Effect of the interfunctional climate on internal and external new product performance. The moderator role of innovation type

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Abstract:

This study examines the influence of the organizational climate in the marketing–R&D relationship during the new product development (NPD) process on new product performance. Two key variables—trust and interfunctional integration—serve to measure this interfunctional climate. This article distinguishes between internal and external success, such that three dimensions—"met cost goals," "met time goals," and "product advantage"—represent dimensions of internal success, whereas a market dimension represents external success. Furthermore, this research determines whether the type of innovation, in terms of newness, moderates relationships among these variables. According to surveys of R&D directors from 178 innovative Spanish firms that introduced 345 products, (1) trust is positively associated with interfunctional integration; (2) firms in which interfunctional integration exists obtain better cost, time, and product performance; (3) each dimension of internal success is positively associated with greater market success; and (4) newness moderates the intensity of the positive association between the met time goals and market success variables.

Key words: interfunctional integration, trust, internal performance, external performance, newness

1. Introduction

Innovation represents one of the most important sources of competitive advantage for organizations. Aware of the relevance of new product development (NPD), various researchers analyze the factors that contribute to the success of such a process and thus identify a wealth of determinants, including process, strategic, environmental, and organizational (Henard and Szymanski, 2001; Montoya-Weiss and Calantone, 1994; Pattikawa et al., 2006). Because developing new products requires a multidisciplinary process, most recent works study "interfunctional integration" as one of the determinants of new product performance, understood as the cooperation and communication among different areas involved in the innovation process, especially marketing and R&D.

However, these two dimensions likely are not the only variables that constitute the interfunctional climate that affects innovation performance; for example, the relationship between marketing and R&D may be characterized by the presence of other, more affective factors. According to relationship marketing theory, trust represents one of the most relevant relational variables, so an analysis of the interfunctional climate and its effects on performance might be stronger if it considers trust as a determinant of cross-functional integration. Therefore, the first objective of this research is to analyze the influence of the organizational climate that exists between marketing and R&D during the NPD process on the successful operational execution of the project (internal performance in terms of cost, time, and product advantage), as well as how this internal performance affects the results achieved by the new product in the market (external performance). We measure organizational climate using two basic constructs: interfunctional integration and trust.

Furthermore, some of the relationships among these variables probably are moderated by the type of innovation, because the uncertainty and task complexity related to the development process varies depending on the nature of the innovation (i.e., radical or incremental). Previous evidence shows that more complex tasks call for more cooperation and coordination among the team members (Akgun et al., 2005), so the role of interpersonal trust should be more relevant in fostering interfunctional integration. Moreover, the type of innovation likely moderates the relationship between internal and external new product success, because firms face different degrees of internal and environmental uncertainty, depending on a product's newness. External success probably depends more on the successful internal operational execution of those new products that are new to the firm but not to the market. With such products, the lower market uncertainty means success depends less on environmental factors. In contrast, because internal uncertainty is high, the degree to which the firm achieves cost, time, and product performance will affect its final market success. Thus, the second objective of the study involves determining whether the type of innovation influences the intensity of the relationships of (1) trust and interfunctional integration and (2) internal new product performance and external new product performance.

The study is structured as follows: First, we provide an overview of new product performance and interfunctional integration literature, in combination with relationship marketing literature, to conceptualize the basic constructs of our research. Second, we describe the possible moderating effect of type of innovation. Third, we explain the methodology we used to conduct the analysis and discuss the empirical results. Fourth, we

comment on some conclusions from this study, as well as the main limitations and possible lines of further research.

2. New product performance

Performance remains an outstanding topic of innovation literature. Although the multidimensional nature of performance cannot be questioned (Griffin and Page, 1993, 1996; Hart, 1993), there is little consensus about the most appropriate way to measure it. Specifically, three confusing aspects emerge.

First, different management approaches use different indicators. As Blindenbach-Driessen et al. (2005) point out, marketing literature on innovation considers the relationship between the organization and the market and assesses new product performance from an external perspective, focusing on the achievement of market objectives. In contrast, operations management literature emphasizes the use of operative measures that assess the development effort from an internal perspective, such as development time or achieving cost objectives.

Second, a lack of consensus marks the grouping of such indicators. Most studies consider a classification based on different potential outcomes of the development process. For example, Cooper and Kleinschmidt's (1987) work identifies three dimensions of a new product performance: *financial, market impact* (which refers to the superiority of the product and the extent to which it offers benefits not provided by the competitors), and the so-called *opportunity window* (if the new product opens a new business opportunity for the firm), whereas Griffin and Page (1996) distinguish three other dimensions: *financial* (achievement of financial objectives), *customer acceptance* (degree of customer acceptance), and *product* or *technical* (degree of suitability). Huang et al. (2004) obtain four key success dimensions: *financial*, *objective market acceptance* (financial measures of consumer acceptance and satisfaction), *subjective market acceptance* (perceptual measures of consumer acceptance and satisfaction), and *product* or *technical* (contribution to technical success).

However, other recent works adopt an alternative viewpoint when they group the performance dimensions (Alegre et al., 2006; Blindenbach-Driessen et al., 2005; Tatikonda and Montoya-Weiss, 2001; Valle and Avella, 2003). These latter studies distinguish two basic performance dimensions, project (or *internal*) and market (or *external*) success, in an attempt to combine different management approaches. The internal success measure reflects the effectiveness of the NPD process and agglutinates indicators traditionally related to project

management, such as time, development costs, or the degree of product superiority (Valle and Avella, 2003), whereas external success refers to the commercial result of a development project and thus reflects financial performance and the degree of acceptance and satisfaction perceived by consumers of a new product (Blindenbach-Driessen et al., 2005). However, with few exceptions (Blindenbach-Driessen et al., 2005; Tatikonda and Montoya-Weiss, 2001), these works consider the dimensions at the same level, without analyzing the relationship that may exist between them.

