Strategic Capabilities and Radical Innovation: An Empirical Study in Three Countries

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Abstract—This paper examines strategic capabilities as drivers of the development and launch of radical innovations. We construct a theoretical framework relating five strategic capabilities (marketing, market linking, technology, information technology, and management-related capabilities) to radical innovation. From this framework, we derive hypotheses concerning a division’s propensity to engage in radical innovation. Using empirical data derived from a research study of 376 firms in the United States, Japan, and China, we apply analysis of variance and negative binomial distribution (NBD) regression techniques to test our hypotheses. We find evidence that, overall, technology and information technology capabilities are significantly and positively related to radical product innovation. We also find some significant differences among the three country samples concerning drivers of radical innovation. Marketing capability is more significantly and positively related to radical innovation in the United States than in Japan; and, in China, the only capability that is significantly and positively related to radical innovation is technology. All of the findings completely or partially support our research hypotheses. We conclude with a discussion of the managerial implications of our findings, and directions for future research.

Index Terms—Cross-national analysis, Japan and China, negative binomial distribution regression models, radical innovation, strategic capabilities.

I. INTRODUCTION

Firms and strategic business units rely on innovation as a driver of growth. Recent studies of new product managers find that, on average, nearly 30% of sales and profits are obtained from products that are less than five years old; the best product innovating firms derive almost half of their sales and profits from new products [3]. Many managers recognize the particular importance of “radical innovation” to long-term growth [75, p. 34]. Radical innovations are usually defined as innovations that use new technologies and/or create new markets [2]; the technologies employed are different enough from existing practice so as to obsolete existing technology [5]. These innovations therefore can displace or obsolete current products, creating entirely new product categories [77]. As a result, firms that excel in radical innovation consistently outperform competitors [75, p. 34]. Business writer Gary Hamel asserts that building companies that can systemically create radical innovation is “the most important business issue of our time” [43].

Some extant research has specifically examined the precursors of radical innovation, including firm size [14], [29], [60], environmental dynamism and organizational structure [28], or willingness to cannibalize specialized assets [13], but with mixed results. Many studies in the marketing and management literature have examined strategic capabilities that are linked to competitive advantage and long-term success [18], [23], [25], [53], [81]. While the number of strategic capabilities identified in these studies is too large to list, five of them are most often identified in the literature as significant precursors or critical drivers of competitive advantage. These include marketing capabilities (such as skill in segmentation and targeting, and implementing marketing programs), technology capabilities (including skill in technology and product development as well as production and manufacturing process skills), market linking capabilities (market sensing, customer linking, and technology monitoring skill), information technology capabilities (skill in diffusing technical and market information throughout all functional areas), and management-related capabilities (including human resource management, financial management, and forecasting) [18], [24], [26], [31], [40], [51], [69], [73], [81], [89].

Henderson and Clark [47] proposed that radical innovations involve changes in core concepts and also in linkages between the core concepts and components. Innovation involving no change in core competence, but rather affecting the linkages between concepts and components, are termed “architectural innovations.” Firms often have difficulty adapting to architectural innovation and may confuse them with true radical innovation. The capabilities that drive successful architectural innovation may differ from those that drive radical innovation [47]. A few other research studies [12], [19], [74] have examined whether the drivers of radical innovation differ from those of incremental innovation (i.e., innovations that build upon existing technology rather than making it obsolete), again with mixed results (see discussion next). To our knowledge, no studies have attempted to identify the specific strategic competencies that drive radical innovation or to determine if there are significant cross-national effects.

In this paper, we gather data from strategic business units in Japan and China, as well as in the United States. We include Japan and China in our paper because of their importance in the global economy: in addition to being the two largest East Asian economies, they make up two of the three largest economies in the world as measured by purchasing power parity (PPP), the other being the United States [89]. Japan is one of the dominant global economies (the others being North America and Western
Europe), and due to its population, changing economic policies, and projected economic growth, China is seen as among the most important big emerging markets (BEM) projected to be major forces in the global economy in upcoming decades.

Both Japan and China are marked by major cultural differences such as higher collectivism and a longer-term orientation. Further, the business environment in Japan is characterized by the substantial role of government, in the form of the Ministry of Economy, Trade, and Industry (METI), and interorganizational relationships (keiretsu). The Chinese business environment is marked by a high percentage of state-owned enterprises and centralized decision making, although decentralization is occurring in many industries. Both nations have prioritized investment in technology and in radical innovation as a means to increase global competitiveness. Given the importance of these two economies in the global market, it is important to understand the key drivers of radical innovation in these countries.

Our research objective is to understand the effect of strategic capabilities possessed at the divisional level as precursors to the development and launch of radical innovations. Specifically, our first objective is to build a theoretical framework relating strategic capabilities to the development and launch of radical innovations, and to test hypotheses derived from this model. As a second objective, we determine if the relationship between strategic capabilities and radical innovation is moderated by country, and we test two cross-national hypotheses. Our empirical data are derived from an extensive empirical research study conducted with 376 firms in the United States, Japan, and China, who collectively developed a total of 380 radical innovations.

To accomplish our objectives, we first conduct an analysis of variance to determine if there are significant differences in levels of radical innovation by country. Next, using negative binomial distribution (NBD) regression techniques, we determine the relationships between radical innovation and the five strategic capabilities. We run NBD regressions with these various strategic capabilities possessed at the divisional level as precursors to the development and launch of radical innovations.

To test the appropriateness of the Liefer et al. [60] definition of radical innovation, we conducted field research to compare it to other definitions used in the literature. We presented 42 well-known radical innovations, and about the same number of incremental innovations, to a panel of three experts with consulting experience in innovation management in the United States, China, and Japan. We supplied the experts with four major definitions of radical innovation, and asked them to classify the innovations as radical or incremental using each definition. Liefer et al.’s [60] definition had the highest percentage of correct classifications. Therefore, based on both academic literature and field research, we adopt Liefer et al.’s [60] definition for this paper.

