Does Innovativeness Moderate the Relationship Between Cross-Functional Integration and Product Performance?

The authors examine the moderating effect of product innovativeness on cross-functional integration in Japanese and U.S. firms and test the contingency model with data from 788 Japanese and 612 U.S. new products. The results show that national culture affects integration patterns. Product innovativeness significantly moderates the integration–performance relationship in Japanese firms but not in U.S. firms. When developing highly innovative products, Japanese firms should increase the level of cross-functional integration in conducting technical activities (compared with marginally innovative products) but decrease the level of integration in conducting market analysis and launching activities. In U.S. firms, however, cross-functional integration has a similar effect for more and less innovative products. This may suggest the high cost of implementing a differentiated integration pattern in a strongly individualistic culture.

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Japan’s success in capturing a growing share of the global market for many high-technology products has attracted much attention from both academicians and practitioners. The widespread belief that Japanese firms place strong emphasis on cross-functional cooperation in their new product development (NPD) processes (e.g., Kodama 1995; Nonaka 1990; Song and Parry 1997a) has led to several recent empirical studies of Japanese high-technology firms that have found a positive relationship between new product program success and the integration of research and development (R&D) and marketing departments (e.g., Song and Parry 1997b; Song, Xie, and Dyer 2000). An important but less explored issue is the role of product innovativeness in cross-functional integration. To date, the literature has provided little empirical evidence whether Japanese managers adjust their cross-functional integration efforts to the innovativeness of new products.

Given that cross-functional integration simultaneously presents costs and benefits that vary with conditions, cross-functional integration may not work in all situations. Several recent studies have examined the moderating influence of some factors on the effectiveness of cross-functional integration in U.S. firms. For example, Olson, Walker, and Ruekert (1995) examine the effect of seven different coordi-
nation mechanisms in the NPD process on different types of products. Song, Thieme, and Xie (1998) empirically investigate patterns of cross-functional involvement among R&D, manufacturing, and marketing at different stages of the NPD process in U.S. firms. Other studies have suggested that the NPD process and/or integration–performance relationship differs with innovation strategies (Calantone and Di Benedetto 1990a, b; Griffin and Hauser 1996). Although these studies demonstrate the importance of identifying the conditions under which cross-functional integration is more or less effective, no studies have tested how product innovativeness may affect such integration in U.S. firms. Furthermore, to the best of our knowledge, no studies have directly compared the R&D–manufacturing–marketing (RMM) integration–performance relationship and the moderating effect of product innovativeness in Japanese and U.S. firms.

To fill the gap in the literature, we examine the moderating effect of product innovativeness on the effectiveness of RMM integration in Japanese and U.S. firms. We address the following questions:

1. Does every NPD activity need RMM integration?

2. Is the RMM integration–performance relationship the same for more and less innovative products?

3. Do Japanese and U.S. firms have the same effective integration patterns?

4. How might national culture influence the effectiveness of RMM integration in NPD?

To answer these questions, we examine RMM integration in three distinct sets of NPD activities: market analysis, technical, and launching. We address country effects explicitly by using data collected from 788 Japanese and 612 U.S. NPD projects to test a contingency model that (1) links new product performance to RMM integration in the three activities, (2) considers product innovativeness a potentially important moderator in the integration–performance relationship, and (3) conjectures that the nature of the integration–performance relationship varies across countries.

It is important to note that this study differs from Song and Parry's (1997b) study, which tests a model of the antecedents and consequences of product differentiation. Our objective is not to investigate the antecedents of product differentiation or the NPD process employed by U.S. and Japanese firms; it is rather to identify the right conditions for RMM integration in NPD. Furthermore, this is the first article that uses the third phase of the GLOBALTECH project data.
This article makes three contributions to the new product management literature. First, it examines RMM integration in three distinct sets of NPD activities and provides new information about its importance in these activities, whereas the existing literature typically has measured integration more inclusively. Second, it sheds new light on the RMM integration–performance relationship by testing the moderating effects of product innovativeness and by examining cross-country differences in this relationship. Third, it contributes to the international marketing literature. It is the first study that provides a large-scale, head-to-head comparison of the RMM integration–performance relationship in Japan and the United States.

These contributions are important for two reasons. First, the issue of cross-functional integration has become increasingly important because of the growing emphasis on creating customer value through NPD and teamwork. Cross-functional generation and dissemination of market and competitive information have been major components of the market orientation constructs that have occupied center stage in marketing research (e.g., Jaworski and Kohli 1993). In this article, we focus on three sets of managerially controllable NPD activities requiring RMM integration, and we give special attention to the possible moderating effect of product innovativeness on the integration–performance relationship. The findings of this research provide important insights on how to allocate integration efforts efficiently across the three major sets of NPD activities given a certain level of product innovativeness.

Second, understanding cross-national differences and similarities is extremely important in today's increasingly global business environment (Nakata and Sivakumar 1996). Firms in the United States face not only greater competition from foreign firms in technological innovation but also many new opportunities for international cooperation in developing and marketing new products. Understanding cultural influence on NPD will promote the cross-national transfer of valuable NPD management knowledge and help U.S. firms manage their overseas facilities and develop successful joint ventures with foreign firms. Our analysis is based on a large sample of historical NPD projects in Japan and the United States. These project-level data enable the assessment of the direct link between RMM integration and new product performance, and the large sample size from two countries increases the reliability of the findings. By comparing the integration–performance relationship in Japanese and U.S. firms, this study fills a gap in the literature and provides important managerial implications for both U.S. and Japanese managers.
The positive relationship between cross-functional integration and new product performance has been well established by both theoretical and empirical research (Calantone and Di Benedetto 1990a, b; Griffin and Hauser 1992; Olson, Walker, and Ruekert 1995; Song, Xie, and Dyer 2000; Souder 1987). Studies in market orientation have demonstrated that a firm’s performance is positively related to its effective cross-functional generation and dissemination of market and competitive information (Jaworski and Kohli 1993). Research in the cross-functional interface has also suggested that NPD success requires effective R&D—marketing integration (for a review, see Griffin and Hauser 1996). Because manufacturing is a critical functional area in the NPD process, we expect that as a general rule, the performance of a particular NPD project is improved when all three major functions involved in NPD—R&D, manufacturing, and marketing—are well interfaced and coordinated.

As in the cross-functional interface literature, RMM integration is defined here as effective unity of effort by R&D, manufacturing, and marketing in NPD (Griffin and Hauser 1996). The degree of integration refers to the degree of cross-functional interaction in generating and disseminating market and competitive intelligence (Jaworski and Kohli 1993), as well as the degree of cross-functional information sharing, coordination, and joint involvement in specific tasks (Ruekert and Walker 1987). Whereas previous research has measured the level of cross-functional integration inclusively, we develop new measures on the basis of our case study interviews with Japanese and U.S. executives and focus our study of RMM integration on three distinct sets of development activities. Therefore, RMM integration in market analysis activities refers to RMM integration in analyzing the potential competition and the needs of potential customers; RMM integration in technical activities refers to RMM integration in activities related to product design, testing, and manufacturing; and RMM integration in launching activities refers to RMM integration in commercializing the new product in the marketplace. On the basis of research suggesting that higher levels of cross-functional integration lead to higher levels of new product success, we expect to see a positive relationship between new product performance and RMM integration in all three sets of NPD activities (e.g., Song and Parry 1997a).