An in-depth analysis of these and other similar classifications reveals clearly that both perspectives—internal versus external success on the one hand, and the traditional approach on the other—are not incompatible. Thus, if we consider the three dimensions of Griffin and Page's (1996) study, one of the most widely acknowledged and cited works of the innovation literature, we find two consecutive levels of new product success: internal and external success. Specifically, the first two dimensions, financial and customer acceptance, represent the degree of external success attained by the new product in the market, whereas the technical dimension refers to the development process and thus to internal success. Moreover, we can expect a relationship between internal and external success (Blindenbach-Driessen et al., 2005; Tatikonda and Montoya-Weiss, 2001) because internal success cannot represent the final objective; rather, the final result stems from market success, and internal success provides a means to achieve market success.

Third, another conflicting aspect in existing literature focuses on the definition of the performance constructs and whether their measurement should use reflective or formative models (Bollen, 1989; Diamantopoulos and Winklhofer, 2001; Jarvis et al., 2003). Research on NPD usually employs reflective constructs, but an empirical study by Blindenbach-Driessen et al. (2005) shows that project success must be modeled as a formative construct. With regard to market success, their study does not offer conclusive results.

Although this discussion of the reflective versus formative character of new product performance probably will remain an open academic debate for the next few years, the Product Development and Management Association's (PDMA) Best Practices research (Griffin, 1997; PDMA, 2003) finds that the "best" companies are those that are good at all success dimensions, in support of the reflective perspective of performance.

Taking into account these contributions, we consider new product performance as a multidimensional construct composed of four basic dimensions: market, met cost goals, met

time goals, and product advantage. However, we maintain the dimensions as separate measures instead of grouping them together into only one factor, because we are studying the differential effects of organizational climate factors and innovation type on different dimensions of success. Furthermore, we distinguish between internal success and external success, such that the market dimension represents the external or market success of the new product, whereas the former three variables reflect internal success.

As we mentioned previously, external or market success is the final objective of any development process. It represents the commercial and financial performance of a new product in terms of both quantitative or financial indicators (e.g., achievement of objectives, benefits, sales, ROI) and those of a more qualitative or strategic character (e.g., possibility of strengthening the relationships with customers, customer acceptance of the product). Although previous research distinguishes conceptually between financial and market (qualitative) dimensions, it generally groups them both into one factor that represents the external success of the new product (Atuahene-Gima and Evangelista, 2000; Chen, Reilly and Lynn, 2005; Griffin, 2002; Sethi, 2000), because they are highly correlated.

External new product success is associated with new product internal success. Three dimensions of internal success in particular affect commercial performance: met cost goals, met time goals, and product advantage. The first dimension reflects the project's development cost, or the extent to which the firm has achieved its cost objectives (Griffin and Page, 1993, 1996). Previous research indicates that scaling product costs can contribute to the market failure of a new product (Schmidt and Calantone, 1998; Tatikonda and Montoya-Weiss, 2001), whereas achieving cost objectives positively influences the attainment of improved market performance, whether in terms of sales volume or perceived customer satisfaction (Tatikonda and Montoya-Weiss, 2001). High costs may limit a company's ability to position a new product at an acceptable price point for the target market, which in turn means lower–than-projected sales and lower short- and long-term profitability. Thus, we formulate as our first hypothesis:

> H1: The degree of achievement of cost goals during the NPD process is positively associated with greater success in the market.

The variables grouped into the "met time goals" dimension refer to the development time of the new products, that is, the completion of the development program on schedule. Development time usually is defined as the time elapsed from the beginning of new product

idea generation to market introduction (Langerak and Hultink, 2006). This indicator (or a similar one, development speed/time to market/speed to market, which refers to the ability to minimize the time it takes from the beginning of idea generation to market introduction) appears frequently in various research works, because shortening NPD cycle time has become a basic objective for most firms (Bayus, 1997) and a potential source of a sustainable competitive advantage in mature markets (Langerak and Hultink, 2005; Sherman et al., 2000).

Nevertheless, empirical evidence pertaining to the relationship between NPD cycle time and market success is mixed. Although several works indicate a positive relationship (Calantone and Di Benedetto, 2002; Calantone et al., 2003; Davis et al., 2002; Lynn et al., 1999a, 1999b; Tatikonda and Montoya-Weiss, 2001), others find no such relationship (Clark and Fujimoto, 1991; Droge et al., 2000; Griffin, 2002; Ittner and Larcker, 1997), and the latest findings suggest an inverted U-shaped relationship between development speed and new product profitability (Langerak and Hultink, 2006). Therefore, it seems that "speed is not desirable under all conditions" (Chen et al., 2005, p. 199), and as prior research has concluded, there are both advantages and disadvantages associated with being first (or faster) to market (Langerak and Hultink, 2006; Tatikonda and Montoya-Weiss, 2001).

However, we differentiate between the speed-to-market and met time goals concepts. Thus, though the effects of the former on market performance are mixed, due to the advantages and disadvantages associated with being a pioneer, the firm's ability to get to market with a new product at the time it wants to enter, regardless of whether that represents being first to market or not, is important to market success (Tatikonda and Montoya-Weiss, 2001). The firm determines the moment to enter the market on the basis of variables such as its forecasts of demand, growth, competitive activity, and other environmental and internal or operational factors. If the results of its strategic analysis are correct, developing the new product within the initially prescribed time limit should represent an important key to success. Therefore, following Chen et al. (2005) and Tatikonda and Montoya-Weiss (2001), we propose the following hypothesis:

> H2: The degree of achievement of time goals during the NPD process is positively associated with greater success in the market.

