeting our needs	1	2	3	4	5	6	7
15. This item permitted us to do a job or do something we could not otherwise do with what was available	1	2	3	4	5	6	7
16. This item was higher quality than competing items—tighter specifications, stronger, lasted longer, or more reliable	1	2	3	4	5	6	7
17. This item had superior technical performance relative to competing items	1	2	3	4	5	6	7
18. This item had a lower cost relative to competing products	1	2	3	4	5	6	7

D. Participation in the supplier's new product development process:

For each stage of your supplier's new product development process described below, rate the level of participation of all personnel in *your firm* in that stage in terms of ***communication*** with the supplier using the communication methods listed:

	None at all						A great deal
1. Idea generation – prior to actual design being performed							
• face-to-face	1	2	3	4	5	6	7
• phone	1	2	3	4	5	6	7
• postal/express mail	1	2	3	4	5	6	7
• e-mail	1	2	3	4	5	6	7
• other electronic means	1	2	3	4	5	6	7
2. Design – prototype or concept development							
• face-to-face	1	2	3	4	5	6	7
• phone	1	2	3	4	5	6	7
• postal/express mail	1	2	3	4	5	6	7
• e-mail	1	2	3	4	5	6	7
• other electronic means	1	2	3	4	5	6	7
3. Testing – of a prototype or sample							
• face-to-face	1	2	3	4	5	6	7
• phone	1	2	3	4	5	6	7
• postal/express mail	1	2	3	4	5	6	7
• e-mail	1	2	3	4	5	6	7
• other electronic means	1	2	3	4	5	6	7
4. Introduction – launch to the market							
• face-to-face	1	2	3	4	5	6	7
• phone	1	2	3	4	5	6	7
• postal/express mail	1	2	3	4	5	6	7
• e-mail	1	2	3	4	5	6	7
• other electronic means	1	2	3	4	5	6	7

Next page, please ⇨

Rate the extent to which you agree with each statement as it applies to *your level of participation in your supplier's new product development process for this item*:	Strongly disagree						Strongly agree
1. This supplier interacted with us beyond the norm for a simple change	1	2	3	4	5	6	7
2. The duration of joint work was long	1	2	3	4	5	6	7
3. Frequency of meetings with the supplier was high	1	2	3	4	5	6	7
4. A high number of persons from our company were involved	1	2	3	4	5	6	7
5. The intensity of our interaction with the supplier was high	1	2	3	4	5	6	7
6. The number of our departments involved was high	1	2	3	4	5	6	7
7. The supplier relied on us to help define and clarify our needs	1	2	3	4	5	6	7
8. We tried out this item very early in the supplier's development process	1	2	3	4	5	6	7
9. This supplier put a working prototype in our hands early in the development process	1	2	3	4	5	6	7
10. We provided feedback to this supplier on early production versions of this item	1	2	3	4	5	6	7

E. Availability of alternate sources of supply:

Rate the extent to which you agree with each statement as it applies to the supply situation for the new product application:	Strongly disagree						Strongly agree
1. There were few potential suppliers from whom we could have sourced this item	1	2	3	4	5	6	7
2. There were hardly any other suppliers who were qualified to supply this item	1	2	3	4	5	6	7
3. We had limited choices among alternate suppliers who could have supplied this item	1	2	3	4	5	6	7
4. There was very little competition among suppliers to supply this item	1	2	3	4	5	6	7

F. *Overall relationship* between the supplier firm and your firm:

1. Circle the number that best represents the length of time your firm has been doing business with this supplier:
   0-3 mo. 4-6 mo. 7-12 mo. 1-2 yr. 3-5 yr. 6-10 yr. 11+ yr.
2. For the three statements below, circle the number that best describes your overall level of satisfaction with the supplier firm:

Dissatisfied	1	2	3	4	5	6	7	**Satisfied**
Displeased	1	2	3	4	5	6	7	**Pleased**
Unfavorable	1	2	3	4	5	6	7	**Favorable**

3. Rate the extent to which you agree with each statement as it applies to the relationship your firm has with the supplier firm:	Strongly disagree						Strongly agree
• This supplier can be relied on to keep promises it makes to our firm	1	2	3	4	5	6	7
• This supplier is trustworthy	1	2	3	4	5	6	7
• We believe the information that this supplier provides us	1	2	3	4	5	6	7
• This supplier is genuinely concerned that our business succeeds	1	2	3	4	5	6	7
• When making important decisions, this supplier considers our welfare as well as its own	1	2	3	4	5	6	7
• We trust this supplier to keep our best interests in mind	1	2	3	4	5	6	7