A significant literature exists that examines antecedent factors to radical innovation. The role of firm size has been investigated in a few studies. Chandy and Tellis [14] noted that many managers accept the notion of the “incumbent’s curse” (that is, large incumbent firms are less adept at radical innovations than small outsider firms), but their empirical research did not support this notion (see also [60]). In fact, it has been suggested that larger firms are more likely to adopt radical innovation, because they have more technical specialists available [29].

Other organizational drivers of radical innovation have also received research attention. In a study of the food processing industry, different organizational strategies and structures were found to support different types of innovation [33]. Some drivers of radical innovation in the pharmaceutical industry (such as extent of organizational control) were found to be the same as those that drove incremental innovation [12]; see also [19]. Other research comparing radical to incremental innovation, however, did find differences in innovation drivers [74]. For example, some marketing-related capabilities (such as market potential and growth potential) drove incremental innovation but were unimportant for radical innovation.

II. THEORETICAL BACKGROUND

A. Radical Innovation

It is recognized that some innovations pose greater risks for companies than others due to the uncertainties involved in the creation of new technologies and new markets [75, p. 33]. We refer to these as radical innovations, and use the definition of Liefer et al. [60, pp. 5–6]: these are innovations that “involve the discovery of new technologies and the creation of new markets.”

This definition is similar to that of Abernathy and Utterback [2], who defined radical innovations as those involving the creation of new technologies and/or markets and that “are conceptual shifts that make history.” Liefer et al.’s [60] definition is consistent with that used by later authors studying radical innovation [20], [36], [64], [70], [72], [74], [77]. It is also consistent with the “organizational view” of classifying innovations (see [5]). Under this view, radical innovations require technological discontinuities that can be competence-destroying (the technology is so different from existing knowledge as to render existing technology obsolete) or competence-enhancing (the technology, while different from existing knowledge, ultimately strengthens the position of existing competitors) [87]. The transistor was a competence-destroying technology, for example (as it made vacuum tubes obsolete), while the jet engine was a competence-enhancing one (since it strengthened the competitive position of existing aircraft makers).

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B. Strategic Capabilities and Radical Innovation

Strategic capabilities have been defined as “complex bundles of skills and accumulated knowledge that enable firms to coordinate activities and make use of their assets” [23, p. 38]. A broad literature exists in theory development and/or empirical research into strategic capabilities. Many empirical studies take the resource-based view (RBV) in which capabilities are seen as the way by which firms deploy their resources in order to achieve a desirable objective, such as sustainable competitive advantage [7], [31]. Central to the RBV is the notion
that the marginal payoffs among capabilities must be understood, so that the firm can make optimal decisions on acquiring capabilities [34]. Recent literature provides evidence of a dynamic relationship between capabilities and innovation: innovation may require a firm to draw on existing competencies, or to invest in new ones [20], [45]. As noted earlier, we focus on strategic capabilities that the marketing and management literature has linked to competitive advantage and long-term success (e.g., [18], [23], [25], [53], and [81]). These include:

1) **Marketing capabilities**: segmentation, targeting, pricing and advertising skills, knowledge of customers and competition, and skill at integration of marketing activities. These permit the firm to better implement its marketing programs [18], [26], [51], [69].

2) **Technology capabilities**: technology or R&D development, product development, production process, manufacturing process, technological change forecasting, and logistics. These capabilities allow a firm to maintain costs and/or achieve product differentiation, and often develop in response to external challenges and opportunities presented by the market, the competition, and the environment [24], [31].

3) **Market linking capabilities**: market sensing, channel linking, customer linking, and technology monitoring. These allow a firm to increase competitiveness by detecting changes in the market environment early so that it can respond efficiently to changing customer needs [24].

4) **Information technology (IT) capabilities**: those that allow for the diffusion of technical and market information effectively throughout all relevant functional areas and increase strategic flexibility [6], [24], [40], [41], [73], [81].

5) **Management-related capabilities**: other capabilities that also affect profit performance and increase effective execution of strategy. These include human resource management, financial management, profit forecasting, and revenue forecasting [26], [88].

This set of important capabilities is consistent with the “twin stream” new product development literature [8], [24], [82], [83], which notes that successful product innovation (innovation that meets market share or profitability goals) typically requires strengths in both marketing and technology, as well as a match between a technology and an unmet market need. The literature has been equivocal on the relationships between marketing or market-linking capabilities and radical innovation. Some literature suggests no relationship, or even a negative relationship, between these under some circumstances. According to Christensen [15], firms that are overly focused on current customers (i.e., highly linked with their current markets) may become overly risk averse, and thereby produce fewer radical innovations. Song and Montoya-Weiss [81] found that improving proficiency in market opportunity analysis improves profitability for incremental products only and could be detrimental to profitability for radical innovations. In Leonard-Barton’s research [59], the more radical the innovation, the less likely the customer will have relevant experience, ability, or professional knowledge, and the less willing the customer will be to provide accurate knowledge and feedback.

An opposing point of view, however, suggests that marketing plays a paradoxical role in supporting radical innovation (e.g., [20] and [21]). While technology capabilities may be most important in radical innovation, the first applications of emerging technology are often in marginal markets, so it is critical for the incumbent firm launching a radical innovation to be able to develop this marginal market (i.e., through its marketing and market-linking capabilities) in order to succeed. This ability to build the resources to serve new markets has been called a “second-order marketing competence” [20]. The ability to identify the customers making up the new market, and to establish effective interaction (market linking) with them and to adapt to market changes, is critical in the development of radical new products [15], [59], [63], [71], as is the ability to monitor and respond to competitors’ actions [50].