Finally, the product advantage dimension measures the extent to which the product offers the consumer greater quality or unique attributes in comparison with its main competitors. A superior product delivers unique benefits and superior value to customers,

meets technical performance and reliability standards relative to specifications (operational perspective), and also meets customers' expectations and evaluations of its value relative to its features, functionality, and performance (marketing perspective). A product's differential advantage thus becomes a key element of success (Cooper, 1999; Henard and Szymanski, 2001; Hultink and Hart, 1998; Langerak et al., 2004; Montoya-Weiss and Calantone, 1994; Song and Parry, 1996; 1997; Pattikawa et al., 2006; Tatikonda and Montoya-Weiss, 2001). Consequently, we formulate the following hypothesis:

> H3: The degree of achievement of product advantage during the NPD process is positively associated with greater success in the market.

3. Interfunctional integration and its determinants

3.1. The effect of interfunctional integration on new product performance

Creating new products requires a multidisciplinary process and the involvement of different functional units (Olson et al., 2001). To develop that process effectively, the functions must interact, exchange information, and collaborate closely (Griffin and Hauser, 1996). Thus, in recent decades, research has revealed a growing interest in cross-functional integration, particularly between R&D and marketing. Although difficult to delimit, cross-functional integration, according to Kahn (1996), requires a multidimensional definition that differentiates between two components: communication and cooperation.

Cross-functional communication (or "interaction" in Kahn's [1996] framework) refers to "the vehicle through which personnel from multiple functional areas share information that is so critical to the successful implementation of projects" (Pinto and Pinto, 1990, p. 201) through periodic exchanges of information among departments during different planned activities, such as meetings, seminars, or reports. Communication is especially relevant if the departments exchange information about consumer needs, technology, or competitive behavior, because the marketing–R&D interaction can prompt technologically sophisticated products that meet consumer needs (Ayers et al., 1997). To define cooperation, literature uses several terms, including coordination, collaboration, cooperation, and integration. However, these terms refer to a similar idea and use as a common denominator the concept of "joint behaviour toward some goal of common interest" (Pinto and Pinto, 1990, p. 204).

Existing evidence suggests a strong positive influence of cooperation among different functions on NPD performance (McDonough, 2000; Pinto and Pinto, 1990). However, several studies indicate that the mere existence of communication is insufficient to improve new

product performance (Fisher et al., 1997; Kahn, 1996; Maltz and Kohli, 1996). That is, communication represents a necessary but insufficient condition for new product success. Previous works note that the flows of communication among departments must translate into real cooperative activities to reinforce innovation performance. However, despite the predominant role of cooperation, communication is also necessary, because the frequent exchange of information among functional areas increases their cooperation (Kalafatis, 2000). The high correlation between communication and cooperation prompts most research works to group them together into an unique construct called "interfunctional integration" or "development integration" (Millson and Wilemon, 2002; Tessarolo, 2007).

We thus expect a positive association between interfunctional integration and the three dimensions of internal performance of a new product. Communication and cooperation may foster reduced total costs (Valle and Avella, 2003) because they avoid repetition and enhance coordination. Therefore,

> H4: Greater interfunctional integration is associated with better met cost goals performance.

Furthermore, interfunctional integration usually favors both the acquisition and dissemination of new information, which in turn initiates better time performance (Gupta and Wilemon, 1990; Tessarolo, 2007; Valle and Avella, 2003). Effective communication and other integration mechanisms, such as cross-functional teams or proximity, combined with the firm's ability to define clear objectives and a well-recognized development process strategy, make it possible to (1) overlap and compress the development phases, and thus speed up the process; (2) coordinate overlapped phases to avoid delays; (3) anticipate downstream development problems while they are still limited; and (4) stimulate team creativity to find original solutions to the problems that may arise during the development process (Tessarolo, 2007). Therefore,

> H5: Greater interfunctional integration is associated with better met time goals performance.

Finally, effective communication and cooperation between marketing and R&D should also encourage technologically sophisticated and differentiated products (Ayers et al., 1997; McDonough, 2000; Valle and Avella, 2003), because when they share information about consumer needs, technology, competitive behavior, or other environmental and technical factors, they increase the likelihood of a product advantage. In turn,

H6: Greater interfunctional integration is associated with better product advantage performance.

3.2. Trust as a determining factor of interfunctional integration

The interrelation of a firm's departments and functions extends beyond mere actions of cooperation and communication; other aspects of a social or relational nature also play outstanding roles. In particular, communication and cooperation appear in research that applies a recent and significant marketing development, namely, relationship marketing, which focuses fundamentally on interfirm relationships. However, the application of relationship marketing tools and concepts is not limited to external exchanges with final customers but can extend to other fields as well, including within-firm investigations (Morgan and Hunt, 1994), which prompts the conceptualization of internal marketing.

Internal marketing is "a planned effort using a marketing-like approach to overcome organizational resistance to change and to align, motivate and interfunctionally co-ordinate and integrate employees towards the effective implementation of corporate and functional strategies in order to deliver customer satisfaction through a process of creating motivated and customer orientated employees" (Rafiq and Ahmed, 2000, p. 454). Basically, it represents a philosophy for managing the organization's human resources from a relationship marketing perspective (Ahmed et al., 2003). The relevance of internal marketing rests on the idea that the company's employees directly affect the value that the company's external customers receive, as is particularly evident in the case of NPD, for which cross-functional coordination is vital.

Within the relationship marketing framework, trust constitutes an absolutely key variable (Coote et al., 2003; de Ruyter et al., 2001; Morgan and Hunt, 1994). Marketing research on trust generally centers on interorganizational relationships, especially distribution channels and supplier–buyer relationships, in which context trust indicates the firm's belief that another company will perform actions that result in positive outcomes for it and will not take unexpected actions that result in negative outcomes (Morgan and Hunt, 1994). Empirical evidence relates trust positively to both interfirm cooperation (McCutcheon and Stuart, 2000; Morgan and Hunt, 1994; Parker, 2000) and communication (Coote et al., 2003; de Ruyter et al., 2001; Morgan and Hunt, 1994).