Our conceptual framework, presented in Figure 1, focuses on how the three RMM integration dimensions (i.e., market analysis activities, technical activities, and launching activities) influence new product performance. These dimensions were selected because, as we suggest in this article, they have been described in the literature as improving new product performance. The central premise of our model development is that a product’s innovativeness and the national culture in

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which it is developed moderate the RMM integration—performance relationship. Contingency theory suggests that a firm's procedures, strategies, and techniques for dealing with management problems—such as cross-functional team management—vary according to its particular circumstances (Olson, Walker, and Ruekert 1995). In our contingency view, new product performance depends on the congruence of RMM integration with the environments surrounding the development project, that is, product innovativeness (Olson, Walker, and Ruekert 1995) and national culture (Nakata and Sivakumar 1996). We discuss the contingency effects of these two moderators next.

Product innovativeness may affect the RMM integration—performance relationship in several ways. First, it may moderate the strength of that relationship. That is, a higher degree of product innovativeness may increase (or decrease) the effect of one factor on another. Second, product innovativeness may affect the necessary focus of the three RMM integration dimensions for a given project. For example, a higher level of new product performance may be achieved by emphasizing one particular area of RMM integration (e.g., technical activities) over another (e.g., market analysis activities) in more or less innovative projects.

Two theories have been offered to explain the possible moderating effect of product innovativeness: resource-dependency theory and information-processing theory. Resource-dependency theory asserts that perceptions of environmental uncertainty affect the degree of interdependence among the functions and the nature of their resulting interaction (Olson, Walker, and Ruekert 1995; Ruekert and Walker 1987). According to information-processing theory, NPD is an information-transfer process characterized by information acquisition and use for the purpose of reducing efficient task uncertainty. Given that a higher level of product innovativeness implies a higher level of external and internal uncertainty, both resource-dependency theory and information-processing theory suggest that as product innovativeness increases, so do functional interdependence and cross-functional information and resource exchanges among
the three functional areas in NPD activities. Thus, both theories support a general positive moderating effect of product innovativeness on the integration–performance relationship. In the following subsections, we develop our research hypotheses and provide further rationales for each of the hypothesized relationships.

**RMM Integration in Market Analysis Activities.** Highly innovative projects may require the collection of information about new customers; the analysis of different customer needs; and the development of new market research skills, new service capabilities, and new distribution and communication channels. Greater RMM integration in performing market analysis activities leads to a better understanding of customers and their needs, preferences, and potential for using the product. This knowledge helps guide engineering design and contributes to better technical development and manufacturing process designs. Information about customers, competitors, and manufacturing capabilities is essential in determining product features and specifications.

Because such information is equally valuable for other functional areas, increasing RMM integration in market analysis activities for highly innovative products becomes particularly important in ensuring an effective and timely generation and dissemination of market and competitive intelligence. This integration significantly reduces both marketing- and technical-related uncertainties in the NPD process, thereby improving a company's ability to develop a product that provides superior technical performance and meets consumers' needs. As product innovativeness decreases, however, so does the effect of RMM integration in market analysis activities on new product performance, because the consumer needs and market uncertainties of less innovative projects are often well known to all functional areas. Therefore,

\[ H_1: \text{The positive relationship between RMM integration in market analysis activities and new product performance will be stronger for more innovative products than for less innovative products.} \]

**RMM Integration in Technical Activities.** Integration of RMM in technical activities can increase marketers' understanding of technical development and manufacturing process designs. At the same time, marketers' knowledge about the market and the competition can be used to determine desirable features and specifications and thus improve the chances of developing a successful product. A high degree of involvement by marketing and manufacturing in technical activities can also minimize the need for costly redesigns and respecifications while maximizing the possibility of meeting customer needs.
Furthermore, RMM integration in technical activities can ease R&D’s task of designing and redesigning product features, manufacturing’s task of planning production schedules and reducing product costs, and marketing’s task of positioning and differentiating the product in the global marketplace.

The benefits of integration in technical activities may be expected to increase with the innovativeness of the product. This is because innovative products involve uncertainties about consumers needs, market potential, competitor reactions, and technical development and manufacturing processes. In part, these uncertainties arise because the firm’s experience base is less useful in developing innovative new products than it is in modifying an existing product (Olson, Walker, and Ruekert 1995). This technical and market uncertainty leads to greater uncertainty about the resources needed to create more innovative products. As a result, more innovative NPD projects may require more and quicker information exchange and cross-functional coordination (Olson, Walker, and Ruekert 1995). We thus posit that when product innovativeness is low, marketing and manufacturing have less influence on the outcome of technical activities, because there is less uncertainty about market needs and the manufacturing process. Formally,

\[ H_2: \text{The positive relationship between RMM integration in technical activities and new product performance will be stronger for more innovative products than for less innovative products.} \]

**RMM Integration in Launching Activities.** The positive association between RMM integration in launching activities and new product performance reflects the importance of RMM integration in establishing an overall direction for commercialization and in developing and implementing detailed product-launch programs. It also reflects the benefits of generating and disseminating accurate competitive and market intelligence (Jaworski and Kohli 1993), both for new product selection and for product introduction decisions. More innovative projects require greater information flow during the launch phase: from marketing to manufacturing (e.g., sales forecasts), marketing to R&D (e.g., product modifications), and R&D to marketing (e.g., product support services).

Our extensive case studies of Japanese and U.S. NPD projects show that the positive relationship between RMM integration in launching activities and new product performance partly owes to the process by which decisions about the development of innovative products are made. Decisions about when and how a highly innovative new product is to be introduced into or withdrawn from the marketplace are often made only after a consensus is reached among R&D, manu-
facturing, and marketing. Thus, in the development of more innovative projects, greater RMM integration in launching activities increases the likelihood that the new product will be positioned in the right market segments and introduced at an optimal time, thereby improving the chances of product success or minimizing financial loss. Therefore,

H₃: The positive relationship between RMM integration in launching activities and new product performance will be stronger for more innovative products than for less innovative products.