While the literature offers support for both viewpoints, our expectation is that marketing and market linking capabilities are unlikely to make a firm less capable at radical innovation, but rather will improve the firm’s ability to bring the radical innovation to the newly emerging markets where it initially is adopted [21]. Indeed, several authors have commented on the need for firms to be able to understand emerging customer needs for commercially successful radical innovation [35], [46], [66], [80] and to focus on the future market [85]. This standpoint is consistent with Liefier’s definition [60], in which radical innovation involves the use of new technology in the creation of a new market. The firm must have marketing and market-linking capabilities to find the emerging markets that will be the first to accept the new technology; that is, the firm must be able to create “market pull” for a project that may have been largely or completely “technology push” in origin.¹

We express our expectations about the directional relationships between capabilities and frequency of radical innovation as follows:

**H1a**: Marketing capability will be significantly positively related to radical innovation.

**H1b**: Technology capability will be significantly positively related to radical innovation.

**H1c**: Information Technology capability will be significantly positively related to radical innovation.

**H1d**: Market Linking capability will be significantly positively related to radical innovation.

**H1e**: Management-Related capability will be significantly positively related to radical innovation.

C. **Technology-Related Capabilities and Radical Innovation**

Abernathy and Utterback [2] proposed a dynamic model of product and process innovation. As a technology evolves, the industry moves through three phases. In the first fluid phase, there are high levels of technological and market uncertainties. Products are often custom-designed to suit market niches, and the designs are subject to much change as more is learned about marketplace needs, and as customers learn more about the

¹We are grateful to a reviewer for this explanation and for the insight on the role of market linking in supporting radical innovation.
emerging technology. Eventually, the transitional phase is reached: technological and market uncertainties subside, and a dominant form of the product emerges. The product and its components become standardized, process innovations take precedence, and firms begin to compete on the basis of product differentiation. In the third specific phase, process innovations, especially of the cost-reducing kind, predominate. Different capabilities are required for firms to profit from technology as it moves through the dynamic model stages [5]. In earlier stages, technical-related capabilities will be most critical, while at later stages, the ability to differentiate products and to reduce costs will grow in importance (see discussion of technological versus market capabilities in [1]).

Based on this process model, we note that we must consider the differential effects of market- and technology-related capabilities on innovation. To assess these effects, we group technology and information technology capabilities together as technology-related capabilities, and group marketing and market-linking capabilities together as marketing-related capabilities. We expect that technology-related capabilities will be the most critical to radical innovation, due to the “technology-push” nature of most radical innovations; this expectation is consistent with the findings of O’Connor [74], who determined that technology-related capabilities are relatively more important than marketing-related capabilities in the case of radical innovation. The most important role of marketing in radical innovation is often to identify possible markets ([2]; [72, p. 36]). Customers are unlikely to be able to articulate desires or preferences, as the technology and its possible benefits will be unfamiliar to them. Still, the firm’s ability to understand customer needs and match them to emerging technologies is critical to converting the technology into a successful innovation. This hypothesis is consistent with [74], especially regarding the relatively greater importance of technology-related capabilities in earliest stages of radical innovation. It is also consistent with Danneels [20], [21], who accepted that technological capabilities are most important to radical product development, yet the “second-order marketing competence” is also important in cultivating the small, emerging market most interested in the radical innovation.

We also expect that management-related capabilities will be significant drivers as management needs to make appropriate allocation decisions regarding financial and human resources, and accurately foresee the revenue and profits that could be generated by the investment in radical innovation, to provide enough funding and support to the radical innovation (such as adequate promotion for the innovative and early adopter markets [20], [21], [26], [88]).

We state our expectations here as a series of testable hypotheses:

H2a: Technology-related capabilities will be more strongly positively related to radical innovation than marketing-related capabilities.

H2b: Management-related capabilities will be more strongly positively related to radical innovation than marketing-related capabilities.

D. Cross-National Effects

Due to cultural environment differences between the United States, Japan, and China, one would expect differences among the drivers of radical innovation. There are very few cross-national research studies on drivers of radical innovation, other than Chandy and Tellis [14]. Nevertheless, we use the literature on the business and cultural environments in these countries to develop and test two cross-national hypotheses as described next.

Japanese and Chinese cultures are collectivistic and long-term oriented, and value group harmony and cohesiveness. By comparison, the United States is more individualistic and short-term oriented: freedom of choice and competition are valued over group cohesiveness [49], [86].

The Japanese business environment reflects these cultural traits. The Ministry of International Trade and Industry (MITI), recently renamed the Ministry of Economy, Trade, and Industry (METI), encourages heavy investment in selected technologies, and strong competition among Japanese firms in key industries [54], in order to increase Japan’s global competitiveness. Since 2001, METI has broadened its policies to promote a greater role for information technology and the development of environmentally-friendly products [32]. MITI and METI have also protected Japanese technology against foreign-developed product forms. Keiretsu (interorganizational business groups) are also seen in many Japanese industries. These comprise cooperative relationships between a major Japanese manufacturer and its suppliers and distributors (vertical keiretsu) [56], [61], or between several Japanese manufacturers across various related industries (horizontal keiretsu) [56], [70]. Consortia of Japanese firms may work cooperatively to perfect a new technology, as in the development of the Sony global positioning system [11]. Technology development by Japanese firms is strongly supported by government policy and the keiretsu, and this is still the case even after the emergence of the METI [32]. While Japanese manufacturers in industries such as carmaking are typically strong at consumer research, it is excellence in technology capabilities, prioritized by government policy and by the keiretsu, which will have the greatest impact on radical innovation. We state the hypothesis:

H3a: Relative to the United States, technology capability will be more positively related to radical innovation in Japan.

The Chinese business environment has also emerged in a long-term-oriented, highly collectivistic culture, and is different from the business environments of the United States and Japan. A large number of Chinese firms are state-owned enterprises (SOEs), typified by both administrative (firm) and party authority [78]. Since the 1970s, investments in technology and innovation have been made to stimulate growth in the Chinese economy and boost global competitiveness. In more recent years, some decentralization has occurred: the SOE has obtained more decision-making authority and also more profitability relative to that gained by the state [55]. Today, the SOE has much of latitude in making decisions on product mix, prices, and outputs, among others [48], [78], and smaller enterprises

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such as collectives are even less controlled by government [76]. Still, government policy in China has for many years prioritized investment in technology capability to stimulate growth and increase global competitiveness. Due to central government prioritization and funding, radical innovation in China will be driven more by technology, and less by marketing and market linking capabilities, than is the case in the United States. In the literature on Chinese SOEs, information technology is not expressly prioritized or funded by the Chinese government, so we do not hypothesize that information technology will be a significant driver of radical innovation in China. We state:

**H3b:** Relative to the United States, technology capability will be more positively related to radical innovation in China.