With regard to intra-organizational relationships, though several authors underline the importance of trust in this field (Gupta and Wilemon, 1990; Song et al., 1996), a lack of

empirical support confirms its importance (Bstieler, 2006; Sivadas and Dwyer, 2000). In the context of an NPD process, trust can be defined as "the shared perception by the majority of team members that individuals in the team will perform particular actions important to its members and the individuals will recognize and protect the rights and interests of all the team members engaged in their joint endeavour" (Webber, 2002, p. 205). Some qualitative and case studies identify possible influences, but structured academic research pertaining to this topic is lacking, in that "studies that provide results on trust in new product development—as a byproduct only—mostly concentrate on case-based research or rely on anecdotal evidence…. Clearly, given the discussion about whether trust matters, more research is warranted at this point so as to shed light on how trust formation affects outcomes, such as partnership efficacy or project performance" (Bstieler, 2006, p. 58).

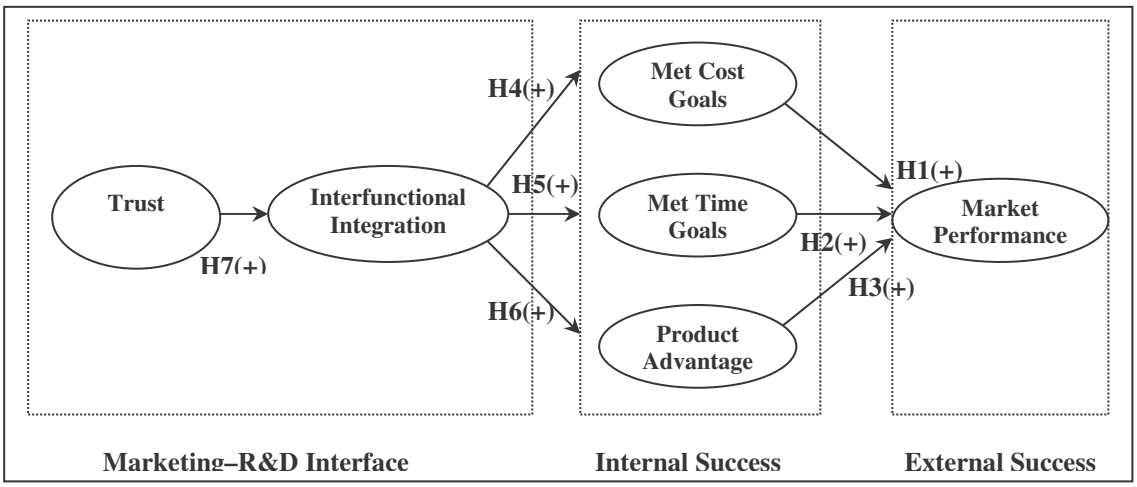
Despite of the lack of direct empirical evidence, some works imply an association between trust and interfunctional integration and consider its relevance in the NPD process. For example, recent work by Bstieler (2006) suggests that trust between partners (e.g., manufacturer and customer or supplier involved in conception, testing, production, or marketing of a new product) relates to positive outcomes such as perceived partnership satisfaction, continuity of the collaborative development process, financial success, and time efficiency. Although his research focuses on interorganizational partnerships, the results reveal the significant impact of trust on NPD processes. Therefore, the role of trust appears to goes beyond the relationships of a manufacturer and a customer or supplier to play an essential role in the relationship between marketing and R&D as well.

To attain a working environment with open communication, team spirit, and cooperation, trust represents a necessary basis (Webber, 2002). This requirement becomes especially relevant in the case of design and innovation development activities, which normally entail high levels of uncertainty. Employees who take part in NPD processes that contain trust are more willing to share ideas and relevant information or clarify problems (Bstieler, 2006; Jassawalla and Sashittal, 1998). Trust increases the quality of information exchanges and improves relationships between marketing and R&D (Gupta and Wilemon, 1990). Furthermore, when trust exists, participants are more inclined to ask for help and take risks with new and creative ideas generation, which provides a greater motivation to cooperate (Jassawalla and Sashittal, 1998). With high levels of interpersonal trust, the chances for knowledge transfer and sharing in the team increase (Akgun et al., 2005; Koskinen et al., 2003). In line with the previous arguments, we put forward the following hypothesis:

H7: Trust between marketing and R&D during a NPD process is positively associated with the degree of interfunctional integration between both departments.

Figure 1 shows the theoretical model we propose.

Figure 1. Theoretical model



3.3. The moderating role of the type of innovation

Some of these relationships may not always have the same intensity but instead vary according to the specific conditions. For example, one of the possible moderators of these relationships is the type of innovation associated with the NPD process.

Innovation literature usually employs the degree of newness of a product as a criterion to classify innovations. The classical and most often used typology of new products employs the definition provided by Booz, Allen and Hamilton (1982), which categorizes new products along two perspectives: newness to the market and newness to the developing firm. This classification distinguishes the following six categories of new products: (1) new to the world (products are new to both the firm and the market), (2) new product lines (new to the firm but not to the market), (3) additions to existing product lines (supplement established product lines), (4) improvements/revisions to existing products (provide improved performance or greater perceived value to customers and replace an existing product), (5) repositionings (existing products targeted to new markets), and (6) cost reductions (products provide similar performance as that of existing products but at a lower cost).

Previous studies in innovation literature also relate a product's newness to the concepts of uncertainty and complexity. As Avlonitis et al. (2001) indicate, uncertainty associated with really new products is much greater than in the case of incremental products, because as the degree of newness increases, the amount of relevant experience and knowledge

decreases, which then enhances the degree of uncertainty surrounding the project (Sethi, 2000). Moreover, radical projects imply more complex tasks, so evaluating alternatives requires more communication and cooperation among departments (Akgun et al., 2005). Hence, more uncertain and complex tasks demand higher interpersonal trust to foster cross-functional integration. In other words, in the case of radical innovations, in which communication and cooperation are more difficult to achieve as a result of the uncertainty and complexity involved, we expect that the impact of trust on the interfunctional integration between marketing and R&D will be greater than in the case of incremental innovations, when trust is not as necessary. Therefore, we hypothesize that

> H8: The positive association between trust and interfunctional integration grows stronger as product newness increases.