Cross-National Differences

So far, we have developed hypotheses regarding the moderating role of product innovativeness in the integration-performance relationship (H₁–H₃). Our conceptual framework, presented in Figure 1, also suggests that the effect of RMM integration on new product performance is moderated by national cultures, specifically those of Japan and the United States. A review of the literature provides relatively little theoretical or empirical evidence to justify the development of specific hypotheses about the differences between Japanese and U.S. firms. Following the “theories-in-use” approach described by Zaltman, LeMasters, and Heffring (1982), we conducted 36 extensive case study interviews with Japanese and U.S. firms to investigate possible rationales for cross-national differences in RMM integration-performance. The purpose of these interviews was to seek insights that may not emerge from a literature review. On the basis of a combination of these case studies of “theories-in-use” practices and the limited evidence we gained from the literature, we provide the following rationales for possible differences in the RMM integration-performance relationships of Japanese and the U.S. firms.

First, in the management literature, the concept of individualism versus collectivism often has been used to describe how national culture influences workplace dynamics (Hofstede 1980). Nakata and Sivakumar (1996) also suggest that national culture (specifically, individualism versus collectivism) moderates NPD management practices. Japanese culture generally has been described as collectivist, U.S. culture as comparatively individualistic. In a collectivist culture, there is stronger cohesion among group members as well as a stronger commitment to the group’s overall goals. One relevant aspect of collectivism is the need for the groups to reach consensus decisions. Although a high level of cross-functional consensus maintains group harmony, it also increases the time required to reach decisions. Because the implementation of cross-functional integration tends to be more time consuming in Japanese firms than in U.S. firms, Japanese firms may benefit more from adjusting the level of integration to a specific situation, such as the type of product under development.

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Second, our case studies and other anecdotal evidence in the literature suggest that the NPD process itself differs in Japan and the United States. Nonaka (1990) has described the Japanese NPD process as one of innovation and generation: Problems are generated, information is created, and continuous learning is induced in a fluid and iterative manner (see also Song and Parry 1997a). In an analysis of Japan’s technological advantage, Kodama (1995, p. 8) asserts that the most important factor in the Japanese NPD process is “the ability to convert demand from a vague set of distant wants into well-defined products.” This capability, termed “demand articulation,” is a two-step process: (1) the translation and integration of market data into a product concept and (2) the decomposition of the product concept into development projects. Kodama also claims that the practice in U.S. firms of pipeline progression—a step-by-step process of basic research, applied research, exploratory development, engineering, and manufacturing—is fundamentally unsuited to today’s technological environment. He concludes that the ability to articulate potential demand in “virtual markets” by means of effective cross-functional integration is higher in Japanese than in U.S. firms.

Our interviews with Japanese and U.S. new product managers reinforce Kodama’s (1995) assertion that Japanese firms apply the principles of demand articulation in the NPD process more often than do U.S. firms. Specifically, compared with U.S. firms, Japanese firms tend to (1) have a high degree of cross-functional and interfirm learning and therefore a greater capacity for absorbing new technologies from other industries and for detecting shifts in the marketplace, (2) have a long-term view of NPD programs and a long-term commitment to providing necessary resources for R&D and technical development, and (3) respond to the markets quickly by getting their product out, performing cross-functional evaluation of its market performance, and modifying it accordingly.

Although both Japanese and U.S. NPD programs aim to provide consumers with high value, Czinkota and Kotabe (1990) suggest that Japanese and U.S. firms view the relationship between cost reduction and quality improvement differently. For U.S. firms, these are contradictory, whereas for Japanese firms, they are parallel. Japanese new product programs emphasize creating value by simultaneously lowering cost and increasing quality. Thus, the Japanese NPD process may have a greater need for frequent communication and collaboration among R&D, manufacturing, and marketing functions, especially in the development of radical, often costly innovations.

Third, our in-depth case studies suggest that Japanese and U.S. firms differ in knowledge creation. Japanese firms tend to employ symbolism and other forms of figurative language to communicate holistic vision, mission, innovative culture,
and organizational knowledge. They often direct their technology development toward a collective company goal. Firms in the United States, in contrast, often seek to create knowledge by attempting to push technology toward the individual goals of the development project.

Finally, Japanese and U.S. NPD processes also differ in the functional area that leads the concept development process. Nonaka and Takeuchi (1995) suggest that the Japanese NPD process tends to be technology led (i.e., the engineering department’s planning section determines new product specifications), whereas the U.S. NPD process appears to be market led (i.e., the marketing department determines new product specifications). Our case studies also suggest that Japanese firms tend to increase the emphasis on cross-functional integration in technical activities when developing more innovative products. Because the roles of individual functional areas within the NPD process differ in Japanese and U.S. firms, the relative importance of RMM integration in each set of NPD activities may vary as well.

No one has yet directly compared the moderating effects of product innovativeness on RMM management practices in Japanese and U.S. firms. We believe that existing theories are insufficient to predict a priori the nature of cross-national differences in the contingency perspective of the integration–performance relationship. Although our two years of case studies may suggest some “theories-in-use” practices (Zaltman, LeMasters, and Heffring 1982), we choose to propose a general research question: How do the nature of the RMM integration–performance relationship and the moderating effects of product innovativeness differ in Japanese and U.S. firms? Answering this general question may lead to future theory development.

The original GLOBALTECH project sample design is as follows: From a list of 792 Japanese manufacturing companies traded on the Tokyo, Osaka, and Nagoya stock exchanges, we identified, through a presurvey, 611 Japanese firms that met the criteria of having developed and commercialized at least four new products since 1991. The U.S. sampling frame consisted of 643 firms listed in the Directory of High-Technology Industries that met the same criteria as in the Japanese sample. For the final survey, we selected a random sample of 500 firms from both countries with matching industry stratification. Before mailing the questionnaires, we promoted the study in trade association meetings, obtained appropriate endorsements from trade associations and business leaders, gained precommitments from the companies’ chief executive officers, and established personal contacts and a good relationship with the companies through the regular research reports we sent them.

**Methodology**

**Sample Design and Responses**

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In administering the survey, we followed the total design method for survey research (Dillman 1978). We followed the same procedure for both samples, with the exception that one instrument was in English and the other was in Japanese. We asked the contact person at each company to distribute the questionnaire to the project managers who were responsible for the two recently introduced new products. To increase the reliability of the responses, each project manager was then asked to seek consensus from more than two team members, if possible. To encourage participation, we signed a confidential agreement with each company, provided regular research reports, and offered them a certificate to attend an executive program at a significant discount. After four follow-up letters and innumerable personal contacts by telephone and fax, we received 788 usable questionnaires from 404 Japanese firms and 612 usable questionnaires from 312 U.S. firms. The effective company response rates were 81% for the Japanese sample and 62.4% for the U.S. sample.

The GLOBALTECH research design consisted of a multistage combination of extensive case studies and survey research. Because it is important to establish the comparability of data collected in different cultural contexts, we adapted Churchill's (1979) paradigm for developing measures of marketing constructs using a five-phase iterative procedure to develop the measurement scales.