### III. RESEARCH DESIGN

#### A. Measurement Scales

Well-defined constructs should be based on theory, and the operationalization of these constructs through measures with high degrees of validity and reliability is a prerequisite for any study [16]. We used scales developed and validated in DeSarbo et al. [27] to assess the impact of five strategic capabilities (marketing, technology, information technology, market linking, and management) on radical innovation. The procedure is briefly summarized next.

The constructs for the capabilities were defined based on competitive capability theory [24]. However, a review of the marketing and management literature ([6], [18], [23]–[25], [51], [53], [67], [73], [81], [88], and others) found no existing scales for the capabilities. A three-step instrument development procedure was used to develop appropriate scales.

1. **Step 1: Measurement Items for the Capabilities:** An initial pool of scale items was obtained by scanning the extant literature and compiling all items used in these articles. These items were each classified into one of five categories, each corresponding to one of the strategic types. To this pool of items, new items were added in cases where the dimensions of the construct were not sufficiently covered.

To ensure content validity and appropriateness of items, we refined the scales through in-depth focus interviews in two strategic business units (SBUs). The interviews consisted of three parts. First, executives were asked their opinions regarding salient issues in SBU capabilities. In particular, we wanted to investigate the best way to measure capabilities. Second, the executives were asked to evaluate whether our study hypotheses described their own experiences adequately. The third part of the interviews addressed executives’ perceptions of the relevance and completeness of scale items drawn from our literature review and earlier case studies.

2. **Step 2: Scale Development:** Following [16], we assessed construct validity of the scales being developed, correcting any scale items that may still be ambiguous and identifying subsets of items that possessed “different shades of meaning” to informants. Seven judges (two professors and five doctoral students with background in measurement development) were asked to sort the items from the first step into the five capability scales, following Davis’s [22] procedure. First, the judges were presented with the construct definition of each capability type, and asked to assess how well the items developed in step 1 fit the construct definitions. Second, a set of index cards with each scale item on a card were shuffled into random order and presented to the judges, who had been read a standard set of instructions. Working independently, the judges sorted the cards into the capability types. Then, construct convergence and divergence were examined by assessing interrater reliability.

Interrater reliability was assessed in two ways. First, the percentage of correct placement of items was calculated as the proportion of items placed by the seven judges within the intended theoretical construct. Higher percentages indicate higher degree of construct validity, and a higher potential for good reliability. The minimum percentage obtained was 84%. Five items were responsible for “incorrect” placement, and were deleted from the pool. Second, we calculated Cohen’s Kappa [17] for each pair of judges to measure their level of agreement in categorizing items into capability types and product competitive advantages. The Kappa scores ranged from 0.97 to 0.82, exceeding the acceptable level of 0.65 [52]. We concluded that the scale items were consistently placed within the correct constructs. Therefore, the items demonstrated convergent validity with the related capability, and discriminant validity across the capabilities. Furthermore, because the judges’ categorizations of items into strategic types were consistent, we concluded that the scales demonstrated convergent and discriminant validity [22].

3. **Step 3: Instrument Pretesting:** Based on step 2 results, we reexamined all scale items and eliminated inappropriate, ambiguous, or inconsistently classified items. The scales were combined into an overall instrument for additional pretesting. The instrument was distributed to 32 managers in the two SBUs to further assess scale reliability and validity. This pretest resulted in two further items being deleted. Then, the instrument was distributed to 41 EMBA students taking a new product development class. The following five capability scales were developed by this procedure (see Appendix A for the scale items produced by the procedure).

4. **Marketing Capabilities (MKTG):** Marketing capabilities were measured using a set of scale items drawn from the Conant et al. [18] study of marketing capability and strategic type. These include knowledge of customers and competitors, integration of marketing activities, skills in segmentation and targeting, and effectiveness of pricing and advertising programs.

5. **Technology Capabilities (TECH):** These capabilities are related to technology development and new product development, as well as production processes. These were rated according to scale items originally drawn from Day’s [24] set of such capabilities. The items measure relative capabilities in technology, new product development, and production facilities.

6. **Information Technology Capabilities (ITECH):** These refer to relative capabilities that support new product development projects, and facilitate cross-functional communication flow. DeSarbo et al. [27] developed items that measure the possession of information technology systems for product development and cross-functional integration.
7) Market Linking Capabilities (MLINK): The market linking capabilities, focusing on market sensing capabilities outside the organization, were rated on scale items originally developed by Day [24]. These items measure the relative capabilities in creating and managing durable customer relationships, market sensing, and creating durable relationships with suppliers.

8) Management-Related Capabilities (MR): These are other capabilities that impact profit performance and allow firms to execute strategy more effectively. They include human resource management, financial management, profit and revenue forecasting, and others [26, 27, 88].

The aforesaid steps served only as a starting point for our scale development. We then took the following steps to ensure we avoided a North American bias. To ensure accurate translation, we used a double-translation method to translate the questionnaire into Japanese and Chinese [4], [30], [79]. That is, it was first translated into the foreign language by a translator and then translated back into English by a different translator to ensure translation equivalence. A comparison of the resulting questionnaires revealed considerable consistency across translators.

After translation, we conducted field research in six Japanese firms and two Chinese firms. The purposes of the field research were: to establish content validity of the concepts and the hypothesized relationships among the constructs; to establish equivalence of the constructs, concepts, measures, and samples; and to assess the possibility of cultural or response-format bias [30]. The field research was done over a nine-month period with multiple visits to the firms.