Furthermore, the relationships of cost performance, time performance, and product advantage performance with market success likely are moderated by interpersonal trust. A stronger association between each of the three dimensions of internal success and market success occurs when innovations entail an intermediate degree of newness. More radical innovations, or new-to-the-world products in Booz, Allen and Hamilton's (1982) terminology, are new to both the firm and the market and therefore involve the highest degree of uncertainty for the developing firm. Tatikonda and Montoya-Weiss (2001) predict that external uncertainties weaken the positive effects of successful operational execution on market outcomes. For example, even if cost objectives have been achieved, the development completed on schedule, and the product called a technical success from an internal viewpoint, market success is not guaranteed. New-to-the-world products are unknown to the market, which means their external success depends on other environmental and strategic factors, such as competitors' reactions, or the launch strategy in terms of segmentation, positioning, communication, and distribution.

In contrast, in the case of new product lines (new to the firm but not to the market), market uncertainty is lower because the firm has information about customer needs and expectations, so the degree to which the developing firm achieves its cost and time objectives and obtains a better technical product should have a greater impact on external performance (i.e., compared with new-to–the-world products, the external success of new product lines depends more on internal factors). For the remaining types of innovations (additions to existing product lines, improvements/revisions to existing products, repositionings and cost reductions), their incremental nature suggests that, compared with new product lines, internal

success will not have a significant influence on market performance. These types of new products are not really new to either the firm or the market, so internal and environmental uncertainty are lower. External success probably depends more (compared with new product lines) on the launch communication strategy or other appropriate marketing strategies, such as segmentation and market intelligence generation. Therefore, we propose:

> H9: The positive association between (a) met cost goals, (b) met time goals, and (c) product advantage and market performance is stronger when innovations are characterized by an intermediate degree of newness (i.e., new product lines) than for the other categories of new products.

4. Methodology

4.1. Data collection and sample design

The reference sectors for our empirical research include those usually considered innovative, namely, food, chemistry and plastic, iron and steel, metal, machinery and mechanical equipment, electrical, electronic and optical equipment, and transportation equipment. Using the SABI[1] database, we select 1600 firms that meet the following requirements: goods manufacturing firms in Spain that belong to any of the previously mentioned sectors, with sales volume greater than €10 million and at least 50 employees. Regarding these selection criteria, some comments are appropriate. First, literature on interfunctional relationships mainly focuses on the United States, so the analysis of other economies and countries represents an underresearched topic. Second, firms in the sample are medium and large companies, which more commonly contain structured marketing and R&D departments than do small companies. Therefore, medium and large-sized firms represent a more appropriate sample population. Because Spain belongs to the European Union, these limits follow the 2003/361/EC Recommendation of the Commission of the European Communities (2003).

The research conducted during the first semester of 2003 consisted of a mail survey of R&D department managers from the selected firms. Previously, in-depth interviews with managers of the marketing and R&D departments of six firms served as a pretest. The research approach focuses on individual new product projects, and the questionnaire asks R&D managers to think about two products, developed and commercialized recently, one successful and the other a failure, for which that manager had been at least partially responsible. Specifically, the interviewee evaluated the relationship his or her department had

maintained with the marketing department for both a successful and a failed product development. The final sample consists of 178 valid questionnaires (response rate of 11.1%) that describe 345 cases of new products, of which 177 (51.3%) are successful and 168 (48.7%) are failures. Using the procedure recommended by Armstrong and Overton (1977), we compare late with early respondents and find no significant differences between the two groups. Table 1 offers a description of the final sample obtained.

Table 1. Description of the sample firms

Sector	Sales (thousands of euros)	Number of employees
Food (25.8%) Chemistry and plastic (33.7%) Iron and steel, and metallurgic (19.2%) Machinery and mechanical equipment (2.8%) Transportation equipment (4.5%) Electrical, electronic and optical equipment (14%)	10,000 - 30,049 (10.1%) 30,050 – 60,101 (36.5%) 60,102 – 90,152 (18%) More than 90,152 (35.4%)	50 - 100 (7.3%) 101 - 500 (60.5%) 501 – 1,000 (20.3%) More than 1,000 (11.9%)

4.2. Measuring the model's variables

To measure the model's variables, we rely on multi-item scales derived from previous research, with the exception of the met cost goals dimension, which we measure with a single item. The Appendix provides these scales in full detail and the summary statistics. The variable measures employ reflective indicators, and all items use seven-point Likert-type scales, on which 1 means "completely disagree" and 7 indicates "completely agree." The type of innovation is evaluated on the basis of Booz, Allen and Hamilton's (1982) classic scale (see the Appendix). Similar to Langerak and Hultink (2006), we use a self-typing approach to measure the type of innovation, such that respondents assigned the selected new product to one of the six categories of Booz, Allen and Hamilton's (1982) typology. We employ a parallel-translation method, so the items were first translated into Spanish by one person and then translated into English by a second person. Both translators jointly reconciled any differences to provide a final version of the questionnaire in both Spanish and English.

The use of self-reported data and a single key respondent demands additional methods to alleviate possible common method bias. As Podsakoff et al. (2003) recommend, the questionnaire design includes a psychological separation between the organizational climate variables and performance indicators, created by the inclusion of other questions not related to the research objective. Specifically, managers evaluated the characteristics of the firm environment and described a set of procedural aspects related to the firm's innovation activities. The performance item measures appear at the end of the questionnaire, together

with the firm classification variables. Therefore, the questionnaire tries to avoid any direct connection between the measurement of the predictor and the criterion variables. Moreover, we implement three additional procedures to reduce method biases by (1) allowing respondents' answers to be anonymous; (2) assuring respondents that no right or wrong answers exist, so they should answer the questions as honestly as possible; and (3) carefully constructing the items to reduce item ambiguity, particularly through our pretest.