To develop new measures of RMM integration, we conducted 36 in-depth case studies with 16 Japanese NPD teams and 12 U.S. NPD teams. We then refined these scales through in-depth interviews with individual team members and consultation with two panels of academic experts. We used two parallel translations/double translations to translate the questionnaire into Japanese. We pretested the final questionnaires twice using six Japanese MBA graduates, four experienced Japanese senior executives, and all the participants of the 36 case studies (a detailed description of the GLOBALTECH project, measurement development, and case studies is available on request from the authors).

The data used in this study came from the third phase of the GLOBALTECH project. It is important to note that Song and Parry's (1997a, b) articles examined the determinants of NPD success and used the first phase of the GLOBALTECH project data. Although the data from the third phase were not part of Song and Parry's data, we extended their work, closely followed their approach, and collected new data on the cross-functional integration of the R&D, manufacturing, and marketing functional areas.

The measures used to capture the constructs came from a variety of sources. Respondents answered all questions using

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**Instrument Development**

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**Measures**

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an 11-point Likert-type scale. Appendix A offers a description of the measurement items used in this study.

New product performance was measured by a five-item scale. The five items elicited the respondent’s perception of (1) the product’s overall profitability compared with the firm’s objective for the product (one item), (2) the product’s success in terms of market share compared with the firm’s other new products (one item), (3) the product’s success in terms of market share and profit compared with competitive products (two items), and (4) the product’s success in terms of profits compared with the firm’s objectives (one item).

The use of a subjective scale for new product performance might be criticized for allowing the same product to be scored a success (above or far above expectations) by one firm and a failure (below or far below expectations) by another firm. For example, a small firm may have a lower return on profit expectation than a large firm. However, this phenomenon is an artifact of real-world differences between firms and situations rather than a defect of the scale. As suggested by both U.S. and Japanese managers during our in-depth case studies and focus group interviews, the perceived performance measurement scale appropriately captures the perceptions underlying the respondents’ decision-making processes. An advantage of this scale is that it also enables comparisons across firms based on each project team’s assessments within the context of its own particular industry, culture, time horizon, economic conditions, and expectations. The validity and operationality of these types of scales have also been reaffirmed in other studies (Calantone, Schmidt, and Song 1996; Song and Parry 1997a, b). Similar subjective scales have been used extensively in the new product literature, and many recent marketing studies also use subjective measures of performance (e.g., Jaworski and Kohli 1993). Moreover, we have collected market share and return on investments for approximately 65% of the original sample. We performed a correlation analysis and found that the correlations between the objective and subjective performance variables in the subsample exceeded .75, which further justifies the use of the subjective measurements in this study.

Song and Parry (1999) define product innovativeness as the level of a product’s newness to the firm that develops the product and to the marketplace. They suggest that the construct is a subcomponent of the “product differentiation” construct developed by Song and Parry (1997b). Consistent with Song and Parry (1999), we use their previous (1997b) second component of product differentiation to examine the moderating effect of product innovativeness on cross-functional integration. The scale consists of seven items that as-
sess the innovativeness of a product's technology to the market and to the firm, the effect of the product on the industry, and the newness of the product's class and its manufacturing and R&D processes to the firm.

The measure RMM integration in market analysis activities is a company's RMM integration in conducting several activities: (1) analyzing the potential competition and the needs of potential customers (two items), (2) visiting potential major customers to understand their needs and concerns (one item), and (3) conducting a preliminary market assessment and detailed market research (two items).

We assessed RMM integration in technical activities using a six-item scale that measures a company's degree of RMM integration in conducting the following technical activities: (1) preliminary engineering, technical, and manufacturing assessments; (2) prototype/sample testing; (3) pilot production/trial production; (4) determination of the desired product features and their design feasibility; (5) determination of final product design and specifications; and (6) detailed plans for manufacturing.

We measured RMM integration in launching activities using three items that assessed the degree of RMM integration in (1) completing detailed plans for marketing, (2) establishing the overall direction of product commercialization, and (3) launching and introducing the product (i.e., selling, promoting, and distributing).

We performed confirmatory factor analysis to evaluate the measures used for the three integration constructs. As Appendix B indicates, for both the Japanese and the U.S. samples, all measures demonstrated acceptable levels of unidimensionality, reliability, and discriminant validity.

To examine the moderating effect of product innovativeness and national culture, we used ordinary least squares regression with a dummy variable (for country) and a continuous variable product term (for innovativeness). To reduce multicollinearity problems, we mean-centered all the independent and dependent variables in the regression models as Jaccard, Turrisi, and Wan (1990) suggest. We define C as a dummy variable representing country, where C = 0 for Japan and C = 1 for the United States. We applied the following regression model to our data:

\[
\text{(1) } \text{NPP}_i = \beta_0 + \sum_{k=1}^{3} \beta_k \text{RMM}_{ik} + \sum_{k=1}^{3} \alpha_k \text{PI}_i \text{RMM}_{ik} + \lambda \text{PI}_i \\
+ C \sum_{k=1}^{3} \gamma_k \text{RMM}_{ik} + C \sum_{k=1}^{3} \phi_k \text{PI}_i \text{RMM}_{ik} + \mu C + \epsilon_i,
\]

**ANALYSIS AND RESULTS**

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where $NPP_i$ is the new product performance of Project $i$; $RMM_{ik}$, $k = 1, 2, 3$, is the level of RMM integration in the three types of NPD activities of Project $i$ (1 for market analysis activity, 2 for technical activity, and 3 for launching activity); $P_i$ is the level of product innovativeness of Project $i$; and $\epsilon_i$ is the error term. In Equation 1, $\beta_k$ represents the main effect of RMM integration on new product performance, $\alpha_k$ represents the moderating effect of product innovativeness, $\gamma_k$ represents the culture influence on the main effect, and $\phi_k$ represents the culture influence on the moderating effect of product innovativeness. Following the procedure of regression with interaction effect (Jaccard, Turrisi, and Wan 1990), we also include $P_i$ and $C$ in the model as independent variables.

To examine the significance of interaction effects, we performed hierarchical regression analysis (Jaccard, Turrisi, and Wan 1990). We first ran the model without the moderating effect of product innovativeness and later with interaction terms, $\sum_{k=1}^{3} \alpha_k P_i RMM_{ik} + C \sum_{k=1}^{3} \phi_k P_i RMM_{ik}$, added. In Table 1, we present the results of the full model and show the statistical significance of adding the interaction terms (see note at Table 1). As shown in Table 1, comparing the reduced model (without moderating effect) with the full model gives an F value that is statistically significant at the .001 level. The results support our basic premise that product innovativeness influences the strength of the RMM integration on new product performance. Table 1 shows that the hypothesized contingency model explains 53% of the variance in new product performance.