Over for final page, please ⇨

	Strongly disagree						Strongly agree
• There are times when we find this supplier to be a bit insincere	1	2	3	4	5	6	7
• We find it necessary to be cautious when dealing with this supplier	1	2	3	4	5	6	7
• We expect our relationship with this supplier to continue for a long time	1	2	3	4	5	6	7
• Renewal of our relationship (contracts) with this supplier is virtually automatic	1	2	3	4	5	6	7
• It is unlikely that our firm will still be doing business with this supplier in 2 years	1	2	3	4	5	6	7

G. Your own <u>business unit</u>:

1. Please indicate your level of agreement with each of the following statements:	Strongly disagree						Strongly agree
• Technical innovation, based on research, is readily accepted in this business unit	1	2	3	4	5	6	7
• Management actively seeks innovative ideas	1	2	3	4	5	6	7
• Innovation is readily accepted in program/project management	1	2	3	4	5	6	7
• People are penalized for new ideas if they don't work	1	2	3	4	5	6	7
• Innovation is perceived as too risky and is resisted in this business unit	1	2	3	4	5	6	7

2. Rate your business unit's performance over the past 3 years in each of the following areas:	Well below Industry average						Well above Industry ave.
• Market share growth	1	2	3	4	5	6	7
• Sales growth	1	2	3	4	5	6	7
• Average return on investment	1	2	3	4	5	6	7
• Average profit	1	2	3	4	5	6	7
• Profit growth	1	2	3	4	5	6	7

3. Briefly describe the products for your business unit: |_____

4. Please indicate your estimate of the number of employees in your business unit: |_____

5. Indicate (circle) your estimate of the annual sales of your business unit:

a) Less than $250,000 b) $250,000 - $1 Million c) $1 Million - $10 Million

d) $10 Million - $100 Million e) $100 Million or More

Please fold and place in the postage paid return envelope.

(Please enclose a business card if you would like a summary of the results of this study)

Thank you for your participation.

APPENDIX C:

INSTITUTIONAL REVIEW BOARD APPROVAL

IRB Approval Form

Oklahoma State University
Institutional Review Board

Protocol Expires: 6/26/02

Date: Wednesday, June 27, 2001 IRB Application No BU0118

Proposal Title: THE DETERMINANTS OF NEW PRODUCT ACCEPTANCE IN INDUSTRIAL CHANNELS

Principal Investigator(s):

E. Scott Cragin
3950 E. Newman Rd
Joplin, MO 648011595

Gary Frankwick
312 College of Business
Stillwater, OK 74078

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved *

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive Secretary to the IRB, in 203 Whitehurst (phone: 405-744-5700, sbacher@okstate.edu).

Sincerely,

Carol Olson, Chair
Institutional Review Board

*NOTE: Please include in the cover letter the IRB contact person, Sharon Bacher, 203 Whitehurst, 405-744-5700.

VITA

Evan Scott Cragin

Doctor of Philosophy

December 2003

Thesis: THE DETERMINANTS OF NEW PRODUCT ACCEPTANCE IN INDUSTRIAL CHANNELS

Major Field: Marketing

Minor Field: Total Quality Management

Biographical:

Personal Data: Born in West Point, New York on April 16, 1959.

Education: Graduated from Memorial High School, Joplin, Missouri in May 1977. Received Bachelor of Science degree in Mechanical Engineering from Rose-Hulman Institute of Technology, Terre Haute, Indiana in May 1981. Received Master of Management degree with concentrations in marketing, finance, and policy from the J.L. Kellogg Graduate School of Management at Northwestern University, Evanston, Illinois in May 1987. Completed the requirements for the Doctor of Philosophy degree in Business Administration at Oklahoma State University in December 2003.

Experience: Employed as a mechanical engineer by Amoco Oil Company in Chicago, Illinois from 1981 to 1985. Employed as a management trainee by Criton Technologies of Bellevue, Washington from 1987 to 1989. Since 1989 has been employed as an instructor and assistant professor at Missouri Southern State University in Joplin, Missouri.

Professional Memberships: American Marketing Association, Academy of Marketing Science, Society for Marketing Advances, American Society for Quality.