5. Results

5.1. Unidimensionality, reliability,y and validity of the model's scales

The psychometric properties of the model's scales appear in Table 2.

Table 2. Unidimensionality, reliability, and validity of the variables

Factor	Item	Loadings (t-value)	Reliability	AVE	Discriminatory Validity	
					Factor	Correlation Coef. (confid. intervals)
TRUST	TRUST1	0.78(14.94)	**0.898**	**0.688**	TRUST-INT	(0.777;0.869)
(TRUST)	TRUST2	0.87(20.92)	(0.897)		TRUST-PADV	(0.079;0.331)
	TRUST3	0.81(16.08)			TRUST-TIME	(0.315;0.511)
	TRUST4	0.85(19.30)			TRUST-MP	(0.260;0.464)
INTEGRATION	INT1	0.90(21.01)	**0.919**	**0.696**	TRUST-COST	(0.125;0.349)
(INT)	INT2	0.89(18.44)	(0.914)		INT-PADV	(0.106;0.350)
	INT3	0.84(19.25)			INT-TIME	(0.332;0.520)
	INT4	0.73(18.01)			INT-MP	(0.281;0.477)
	INT5	0.81(16.84)			INT-COST	(0.151;0.371)
PRODUCT ADVANTAGE	PADV1	0.82(10.96)	**0.764**	**0.618**	PADV-TIME	(0.095;0.335)
(PADV)	PADV2	0.75(11.85)	(0.755)		PADV-MP	(0.312;0.528)
					PADV-COST	(0.172;0.413)
					TIME-MP	(0.290;0.482)
MET TIME GOALS	TIME1	0.98(29.06)	**0.951**	**0.907**	TIME-COST	(0.344;0.553)
(TIME)	TIME2	0.92(24.84)	(0.951)		MP-COST	(0.475;0.675)
MARKET PERFORMANCE	MP1	0.89(38.64)	**0.956**	**0.783**		
(MP)	MP2	0.94(46.98)	(0.956)			
	MP3	0.95(29.06)				
	MP4	0.90(31.94)				
	MP5	0.78(20.14)				
	MP6	0.83(24.40)				
Goodness-of-fit measures						
S-Bχ^2(156)=364.93	**BBNFI**		**CFI**	**SRMR**	**RMSEA**	
p= 0.00	0.931		0.959	0.036	0.062	

Note: The reliability column shows the value of the composite reliability coefficient and, in brackets, the Cronbach's alpha values.

	Discriminatory Validity					
	TRUST	**INT**	**PADV**	**COST**	**TIME**	**MP**
TRUST	**0.830**					
INT	0.823	**0.834**				
PADV	0.205	0.228	**0.786**			
COST	0.237	0.261	0.292	**- - -**		
TIME	0.413	0.426	0.215	0.449	**0.952**	

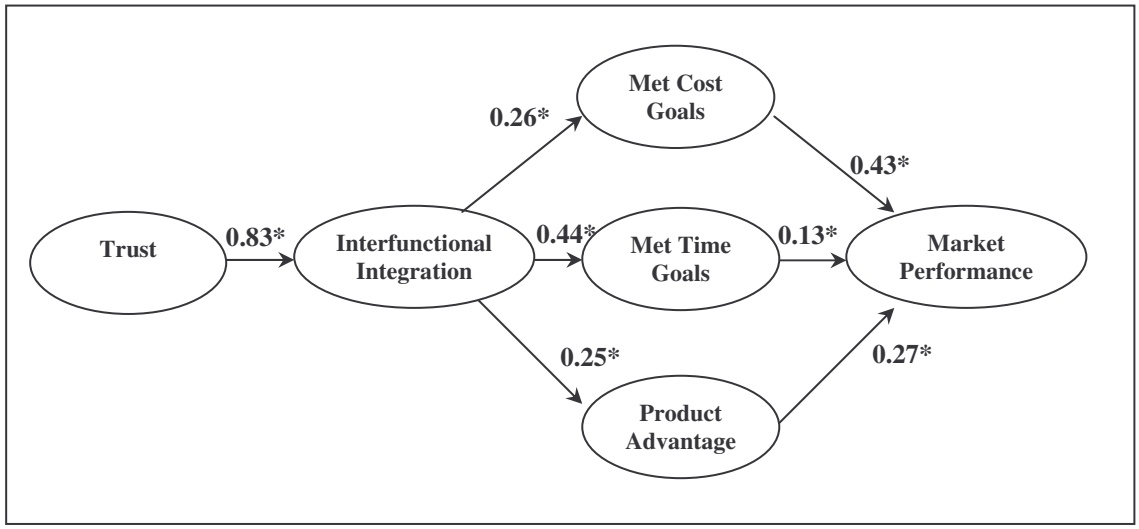
MP	0.362	0.379	0.420	0.575	0.386	**0.885**

Note: The values located on the diagonal are the square roots of the AVE coefficients of each of the six dimensions considered. Values located outside the diagonal are the correlations between each pair of dimensions

5.2. Estimation of the causal model

We evaluate H1–H7 with a structural equation analysis (Figure 2). As the indicators show, the goodness-of-fit measures are satisfactory (S-Bχ^2(161) = 380.54, p = 0.00; Bentler-Bonnet normed fit index [BBNFI] = 0.928; confirmatory fit index [CFI] = 0.957; square root mean residual [SRMR] = 0.071; root mean squared error of approximation [RMSEA] = 0.063). From these results, we can conclude that all seven direct hypotheses are fully supported. The three dimensions of internal performance—met cost goals (H1), met time goals (H2), and product advantage (H3)—are positively and significantly associated with market performance. Moreover, higher levels of effective interfunctional integration between marketing and R&D are significantly and positively related to cost performance (H4), time performance (H5), and product performance (H6). Finally, trust is highly associated with interfunctional integration (H7).