When mean-centered data are used, “the unstandardized regression coefficient for the independent variable reflects its influence on the dependent variable at the average value of the moderator variable” (Jaccard, Turrisi, and Wan 1990, p. 34). Thus, the main-effect coefficients in Table 1 should be interpreted as the effect of the respective RMM integration constructs on new product performance when product innovativeness is at the mean level. To examine the hypothesized relationships and the cross-national differences, we used t-tests to test the equality of individual coefficients using the procedure provided in the SAS program.

Because the country dummy variable, $C$, is coded as zero for Japan and one for the United States, the main effects and the moderating effects shown in Table 1 represent the regression results of the Japanese sample (i.e., let $C = 0$ in Equation 1). The country effects in Table 1 indicate how U.S. firms differ from Japanese firms. Therefore, we obtain the regression results of the U.S. sample by adding the estimates in the Japanese sample and the estimates of the country effects (i.e., let $C =$
### Table 1. Results of Regression Analysis

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Dependent Variable: New Product Performance</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intercept</strong></td>
<td>−.01 (.07)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Main Effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>.17 (.03)</td>
<td>Yes**</td>
</tr>
<tr>
<td>RMMI in MA</td>
<td>.38 (.06)</td>
<td>Yes**</td>
</tr>
<tr>
<td>RMMI in TA</td>
<td>.41 (.06)</td>
<td>Yes**</td>
</tr>
<tr>
<td>RMMI in LA</td>
<td>.36 (.05)</td>
<td>Yes**</td>
</tr>
<tr>
<td><strong>Moderating Effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(RMMI in MA) × PI</td>
<td>−.05 (.03)</td>
<td>Yes*</td>
</tr>
<tr>
<td>(RMMI in TA) × PI</td>
<td>.13 (.03)</td>
<td>Yes**</td>
</tr>
<tr>
<td>(RMMI in LA) × PI</td>
<td>−.06 (.03)</td>
<td>Yes*</td>
</tr>
<tr>
<td><strong>Country Effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(RMMI in MA) × Country</td>
<td>−.09 (.09)</td>
<td>No</td>
</tr>
<tr>
<td>(RMMI in TA) × Country</td>
<td>.07 (.08)</td>
<td>No</td>
</tr>
<tr>
<td>(RMMI in LA) × Country</td>
<td>.05 (.08)</td>
<td>No</td>
</tr>
<tr>
<td>(RMMI in MA) × PI × Country</td>
<td>.03 (.04)</td>
<td>No</td>
</tr>
<tr>
<td>(RMMI in TA) × PI × Country</td>
<td>−.11 (.04)</td>
<td>Yes (Japan &gt; U.S.) **</td>
</tr>
<tr>
<td>(RMMI in LA) × PI × Country</td>
<td>.08 (.04)</td>
<td>Yes (U.S. &gt; Japan.) *</td>
</tr>
<tr>
<td>Country</td>
<td>.01 (.08)</td>
<td></td>
</tr>
<tr>
<td><strong>Full Model</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistics</td>
<td>F(14, 1385) = 111.18</td>
<td></td>
</tr>
<tr>
<td>Significance</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>.53</td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.52</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Table 1 presents results of the full model that includes both main effects and moderating effects. The difference of F-statistics between the main effect model and the full model is significant (change in F-statistics = 7.36, p < .001). The coefficient estimates are unstandardized estimates. The numbers in parentheses are the standard deviations. RMMI = RMM integration, MA = market activities, TA = technical activities, LA = launching activities, and PI = product innovativeness. A one-sided test was used for the main effect and the moderating effect; *p < .05 (t = 1.64) and **p < .01 (t = 2.57). A two-sided test was used for the country effect: *p < .05 (t = 1.96) and **p < .01 (t = 2.33).

1 in Equation 1). We determine the significance of the resulting coefficients in the U.S. model by examining their standard error (Jaccard, Turrisi, and Wan 1990). To highlight the cross-national differences in the moderating effect, we present the resulting moderating effects of product innovativeness of both Japanese and U.S. samples, along with their significance, in Table 2. We calculate the coefficients of the U.S. sample from $\sum_{k=1}^{3} (\alpha_k + \phi_k)PI_{RMMI_k}$ and test the significance of the resulting coefficients with the procedure provided in the SAS program.

We hypothesize that product innovativeness increases the positive effect of RMM integration on new product perfor-
Table 2. Main Effects and Moderating Effects in Japanese and U.S. Firms

<table>
<thead>
<tr>
<th>Effects</th>
<th>Japanese Sample</th>
<th>U.S. Sample</th>
<th>Cross-National Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RMMI in MA</td>
<td>.38**</td>
<td>.29**</td>
<td>No</td>
</tr>
<tr>
<td>RMMI in TA</td>
<td>.41**</td>
<td>.48**</td>
<td>No</td>
</tr>
<tr>
<td>RMMI in LA</td>
<td>.36**</td>
<td>.41**</td>
<td>No</td>
</tr>
<tr>
<td><strong>Moderating Effects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(RMMI in MA) x PI</td>
<td>-.05*</td>
<td>-.02 n.s.</td>
<td>No</td>
</tr>
<tr>
<td>(RMMI in TA) x PI</td>
<td>.13**</td>
<td>.02 n.s.</td>
<td>Japan &gt; U.S. **</td>
</tr>
<tr>
<td>(RMMI in LA) x PI</td>
<td>-.06*</td>
<td>.02 n.s.</td>
<td>U.S. &gt; Japan *</td>
</tr>
</tbody>
</table>

Notes: RMMI = RMM integration, MA = market activities, TA = technical activities, LA = launching activities, and PI = product innovativeness. For the main effect and the moderating effect: *p < .05 (t > 1.64) and **p < .01 (t > 2.33). For the cross-national difference: *p < .05 (t > 1.96) and **p < .01 (t > 2.57).

formance in all three sets of NPD activities: market analysis activities (H₁), technical activities (H₂), and launching activities (H₃). Table 1 shows that the Japanese sample supports H₂: The moderating effect of product innovativeness on the effect of RMM integration in technical activities is significantly positive (.13, p < .01). This suggests that the positive relationship between RMM integration in technical activities and new product performance is stronger for more innovative products than for less innovative products in Japanese firms.

Surprisingly, product innovativeness has a negative effect on the integration–performance relationship in both market analysis (−.05, p < .05) and launching (−.06, p < .05) activities. Note that both market analysis and launching activities traditionally are considered marketing’s domains. The two negative moderating effects found in Japanese firms suggest that RMM integration in these two marketing-related activities has a weaker impact on the performance of products with breakthrough innovations than on that of those with incremental innovations.

The country effects in Table 1 show that the moderating effect of product innovativeness on the effectiveness of RMM integration in technical activities is significantly lower (−.11, p < .01), but the effect in launching activities is significantly higher in U.S. firms than in Japanese firms (.08, p < .05). The result of these cross-national differences, as shown in Table 2, is that product innovativeness does not moderate the relationship between RMM integration and new product performance in U.S. firms.