Our field research studies allowed us to assess construct equivalence (conceptual, functional, and category equivalence). They also indicated that (with minor modifications) the measurement scales were appropriate for studying capability and radical innovation in Japanese and Chinese contexts. The field research results suggested that it is more appropriate to ask the respondents to rate their SBU on each capability scale item relative to their major competitors, and to use 11-point Likert-type scales (from 0 to 10) to measure capabilities (as recommended in [82] and [83]), where 0 = much worse than our competitors and 10 = much better than our competitors.

The questionnaire also required respondents to list the number of radical and incremental (nonradical) innovations developed and launched by the division within the past three years, and also to provide a brief description of each innovation. For clarity, the respondents were given an abridged version of the Liefer et al. [60] definition of radical innovations (“innovations that employ new technologies and create new markets”). Finally, data on several control variables were also collected, as suggested by [73]: buyer power, supplier power, seller concentration, ease of entry, market growth rate, and rate of technology change.

B. Data Collection Procedures

The data were obtained via a large mail survey of the companies listed in the Ward’s Business Directory, the Directory of Corporate Affiliations, and the World Marketing Directory. A proportionate-stratified random sample of 800 firms was drawn from each country (United States, Japan, and China), using industries as strata. The first stage of data collection was a presurvey, in which we sent a one-page survey and an introductory letter requesting participation, and offered a list of available research reports to participating firms. Each firm was asked to select a division for participation and provide a contact person in that division. Of the 2400 firms contacted, 1173 firms (392 in the United States, 429 in Japan, and 352 in China) agreed to participate and provided the necessary contacts at the division level.

In the second stage of data collection, we sent the questionnaire to the division managers, followed by a three-wave mailing. In this stage, we obtained usable data on relative capabilities from 152, 140, and 84 divisions in the United States, Japan, and China, respectively. These sample sizes represent response rates of 19.0% in the United States, 17.5% in Japan, and 10.5% in China. The final sample includes the following industries: computer-related products, electronics, electric equipment and household appliances, pharmaceuticals, drugs and medicines, machinery, telecommunications equipment, instruments and related products, air conditioning, chemicals and related products, and transportation equipment. Most participating divisions had annual sales of $11–750 million and 100–12500 employees.

To test for nonresponse biases, we performed multivariate analysis of variance (MANOVA) analysis on the means of capabilities comparing the early and late response groups. We found no significant differences between early and late response groups. Thus, we conclude that nonresponse bias is not a major problem. We then tested for possible industry effects across the three countries (due, for example, to some industries being over- or underrepresented in some countries). We tested for all of the industry control variables mentioned earlier (supplier power, buyer power, etc.), again using MANOVA analysis. No significant differences were found across the three countries; thus, we conclude that industry effects are also not a major problem.

To further verify correctness of the classification of radical innovations by companies, we conducted follow-up interviews with a sample of companies (12 selected Chinese firms, 8 Japanese firms, and 14 U.S. firms) to identify the radical innovations reported by these companies. We presented these data to the three experts with consulting experience who had previously assisted in the selection of the definition of radical innovation. These experts were requested to classify the innovations independently as either radical or incremental. The classifications by the experts were consistent in all cases (i.e., the experts were all in agreement in their judgments) except four in China and three in Japan. In the seven cases where the experts disagreed, the disagreements were resolved using a simple majority rule. We also checked the sample of respondent firms against secondary sources (in cases where secondary data were available to us), again to determine if radical innovations had been correctly classified. All remaining discussion includes only those self-reported radical innovations that were verified by the experts and by comparison against secondary sources.\(^2\)

\(^2\) All means, standard deviations, and correlations are given in Appendix B.
outliers in the data. Finally, as with any model, the issue of processes leading to zero outcomes are the same as those leading to radical innovations—a condition often described as zero inflation (NRAD). As shown, NRAD is a discrete count type of data (cf., [9], [35]). As Long [62] notes, the use of the traditional linear model for count outcomes can result in inefficient, inconsistent, and biased estimates. One, the variance is much larger than the mean and variance may not prove appropriate. Two, for which models like Poisson regression that assume equality of the mean and variance functions is typically not significantly different.

The LIMDEP V8.0 software system was used. Cameron and Trevedi [9] overdispersion tests suggest that the Poisson regression model is not appropriate given the overdispersion problem. The Vuong test was used to compare ordinary (unaltered) NBD regression with the ZIP NBD model, and this test fails to reject the ordinary NBD regression model. In addition, the ordinary NBD model has a higher likelihood value (log likelihoods of the NBD and ZIP NBD models are −494.64 and −498.86, respectively). Therefore, we select the ordinary NBD model for our analysis.

Count data of this type are typically analyzed with Poisson regression in the presence of such covariates. The assumed equality of the conditional mean and variance functions is typically taken to be the major shortcoming of the Poisson regression model. Perhaps, the most common alternative procedure is the negative binomial model, which arises from a natural formulation of cross-sectional heterogeneity. One can generalize the Poisson model by introducing an individual, unobserved effect into the conditional mean

\[ \ln \mu_i = x_i \beta + \varepsilon_i = \ln \lambda_i + \ln u_i \]  

where the disturbance \( \varepsilon_i \) reflects either specification error as in the classical regression model or the kind of cross-sectional heterogeneity that normally characterizes many types of data. Then, the distribution of \( y_i \) conditioned on \( x_i \) and \( u_i \) (i.e., \( \varepsilon_i \)) remains Poisson with conditional mean and variance \( \mu_i \)

\[ f(y_i | x_i, u_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i} e^{\beta' x_i}}{y_i!}. \]

The unconditional distribution \( f(y_i | x_i) \) is the expected value (over \( u_i \)) of \( f(y_i | x_i, u_i) \)

\[ f(y_i | x_i) = \int_0^\infty \frac{e^{-\lambda_i} \lambda_i^{y_i} e^{\beta' x_i}}{y_i!} g(u_i) du_i. \]

The choice of a density for \( u_i \) defines the unconditional distribution. For mathematical convenience, a gamma distribution is usually assumed for \( u_i = \exp(\varepsilon_i) \). With appropriate normalization

\[ g(u_i) = \frac{\theta^\theta}{\Gamma(\theta)} u_i^{\theta-1} e^{-\theta u_i}. \]