Figure 2. Interfunctional climate as a determining factor of a new product performance



* Relationship significant at 0.05.

Notes: S-Bχ2(161) = 380.54, p = 0.00; BBNFI = 0.928; CFI = 0.957; SRMR = 0.071; RMSEA = 0.063.

5.3. Type of innovation as a moderator

Multisample analysis using the EQS statistical package (Bentler, 1995) enables us to investigate the remaining hypotheses. We consider four of the six initial categories of Booz, Allen and Hamilton's (1982) typology, namely, new to the world, new product lines, additions to existing product lines, and improvements/revisions to existing products. Together, these four categories account for 92.46 percent of all new products in the sample

(Table 3), whereas the two remaining types of innovations (repositionings and cost reductions) represent too few examples to be included in the tests. In any case, our consideration of these four categories represents an extension of Langerak and Hultink's (2006) study, in which they analyze only additions to existing product lines and improvements/revisions to existing products.

Table 3. Distribution of the products according to their newness

Product Newness	Total (345)	%
New to the world	64	18.55%
New to the company	93	26.96%
Additions to existing product lines	118	34.20%
Improvements/revisions to existing products	44	12.75%
Repositioning	14	4.06%
Cost reductions	12	3.48%

To conduct the multisample analysis, we must proceed in two steps. The first step involves a multigroup solution, in which EQS derives parameters estimated for each group separately, together with a measure of the model's goodness of fit for the four groups simultaneously (Table 4). The goodness-of-fit levels of the multisample model are acceptable: S-B$\chi^2(20) = 39.002$, $p = 0.0067$; BBNFI = 0.931, CFI = 0.962, SRMR = 0.067, and RMSEA = 0.055. The second step consists of reestimating the model with the restriction that the regression coefficients must be equal in the four groups. The analysis then compares the value of χ^2 in step 2 with the solution without restrictions in step 1. The Lagrange multiplier test verifies whether the differences between the parameters of the four subsamples are significant (Table 5).

Table 4. Multisample analysis: step 1

Causal Relationship	Parameter (t-value)			
	Group 1 New to the world	Group 2 New to the firm	Group 3 Additions to existing product lines	Group 4 Improvements/ revisions
TRUST→ INT	0.772(13.322)*	0.764(9.283)*	0.839(16.105)*	0.583(4.251)*
PADV→ MP	0.155(1.567)	0.353(4.577)*	0.371(5.806)*	0.253(1.799)**
COST→ MP	0.574(5.979)*	0.404(5.081)*	0.415(6.117)*	0.378(2.541)*
TIME→ MP	0.020(0.197)	0.228(3.003)*	0.082(1.087)	0.062(0.427)

*Relationship significant at 0.05; ** Relationship significant at 0.1.
Notes: S-B$\chi^2(20) = 39.002$; $p = 0.0067$; BBNFI = 0.931; CFI = 0.962; SRMR = 0.067; RMSEA = 0.055.

Table 5. Multisample analysis: step 2

Restrictions	g.l.	Dif. χ^2	Probability	Sign.
Trust → Integration (Group 1 = Group 2)	1	0.045	0.832	Non Sig.
Trust → Integration (Group 1 = Group 3)	1	0.187	0.665	Non Sig.
Trust → Integration (Group 1 = Group 4)	1	2.112	0.146	Non Sig.
Product Advantage → Market (Group 1 = Group 2)	1	0.760	0.383	Non Sig.
Product Advantage → Market (Group 1 = Group 3)	1	1.346	0.246	Non Sig.
Product Advantage → Market (Group 1 = Group 4)	1	1.623	0.203	Non Sig.
Met Cost Goals→ Market (Group 1 = Group = 2)	1	0.411	0.522	Non Sig.
Met Cost Goals→ Market (Group 1 = Group = 3)	1	0.070	0.791	Non Sig.
Met Cost Goals→ Market (Group 1 = Group = 4)	1	2.323	0.128	Non Sig.
Met Time Goals → Market (Group 1= Group = 2)	**1**	**3.729**	**0.053**	**Sig.**
Met Time Goals → Market (Group 1= Group = 3)	**1**	**0.235**	**0.628**	**Non Sig.**
Met Time Goals → Market (Group 1= Group = 4)	**1**	**1.237**	**0.266**	**Non Sig.**

The intensity of the relationship between the met time goals dimension of internal success and market success is moderated by the type of innovation. When a new-to-the-world innovation emerges from the NPD process, the association between met time goals and market success is weaker than when a new product line innovation is the focus of the NPD process. Moreover, we find no significant differences between new to the world, additions to existing product lines, and improvements/revisions to existing products. These results support H9b; that is, completing the NPD program on schedule is especially relevant to market success when this success depends more on internal operative factors, such as when the firm faces lower environmental uncertainty because the innovation is not new to the market. The remaining relationships are not moderated by product newness.

6. Conclusions

This research makes three main contributions to innovation literature. First, we consider interfunctional trust as a determining factor of cross-functional integration in a pioneering attempt to analyze this topic in-depth, as several authors have requested. Some recent works , such as that by Bstieler (2006), examine trust formation in vertical NPD partnerships, but no structured academic research previously has analyzed the effects of internal trust between departments on interfunctional integration (communication and cooperation). We attempt to overcome this gap.

In so doing, we reveal the importance of developing a working environment based on trust to enhance cooperation and the frequent and open exchange of information among employees. This positive effect does not depend on the type of innovation. In addition, firms that enjoy interfunctional integration between marketing and R&D obtain better cost, time, and product performance for their projects. Such internal successes then are positively associated with greater market success.