The results in Table 2 suggest some important cross-national similarities. First, the main effect of RMM integration in all three sets of NPD activities is positive and significant in both Japanese and U.S. firms. These results confirm the importance of RMM integration throughout the process of develop-

**Discussion and Implications**

**Cross-National Similarities and Differences**

Michael Song and Jinhong Xie
ing new products with a moderate level of innovativeness in the two countries. Our results also demonstrate the importance of different types of cross-functional involvement in the two countries: technical involvement (R&D and manufacturing) in marketing-related activities (market analysis and launching activities) as well as marketing involvement in technical activities.

Second, neither the Japanese nor the U.S. sample supports a positive moderating effect of product innovativeness on the integration–performance relationship in market analysis activities and launching activities. This suggests that the involvement of technical people in marketing-related NPD activities does not necessarily contribute more to the success of more innovative products than to the success of less innovative products. On the one hand, product innovativeness increases the need for information about consumers. On the other hand, technological breakthroughs often lead to discontinuous innovations that are unfamiliar to consumers. More innovative products often open up new markets that are hard to predict on the basis of the needs of current consumers and market demand. For many successful radical innovations, the initial recommendations based on marketing research often lead to “no go” decisions (Song and Parry 1999). Therefore, a high degree of product innovativeness often involves less sophisticated consumers and less reliable marketing research (Song and Parry 1999). This may explain why product innovativeness does not strengthen the integration–performance relationship in marketing-related activities in both Japanese and U.S. firms.

The results in Table 2 also suggest some important cross-national differences. First, whereas product innovativeness has an insignificant moderating effect on the integration–performance relationship in the two sets of marketing-related activities in U.S. firms, its moderating effect is significantly negative in Japanese firms.

Second, in the Japanese but not the U.S. sample, product innovativeness has a positive moderating effect on the integration–performance relationship in technical activities. Research in organizational psychology and behavior has demonstrated that group decision contexts evoke strong forces for uniformity and conformity that cause people to tend toward agreement, regardless of the correctness of the group decision (for a review, see Nemeth and Staw 1989). A “groupthink” mentality increases with task difficulty and with ambiguity in the stimulus situation (Nemeth and Staw 1989). When developing really new products, involving marketing and manufacturing people in technical activities not only offers an opportunity to integrate diverse information and perspectives but also imposes more constraints on the

The Relationship Between Cross-Functional Integration and Product Performance

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product design. For example, because marketing people tend to have a shorter time horizon and focus on profits (Griffin and Hauser 1992), they may be more willing to compromise technological innovativeness for lower costs and shorter development cycle times. Thus, a higher level of RMM integration in technical activities may limit design creativity. This is harmful to more innovative products because creativity is an important dimension for their success. This is also more harmful if marketing people have higher status and more power. Because the Japanese NPD process is technology led and the U.S. process is market led (Nonaka and Takeuchi 1995; Song and Parry 1997b), marketing has a more influential role in U.S. firms than in Japanese firms (Song and Parry 1997c). Thus, in the development of more innovative products, the negative effect of cross-functional involvement in technical activities may be higher in U.S. firms than in Japanese firms. The insignificant moderating effect of product innovativeness on the integration–performance relationship in technical activities found in the U.S. sample suggests that the cost of a higher level of cross-functional involvement in technical activities offsets its benefit in U.S. firms.

Third, taking all three sets of RMM integration activities together, we observe very different patterns of effective RMM integration in Japanese firms and U.S. firms. Japanese firms should adopt a differentiated RMM integration pattern, varying the level of RMM integration in all three sets of NPD activities according to the level of product innovativeness. Firms in the United States, however, should adopt an undifferentiated RMM integration pattern, regardless of the product's innovativeness. In addition to the possible reasons for the insignificant moderating effect in U.S. firms discussed previously, this effect may also suggest that a strong individualist culture increases the cost of implementing a differentiated RMM integration pattern.

If a differentiated RMM integration pattern is adopted, different functional areas will not be equally involved in cross-functional activities. For example, in Japanese firms, the optimal allocation of RMM integration in developing breakthrough innovations is to increase marketing involvement significantly in technical activities but reduce technical involvement in the two sets of marketing-related activities. Such a variation in the level of cross-functional involvement may not be optimal for a given function in achieving its own objectives. Therefore, implementing such a differentiated integration pattern requires that the functions involved in NPD have shared goals and be willing to sacrifice individual or functional goals for the overall success of the firm. Japanese collectivist culture emphasizes group ideologies and seeks collective interests, thus promoting the implementation of a differentiated RMM integration pattern.
However, U.S. culture emphasizes individual goals and achievements. It is harder for U.S. than for Japanese managers to sacrifice their own objectives and to bear short-term loss for long-term, collective gains. A differentiated integration pattern may require more management involvement in resolving interfunctional conflicts and in coordinating the collaboration between functions. This suggests that even if U.S. NPD can gain from a differentiated integration pattern, the high cost of implementing such a pattern may offset that benefit.

Finally, to examine the differences in the current level of RMM integration between Japanese and U.S. firms, we split each sample into more and less innovative product groups on the basis of the mean value of product innovativeness in each sample. We present the mean values of RMM integration in the three sets of NPD activities for more and less innovative products in Table 3. We conducted multivariate analysis of variance to examine the differences in the current level of RMM integration in the three sets of NPD activities by country (the first half of Table 3) and by the type of projects (the second half of Table 3). It is interesting to see that currently, in developing more innovative product, Japanese firms have a higher RMM integration in market analysis and launching activities than U.S. firms. A high level of RMM integration in these activities implies the technical function’s close involvement in marketing decision making, perhaps because of the higher status of the technical function in Japanese firms.

Table 3 (the second half) also shows that Japanese firms currently vary their RMM integration effort on the basis of the level of product innovativeness (though not all in the directions suggested by our model), but U.S. firms do not.

The preceding discussion suggests several implications for both Japanese and U.S. managers. To demonstrate the potential usefulness of our findings, we first compare the actual RMM integration patterns in Japanese and U.S. firms with the normative integration patterns inferred from our data analyses. As mentioned previously, Table 3 shows the mean values of current Japanese and U.S. RMM integration in the three sets of NPD activities for more and less innovative products. Note that Table 3 simply shows how Japanese and U.S. firms currently allocate their integration efforts and does not link the allocation with new product performance. Thus, the results in Table 3 show what firms are currently doing. In contrast to Table 3, the results of the regression analyses given in Table 2 show how the level of RMM integration in the three sets of NPD activities affects new product success and how product innovativeness moderates the three integration-success relationships. Thus, the results in Table 2 tell us what firms should do.