The density for \( y_i \) is then

\[ f(y_i | x_i) = \int_0^\infty \frac{e^{-\lambda_i} \lambda_i^{y_i} e^{\beta' x_i}}{y_i!} \frac{\theta^\theta u_i^{\theta-1} e^{-\theta u_i}}{\Gamma(\theta)} du_i \]

\[ = \frac{\theta^\theta \lambda_i^{y_i} \Gamma(y_i + 1) \theta^{\theta + y_i} \Gamma(\theta + y_i) e^{\lambda_i + \theta y_i} u_i^{\theta + y_i - 1}}{\Gamma(y_i + 1) \Gamma(\theta + y_i)} \]

\[ = \frac{\theta^\theta \lambda_i^{y_i} \Gamma(\theta + y_i)}{\Gamma(y_i + 1) \Gamma(\theta)} \left[ \frac{\lambda_i}{\lambda_i + \theta} \right]^{y_i} (1 - r_i)^\theta \]

where

\[ r_i = \frac{\lambda_i}{\lambda_i + \theta} \]
which is one form of the NBD. The distribution has conditional mean $\lambda_i$ and conditional variance $\lambda_i (1 + (1/\theta) \lambda_i)$.\(^3\) The negative binomial model is estimated by maximum likelihood. Table II shows the NBD regression coefficients and their significances for each of the five capabilities for the aggregate sample (all three countries combined), and also lists the marginal effects. These marginal effects are calculated as partial derivatives for the NBD model. Since the NBD model is not linear, one cannot interpret the estimated model coefficients themselves like regression coefficients in multiple regression. Rather, the correct way to assess relative impacts of unit changes in each independent variable for the NBD model is to compute marginal effects.

We first examine the NBD regression coefficients in Table II to determine which capabilities are significantly related to radical innovation. These coefficients show that only technology and information technology capabilities (0.0724 and 0.0974, respectively) are significantly and positively related to radical innovation at the 0.05 level, while market linking capabilities (−0.1289) show a significant and negative relationship, which is contrary to H1d (significant at the 0.01 level). Marketing and management capabilities are not found to be significant for the aggregate sample. Hence, H1a, d, and e are not supported, but H1b and c are supported in this aggregate analysis.

Second, to obtain the relative magnitudes of the relationships between capabilities and radical innovation, one must examine the marginal effects (shown in the right column of Table II), and not the raw NBD coefficients. The marginal effects show that information technology has the largest significant and positive relationship to radical innovation, and technology has the second largest (marginal effects $= 0.0958$ and $0.0712$ respectively), though the difference between the two is not great. The results support H2a (technology-related capabilities are more positively related to radical innovation than marketing-related capabilities), but not H2b (management-related capabilities are more positively related to radical innovation than marketing-related capabilities).

C. Cross-National Comparisons

The Table II results combine the results for all three countries, and this could mask important cross-national differences (i.e.,
TABLE III
NEGATIVE BINOMIAL REGRESSION, MAXIMUM LIKELIHOOD
ESTIMATES BY COUNTRY

<table>
<thead>
<tr>
<th>Country</th>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Marginal Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>Constant</td>
<td>-2.0926</td>
<td>0.615**</td>
<td>-1.6382</td>
</tr>
<tr>
<td></td>
<td>Marketing Capabilities (MKTG)</td>
<td>0.1216</td>
<td>0.0536*</td>
<td>0.0952</td>
</tr>
<tr>
<td></td>
<td>Technology Capabilities (TECH)</td>
<td>0.0783</td>
<td>0.0254*</td>
<td>0.0613</td>
</tr>
<tr>
<td></td>
<td>Info. Technology Capabilities (ITTECH)</td>
<td>0.1916</td>
<td>0.0622**</td>
<td>0.1500</td>
</tr>
<tr>
<td></td>
<td>Market Linking Capabilities (MLINK)</td>
<td>-0.0713</td>
<td>0.0528</td>
<td>-0.0558</td>
</tr>
<tr>
<td></td>
<td>Management Capabilities (MR)</td>
<td>0.0126</td>
<td>0.0569</td>
<td>0.0098</td>
</tr>
<tr>
<td>U.S.</td>
<td>Constant</td>
<td>-4.3570</td>
<td>1.2207**</td>
<td>-5.5510</td>
</tr>
<tr>
<td></td>
<td>Marketing Capabilities (MKTG)</td>
<td>0.0965</td>
<td>0.0483*</td>
<td>0.1229</td>
</tr>
<tr>
<td></td>
<td>Technology Capabilities (TECH)</td>
<td>0.2740</td>
<td>0.0996**</td>
<td>0.3491</td>
</tr>
<tr>
<td></td>
<td>Info. Technology Capabilities (ITTECH)</td>
<td>0.1679</td>
<td>0.1165</td>
<td>0.2138</td>
</tr>
<tr>
<td></td>
<td>Market Linking Capabilities (MLINK)</td>
<td>-0.0156</td>
<td>0.0835</td>
<td>-0.0199</td>
</tr>
<tr>
<td></td>
<td>Management Capabilities (MR)</td>
<td>0.0352</td>
<td>0.0716</td>
<td>0.0448</td>
</tr>
<tr>
<td>China</td>
<td>Constant</td>
<td>-6.1992</td>
<td>1.1593</td>
<td>-1.4536</td>
</tr>
<tr>
<td></td>
<td>Marketing Capabilities (MKTG)</td>
<td>-0.2406</td>
<td>0.0968*</td>
<td>-0.2160</td>
</tr>
<tr>
<td></td>
<td>Technology Capabilities (TECH)</td>
<td>0.3169</td>
<td>0.0983**</td>
<td>0.2845</td>
</tr>
<tr>
<td></td>
<td>Info. Technology Capabilities (ITTECH)</td>
<td>-0.0301</td>
<td>0.0952</td>
<td>-0.0270</td>
</tr>
<tr>
<td></td>
<td>Market Linking Capabilities (MLINK)</td>
<td>-0.4734</td>
<td>0.1256**</td>
<td>-0.4250</td>
</tr>
<tr>
<td></td>
<td>Management Capabilities (MR)</td>
<td>0.0281</td>
<td>0.0779</td>
<td>0.0252</td>
</tr>
</tbody>
</table>

** = significant at 0.01 level.
* = significant at 0.05 level.

heterogeneity). Oftentimes, heterogeneity could be the cause of the overdispersion problem. To alleviate this problem, the analysis was conducted by country. Thus, the same NBD regression procedure was then applied to the data for each country individually. Table III contrasts the coefficients and marginal effects for the United States, Japanese, and Chinese samples (fuller statistical details are available from the authors).