Second, we provide an effective measure of new product performance, in which we not only take into account the different key dimensions of performance derived from previous literature but also consider them separately instead of grouping them into a second-order factor. Furthermore, we distinguish between internal and market success. This approach to measuring performance enables a more powerful analysis, because we can investigate in-depth the differential effects of interfunctional integration on each of the three internal success dimensions (i.e., cost, time, and product advantage), as well as the effect of each of these intermediate measures of performance on the final objective of a NPD process: market success.

Third, we highlight the relationships among these variables (trust, interfunctional integration, the three internal success dimensions, and market success) for different types of innovations. The classical typology of Booz, Allen and Hamilton (1982) serves as a moderator, and the results show that the intensity of the positive association between met time goals and market success depends on product newness. Specifically, it is stronger when a new product line is involved in the NPD process than it is for the remaining types of innovations.

6.1. Managerial implications

This research therefore has several implications for practitioners. In agreement with previous research, we confirm the relevance of cooperation and communication between marketing and R&D and highlight interfunctional integration as essential for obtaining stronger new product performance. Therefore, top managers must engage in practices that prompt departments to work together and exchange information so that each area is aware of the needs, resources and strengths, and weak points of the other. One way to do so is to conduct shared meetings, which facilitate open discussions and debates based on different viewpoints. Appreciating and rewarding cooperation and providing the participants with adequate education and training are also important means to foster interfunctional integration.

Top managers further must pay particular attention to the climate of trust in cross-functional relationships. When trust is low or has not been developed, interfunctional integration is more difficult to achieve, which makes successful operational execution less probable. In such circumstances, managers must listen to employees' problems and deal adequately with any conflicts that arise to resolve any discrepancies or tension. Managers must encourage trust among functional areas, perhaps through practices such as fostering the physical proximity of team members, ensuring team members' stability, using formal programs (e.g., training and seminar sessions) that develop better understanding, or encouraging personnel mobility among groups, which makes it possible to consider different perspectives. Moreover, contextual factors, such as procedural and interactional justice, may contribute to trust in an NPD context. Procedural justice refers to the extent to which decision-making procedures (rules, decisions, leadership) are judged as fair by those subjected to them. The latter form of justice relates to the quality of interpersonal treatment people receive from decision makers during the enactment of those procedures (respect, appropriate explanation and justification, honesty, fairness, respectfulness). Top management must be aware of the importance of encouraging these types of organizational justice.

6.2. Limitations and future research guidelines

Among the most important limitations of this work is our use of a single functional perspective: R&D departments analyzing their relationships with marketing departments. Moreover, though these areas play vital roles in developing new products, they are not the only functions involved in the process; areas like production also get involved. Another limitation pertains to the use of convenience sampling among medium and large-sized firms, which we chose to guarantee structured departments. Although most firms in the sample employ more than 100 persons and enjoy a sales volume greater than €30 million, Spanish medium and large-sized firms are small in comparison with worldwide standards (i.e., developed economies) in terms of both sales and number of employees. The smaller average size of Spanish firms may affect comparisons of our results and with those from other countries. Furthermore, our measure of the met cost goals dimension of internal success, which employs only one item, could be improved by developing a multi-item scale. Finally, other determining variables not included in the model might influence the interfunctional climate between marketing and R&D.

Further research therefore might focus on the joint consideration of both perspectives, marketing and R&D, and incorporate other points of view, such as production or firms of

different sizes and sectors. Moreover, a key issue for additional research should be an in-depth analysis of the relationships between internal marketing policies and organizational learning, as well as the relationships between these two constructs and organizational capacities, such as innovation.

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APPENDIX

TRUST Sources: Doney and Cannon (1997); Wilson and Vlosky (1998); Garbarino and Johnson (1999).
TRUST1= It was sincere and honest with us.
TRUST2= Its actions always met our expectations.
TRUST3= It fulfilled the promises made.
TRUST4= It was sincerely concerned about our interests.

INTERFUNCTIONAL INTEGRATION Sources: Pinto and Pinto (1990); Kahn (1996); Song et al. (2000).
INT1= Marketing and R&D helped each other to accomplish their tasks in the most effective way.
INT2= The departments tried to achieve goals jointly.
INT3= The departments shared ideas, information and/or resources.
INT4= The departments took the project's technical and operative decisions together.
INT5= There was open communication between the departments.

MARKET PERFORMANCE Sources: Cooper and Kleinschmidt (1987, 1995); Griffin and Page (1993); Varela et al. (1999).
MP1= The product achieved the economic profit goals established previously to its launching.
MP2= It accomplished the market share goals set previously to its launching.
MP3= The product has met our sales goals.
MP4= The product was a commercial success in comparison with its principal competitors.
MP5= The consumers appreciated this product's quality.
MP6= The product contributed to strengthen the relationships with customers.

MET COST GOALS Sources: Griffin and Page (1993).
COST=The product has met our cost goals.

MET TIME GOALS Sources: Swink (2000); Varela et al. (1999).
TIME1= The project complied with the expected temporal programming.
TIME2= The project was completed at the allotted time.

PRODUCT ADVANTAGE Sources: Song et al. (1997); Song and Parry (1997).
PADV1= This product had higher quality than competing products.
PADV2= Compared to our competitors, this product offered some unique features or attributes to the consumer.

PRODUCT NEWNESS Sources: Booz, Allen and Hamilton (1982).
NEW1=New to the world.
NEW2=New to the company.
NEW3=Additions to existing product lines.
NEW4=Improvements/revisions to existing products.
NEW5=Repositioning.
NEW6=Cost reductions.

[1] The SABI database on CD-ROM contains information about more than 190,000 Spanish firms. It allows the selection of a group of firms by combining different criteria such as location, activity, or employees.