Managerial Implications
Table 3. The Mean Levels of RMM Integration: The Current Practices

<table>
<thead>
<tr>
<th>RMM Integration</th>
<th>Less Innovative Projects</th>
<th>United States</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Japan (376)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market analysis activities</td>
<td>5.56 (1.79)</td>
<td>5.73 (2.19)</td>
<td>No difference</td>
</tr>
<tr>
<td>Technical activities</td>
<td>6.20 (1.60)</td>
<td>6.75 (1.93)</td>
<td>United States higher**</td>
</tr>
<tr>
<td>Launching activities</td>
<td>5.40 (1.92)</td>
<td>5.63 (2.48)</td>
<td>No difference</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RMM Integration</th>
<th>More Innovative Projects</th>
<th>United States</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Japan (412)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market analysis activities</td>
<td>6.06 (1.92)</td>
<td>5.68 (1.86)</td>
<td>Japan higher**</td>
</tr>
<tr>
<td>Technical activities</td>
<td>6.81 (1.86)</td>
<td>6.60 (1.93)</td>
<td>No difference</td>
</tr>
<tr>
<td>Launching activities</td>
<td>6.27 (2.35)</td>
<td>5.48 (2.27)</td>
<td>Japan higher**</td>
</tr>
</tbody>
</table>

Cross-Product Comparisons Within the Country

<table>
<thead>
<tr>
<th>RMM Integration</th>
<th>Less Innovative Projects (376)</th>
<th>Japan More Innovative Projects (412)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market analysis activities</td>
<td>5.56 (1.79)</td>
<td>6.06 (1.92)</td>
<td>More innovative products higher**</td>
</tr>
<tr>
<td>Technical activities</td>
<td>6.20 (1.60)</td>
<td>6.81 (1.86)</td>
<td>More innovative products higher**</td>
</tr>
<tr>
<td>Launching activities</td>
<td>5.40 (1.92)</td>
<td>6.27 (2.35)</td>
<td>More innovative products higher**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RMM Integration</th>
<th>Less Innovative Projects (303)</th>
<th>United States More Innovative Projects (309)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market analysis activities</td>
<td>5.73 (2.19)</td>
<td>5.68 (1.86)</td>
<td>No difference</td>
</tr>
<tr>
<td>Technical activities</td>
<td>6.75 (1.95)</td>
<td>6.60 (1.93)</td>
<td>No difference</td>
</tr>
<tr>
<td>Launching activities</td>
<td>5.63 (2.48)</td>
<td>5.48 (2.27)</td>
<td>No difference</td>
</tr>
</tbody>
</table>

Notes: The cell entries are the current mean values of RMM integration in the three sets of NPD activities for the respective sample; the numbers in parentheses are the standard deviations. More innovative (less innovative) projects: The level of the project's product innovativeness is greater (less) than the mean value of product innovativeness in the respective sample. Multivariate analysis of variance was conducted to examine the differences in the current mean levels of RMM integration in the three sets of NPD activities. For the main effect and the moderating effect: *p < .05 (t > 1.64), **p < .01 (t > 2.33). For the cross-national difference: *p < .05 (t > 1.96), **p < .01 (t > 2.57).
Table 3 (the second half) shows that, in Japanese firms, the current integration levels in all three sets of activities are significantly higher for more innovative products than for less innovative products. This suggests that Japanese firms currently increase their RMM integration efforts in all three NPD activities when developing more innovative products. Recall that the regression analyses reported in Table 2 suggest that, when product innovativeness increases, Japanese firms should emphasize RMM integration in technical activities but not in market analysis and launching activities. There is a deviation between Japanese firms' current practice and the integration pattern for Japan suggested by our data analyses.

The mean level of RMM integration in U.S. firms shown in Table 3 suggests no significant differences between the current levels of RMM integration for more and less innovative products in U.S. firms. This suggests that U.S. firms' current practice is consistent with our findings.

Our findings offer some guidance in product management. First, requiring cross-functional teamwork as a rule for all NPD activities may be counterproductive. The relative importance of cross-functional integration in each set of NPD activities may vary by type of product. For example, our findings suggest that Japanese NPD teams should vary their focus on RMM integration depending on the innovativeness of the project. For a product modification to succeed in Japan, a higher level of technical function involvement in marketing-related activities, but a lower level of RMM integration in technical activities, is optimal. This suggests that, when developing less innovative products, Japanese firms should promote the participation of technical experts in conducting marketing-related activities and then let them apply their “imported” market knowledge independently to design, test, and prototype the modified product. In the development of a breakthrough innovation in Japan, in contrast, the emphasis of cross-functional integration should be placed on the involvement of marketing and manufacturing in technical activities such as design, testing, and prototyping. The technical experts' involvement in marketing activities should be low.

Second, the targeted level of cross-functional integration in each set of NPD activities may need to vary according to the type of development project. For example, in Japanese firms, developing a highly innovative new product requires a significantly higher level of RMM integration in technical activities than modifying an existing product does. When Japanese firms develop a product that requires completely new technology and manufacturing processes, they should increase their RMM integration efforts in performing technical activities. Furthermore, in Japanese firms, developing a marginally innovative product requires a significantly higher
level of RMM integration in marketing-related activities than is required in the development of technological breakthroughs. When Japanese firms develop a product that modifies existing technology and manufacturing processes, they are advised to increase their RMM integration efforts in performing marketing-related activities.

Third, the effective integration pattern may vary in different countries. Our comparative study between Japanese and U.S. firms reveals two completely different effective integration patterns: a differentiated integration pattern in Japan and an undifferentiated integration pattern in the United States. The difference in the effective integration pattern between the two countries demonstrates the importance for U.S. managers of improving their understanding of national culture's effect on successful NPD practice. National culture determines the basic assumptions shared by people in a particular society, which in turn form the basis for their behavior in the workplace. Successful management practice depends on the particular culture in which organizations are located and cannot simply be copied from one nation to another. Understanding the Japanese national culture's effect on NPD practice is particularly important for U.S. managers, given the positive remarks on the success of Japanese cross-functional team practice that appear frequently in popular books on Japanese NPD management.

The empirical evidence based on 612 U.S. new product projects shows that the three sets of integration activities have similar impacts on NPD success for both more and less innovative products. This suggests that a balanced allocation of RMM integration effort across more and less innovative products is more effective in U.S. firms. When developing highly innovative products, U.S. managers should not reduce their RMM integration in marketing-related activities (as Japanese managers should). When developing incremental innovations that use existing technologies, U.S. firms are advised not to play down the importance of marketing and manufacturing involvement in product design, testing, and prototyping. Furthermore, U.S. firms should be aware of the possible higher cost of implementing a differentiated integration pattern in the United States than in Japan because of the cultural difference in individualism between the two countries.