The NBD regression results for the United States are shown in the first panel of Table III. The regression coefficients for marketing, technology, and information technology are 0.1216, 0.0783, and 0.1916, respectively, all significant at 0.05 or better; the other capabilities are not found to be significant. Thus, H1a, b, and c are supported in the U.S. sample, but not H1d or e. Second, examining the marginal effects, information technology capability has the largest positive relationship with radical innovation, followed by marketing and technology (marginal effects are 0.1500, 0.0952, and 0.0613, respectively). These results partially support H2a, which hypothesized that both technology-related capabilities would have stronger positive relationships to radical innovation than the marketing-related capabilities. No evidence was found to support H2b, since the management-related capability was not found to be significant.

Now consider the results obtained for the Japanese sample (Table III, second panel). To make comparisons between the United States and Japanese samples, we observe which capabilities have significant positive effects in each country, and also consider the relative sizes of the marginal effects. Only technology and marketing capabilities are found to be significant in Japan (the coefficients are 0.2740 and 0.0965, respectively, both significant at 0.05 level or better), so H1a and b only are supported (though H1c is only supported at the 0.10 level). Furthermore, the marginal effects show a different order of importance than that found in the United States (coefficient = 0.161). Technology capabilities have a larger marginal effect than marketing capabilities (0.3491 and 0.1229, respectively). Information technology capabilities also have a larger marginal effect (0.2138), but as noted earlier, its NBD regression coefficient is not found to be significant. Since technology capability has a larger marginal effect than marketing, H2a is partially supported in Japan. Management-related capabilities are not found to be significant for Japan and, as was the case for the U.S. sample, there is no evidence supporting H2b in Japan. Hypothesis 3a is supported: technology capability has the largest effect on radical innovation in Japan but has only the third greatest effect on radical innovation in the United States. We also obtain a few surprising results in Japan: we do not find a significant effect for market linking, management, or information technology capabilities.

By contrast, the results for the China sample (Table III, third panel) are widely different from those found earlier. We also see a significant overall fit, as shown by the chi-square statistic. In China, technology capability has a significant positive relationship with radical innovation (coefficient = 0.3169, significant at the 0.01 level), while both market linking and marketing have significant negative relationships (coefficients are −0.4734 and −0.2406, respectively, both significant at 0.05 level or better). Neither information technology nor management-related capabilities are significant in China. Examining the marginal effects, the capability with the largest significant positive relationship with radical innovation is technology (0.2845). Market linking and marketing both have large negative marginal effects (−0.4260 and −0.2160, respectively). In China, we do not find much support for H1 a–e: only H1b is supported. We find one very surprising result in China: marketing and market linking are significantly negatively related to radical innovation, which is in the direction counterintuitive to H1a and H1d. We will further discuss this finding in the next section. H2a is partially supported in the China sample, since technology capability has a stronger positive relationship to radical innovation than the marketing-related capabilities, but information technology capability has no significant effect. Finally, the finding that technology capability is significantly positively related to radical innovation in China supports Hypothesis 3b.

We then performed a likelihood ratio test (akin to a Chow test) to compare the aggregate, pooled regression solution (across three countries) against the three individual country solutions as a nested models test, since the aggregate solution can be shown to be a special restricted case of the three-country-model solutions. The resulting chi-square statistic was 63.42 (significant at $p < 0.001$), thus we reject the hypothesis that all the countries have the same intercepts and slopes (that is, we find evidence that the aggregate sample results do not hold for all three countries and that there is heterogeneity across the three countries). We reject the aggregate model solution in favor of the three-country solution. Thus, cultural or country effects account for much of the heterogeneity seen in this paper.

We summarize all of our hypotheses tests (overall and by country) in Table IV.
V. DISCUSSION AND CONCLUSION

There is little doubt that firm management understands the critical role of radical innovation in sustaining long-term sales growth and profitability. Radical innovation initiatives have an important role in the firm’s portfolio of new product projects. There is also a literature relating strategic capabilities to innovation propensity. In spite of this, there have been relatively few empirical studies that specifically examined strategic capabilities as drivers of radical innovation development and launch, and those studies that have done so have sometimes resulted in conflicting results. Also, little research has examined cross-national differences. We present the results of an analysis conducted over 376 firms in the United States, Japan, and China to test hypotheses regarding the relationships between various strategic capabilities and the development and launch of radical innovations. We find evidence that the capabilities that have the largest magnitude relationship with radical innovation differ by country. In particular, we find that technology and information technology capabilities are significantly related to radical innovation when the three countries are combined (consistent with Hypotheses 1b and c). But when the sample is disaggregated by country, one finds substantial differences across the countries. In the United States, marketing, technology, and information technology capabilities are significant, while only technology and marketing capabilities are significant in Japan and only technology capability is significant and positive in China. Thus, in the United States and Japan, we find evidence of the role of marketing capabilities in radical product innovation. This supports the viewpoint of Danneels [20], [21] and others who noted that radical innovation requires an understanding of customer needs and competitive actions [35], [46], [50], [59], [63], [72], [80]. Our results suggest that the influences on radical innovation in China are different (see next).