Although both Japanese and U.S. managers should be aware of the “groupthink” mentality that may affect cross-functional joint activities, Japanese managers should pay more attention to how Japanese collectivist culture may amplify this tendency toward uniformity and conformity. A recent study on interfunctional conflict management in NPD (Xie, Song, and Stringfellow 1998) shows a concave relationship between interfunctional conflict and new product success in Japanese
firms, which suggests that too little or too much interfunctional conflict between R&D, marketing, and manufacturing leads to a low level of new product success. Thus, to overcome the negative influence of “groupthink” mentality in Japanese cross-functional integration, Japanese firms should maintain a healthy level of interfunctional conflict and encourage multiple functions involved in NPD to express conflicting views openly in cross-functional joint activities. Japanese firms should also be aware of the possibility that the technical function may overpower the marketing decision process when it is involved in marketing activities because of the high status of technical people in Japanese firms.

The findings of this study have several limitations. First, our measures of new product performance involve only the effectiveness of the development process in the marketplace and do not consider the efficiency of this process. It is possible that a higher level of RMM integration may require trade-offs between the effectiveness and efficiency of the development process.

Second, although we have measured the level of RMM integration, it is possible that only two of the three functional areas integrated their efforts to a high degree. A better way to operationalize RMM integration might have been to seek respondents’ input on integration between different pairs of functions in conducting different sets of NPD activities. Although we attempted to do this in separate surveys, we found the correlations between the RMM measures and the pairs integration measures to be high. We conjecture that the key informants took such factors into consideration when responding on an 11-point scale to the questions listed under RMM integration.

Third, the nature of our data limits our ability to examine the antecedents of an effective RMM interface (e.g., organizational requirements, reward structures). Despite these omissions, we believe that the robust results presented here contribute to the literature for several reasons, as outlined in the introduction, and provide a foundation for future path models incorporating additional variables.

Several research opportunities arise from these limitations. A rich line of research would be to compare how Japanese and U.S. firms manage the RMM interface in the NPD process. Such a cross-national comparison would advance the understanding of the organizational requirements and reward systems of effective RMM integration. Another direction for study is the possibility that product innovativeness is a mediator of new product performance. Although it is logical to treat product innovativeness as a moderator under the assumption that it is a preexisting condition in the NPD process, it is also possible that product innovativeness is an outcome of RMM integration.
<table>
<thead>
<tr>
<th>Construct</th>
<th>Measurement Items</th>
<th>Selected Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New product performance</strong> (five items)</td>
<td>1. How successful was this product from an overall profitability standpoint? (11-point scale ranging from “a great financial failure” to “a great financial success”)</td>
<td>Song and Parry 1997a</td>
</tr>
<tr>
<td></td>
<td>2. Relative to your firm’s other new products, how successful was this product in terms of market share? (11-point scale ranging from “far less than our other products” to “far greater than our other products”)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Relative to competitive products, how successful was this product in terms of market share? (11-point scale ranging from “far less than our objectives” to “far greater than our objectives”)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Relative to competitive products, how successful was this product in terms of profits? (11-point scale ranging from “far less than our objectives” to “far greater than our objectives”)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Relative to your firm’s objectives, how successful was this product in terms of profits? (11-point scale ranging from “far less than our other products” to “far greater than our other products”)</td>
<td></td>
</tr>
</tbody>
</table>
1. This product relied on technology that has never been used in the industry before.

2. This product caused significant changes in the whole industry.

3. This product was one of the first of its kind introduced into the market.

4. This product was highly innovative—totally new to the market.

5. The product class itself was totally new to our company.

6. The nature of the manufacturing process was totally new to our company.

7. The technology required to develop the product (R&D) was totally new to our company.

---

RMM integration
During the development process, to what extent did R&D, manufacturing, and marketing people integrate their efforts in conducting each of the following NPD activities? (11-point scale ranging from “strongly disagree” to “strongly agree”)

A. **RMM Integration in Conducting Market Analysis Activities**
   1. Analyzing the potential competition.
   2. Analyzing the needs of potential customers.
   3. Visiting the potential major customers.
   5. Conducting detailed market research—a detailed study of market potential, customer preferences, purchase process, etc.

B. **RMM Integration in Conducting Technical Activities**

---

*The Relationship Between Cross-Functional Integration and Product Performance*
2. Determining the desired product features and their feasibility.

3. Executing prototype and sample testing.

4. Conducting pilot production and trial production.

5. Determining the final product designs and specifications.

6. Completing the detailed plans for manufacturing.

C. **RMM Integration in Conducting Launching Activities**

1. Completing the detailed plans for marketing.

2. Establishing overall direction of the commercialization of the product.

3. Launching and introducing this product into the marketplace—selling, promoting, and distributing.

---

**APPENDIX B. CONFIRMATORY FACTOR ANALYSIS**

We evaluated the measures used for each of the RMM integration constructs with confirmatory factor analyses. The results in Table B1 show that the overall fit for both the Japanese and the U.S. samples all exceeded the critical level (.90) cited by Bearden, Sharma, and Teel (1982). Table B1 also indicates that the smallest t-value was 18.7 for the Japanese sample and 14.55 for the U.S. sample, which demonstrates that the scales for the constructs have convergent validity in both samples. Because no confidence intervals of the φ's values for the measurement model contains a value of one (p < .01, see Table B1, Columns 9 and 10), we conclude that the constructs possess discriminant validity. Examinations of the modification indices, residuals, and overall fit indices revealed no substantial departures from unidimensionality. The reliabilities range from .85 to .90, indicating that the measures are highly reliable (Peter 1979). Thus, we conclude that the measurement model adequately fits the data.

Michael Song and Jinhong Xie
<table>
<thead>
<tr>
<th>Constructs (Number of Items)</th>
<th>Reliability</th>
<th>Overall Fit Indices</th>
<th>Convergent Validity</th>
<th>Discriminant Validity (Phi-Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>United States</td>
<td>Japan</td>
<td>United States</td>
<td>Japan</td>
</tr>
<tr>
<td>RMMI in MA (5)</td>
<td>.68</td>
<td>.88</td>
<td>χ² = 560.64</td>
<td>d.f = 74</td>
</tr>
<tr>
<td>RMMI in TA (6)</td>
<td>.87</td>
<td>.85</td>
<td>GFI = .90</td>
<td>NFI = .90</td>
</tr>
<tr>
<td>RMMI in LA (3)</td>
<td>.85</td>
<td>.90</td>
<td>NFI = .98</td>
<td>NFI = .98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>NNFI = .97</td>
<td>NNFI = .96</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CFI = .96</td>
<td>CFI = .90</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IFI = .96</td>
<td>IFI = .90</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RFI = .97</td>
<td>RFI = .96</td>
</tr>
</tbody>
</table>

Notes: RMM = RMM integration, MA = market activities, TA = technical activities, LA = launching activities, GFI = goodness-of-fit index, NFI = normed fit index, NNFI = nonnormed fit index, CFI = comparative fit index, IFI = incremental fit index, and RFI = relative fit index.


**The Relationship Between Cross-Functional Integration and Product Performance**


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**Strategic Insight**

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- *What your brand’s equities really are*
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