Also, when the country samples are separated, partial support is found for H2a (the importance of technology-related capabilities in supporting radical innovation) in all three countries, but no support is found for H2b (the importance of management capability in supporting radical innovation) in any of the three countries. Technology capability is found to be significantly related to radical innovation in both Japan and China, and in fact, in both of these countries, it is the capability with the largest factor effect. While the effect is also significant in the United States, technology capability does not have the largest effect on radical innovation. This finding is consistent with Hypothesis 3a and 3b.

We obtain surprising findings in the Chinese sample. While we hypothesize that marketing and market linking capabilities...
will not be related strongly to radical innovation in China, we actually find that these capabilities were significantly and negatively related to radical innovation. Though the results do not refute Hypothesis 3b (the effect of technology capability on radical innovation should be more positive than the effect of marketing-related capabilities in China), the significant negative effect was not expected. The China sample results seem to lend support to the views of Christensen [15], i.e., overemphasis on marketing or market linking capabilities may result in risk-averse behavior and an avoidance of radical innovation. The results may be due to the fact that Chinese firms are often suppliers to foreign countries. Relative to the Japan and U.S. sample, the China sample may overrepresent suppliers to foreign firms. It is possible that marketing and market linking capabilities are less important to firms that act largely as suppliers to firms who work for foreign business clients, than to firms that produce for local private customers. If this is the case, investment in marketing-related capabilities beyond some minimal level is wasteful and would have been better off invested in improving technology capabilities. If invested in the latter, there would be a significant positive effect on radical innovation. Investment in information technology, beyond some base level, by Chinese firms has neither a significant positive nor negative relationship and, while not detrimental to radical innovation, would be relatively wasteful.

The results in Japan and the United States are close to what is stated in the hypotheses. The U.S. firms seem to require strong attention to technology capabilities, while also not ignoring the importance of marketing-related capabilities, as these are more positively related to radical innovation. This finding is consistent with the “dual drive” stream in the new product development literature (e.g., [24], [82], and [83]). Marketing capabilities as well as technology-related capabilities are significantly related to radical innovation also in Japan, but, as hypothesized in H3a, the magnitude of the relationship between technology capability and radical innovation was found to be greater in Japan than in the United States. Incidentally, though they examined different drivers of radical innovation, our results are consistent with those of Chandy and Tellis [14] who found differences in patterns between radical innovations developed in Japan relative to the United States.

The research suggests that managers of firms prioritizing radical innovation can take steps to insure that their scarce financial resources are allocated in favor of boosting technology, information technology, and/or marketing capabilities; and that the relative importances of these radical innovation drivers differ across countries. In the extreme, we found evidence that too much investment in marketing-related capability actually decreases the rate of radical innovation rate in China; more often, ill-advised investment in capabilities is wasteful. The research raises several questions, however, which are potentially directions for future research.

Several cross-national research findings were obtained in addition to our findings supporting the relative importance of technology capability in Japan and China (H3a and H3b). For example, information technology capability has the largest effect on radical innovation in the United States, and has one of the largest factor effects in Japan, yet is insignificant in China. Further cross-national research is warranted. Also, as noted earlier, the results suggest not investing in certain capabilities (marketing or market linking in China, for example), due to the apparent significant, negative effects. But this does not mean that the capabilities are unimportant, or that a firm with zero marketing-related capability would be successful with radical innovation. Rather, the results suggest that there is a minimal or threshold level of marketing expertise, without which the firm is incapable of successful launch. Once this threshold is attained, if the firm has additional financial (or human) resources to allocate, these are better aimed at boosting technology-related capabilities. Our research does not permit us to pinpoint what these threshold levels of capabilities are, or if they differ across countries. This is an avenue for further research.

Another unanswered question is how the relative effects of the capability drivers may change through time. The Japanese or Chinese business environments will probably continue to evolve and change, as they have in recent years. The role of METI in Japanese business has already shifted, as noted earlier, to favor technology and information technology capability development. This trend may continue, or possibly METI may refocus attention to encourage Japanese firms to build marketing capabilities to better penetrate developing and third-world markets. Likewise, the current business environment in China is in flux as the government moves toward encouraging more competition while still doing some central planning. As the business environments continue to evolve, the relative differences between Japan, China, and the United States may diminish, or possibly even become more pronounced. It would be interesting to replicate this research in several years’ time after more government policy changes have occurred.

Another possible factor to be explored in future research is the experience of the firm. We have not explicitly considered either the experience of the firm (i.e., institutional experience) in generating radical innovations, or the personal experience of team members or leaders involved in the radical innovation. Possibly the firm with the greatest institutional or personal experience has an advantage, though this could not be ascertained in the current research.

Finally, we note that we have studied antecedents to all radical innovations developed and launched by the respondent firms. Having successfully developed the radical innovation and launched it in the marketplace, of course, does not guarantee ultimate commercial success of the innovation, and we have not distinguished the commercially successful radical innovations from unsuccessful ones. Thus, while we make a contribution by understanding the relationships between strategic capabilities and the successful development and launch of radical innovations, future research could seek to identify how strategic capabilities ought to be best deployed in order to increase the likelihood of ultimate commercial success.
APPENDIX A

ITEM-TO-TOTAL CORRELATIONS AND RELIABILITIES

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>Japan</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing Capabilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Reliability α = 0.924, (\alpha_{U.S.} = 0.948, \alpha_{China} = 0.967))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge of customers</td>
<td>0.814</td>
<td>0.940</td>
<td>0.842</td>
</tr>
<tr>
<td>Knowledge of competitors</td>
<td>0.847</td>
<td>0.950</td>
<td>0.923</td>
</tr>
<tr>
<td>Integration of marketing activities</td>
<td>0.830</td>
<td>0.907</td>
<td>0.948</td>
</tr>
<tr>
<td>Skill to segment and target markets</td>
<td>0.800</td>
<td>0.947</td>
<td>0.963</td>
</tr>
<tr>
<td>Technology Capabilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Reliability α = 0.859, (\alpha_{U.S.} = 0.716, \alpha_{China} = 0.821))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology development capabilities</td>
<td>0.911</td>
<td>0.538</td>
<td>0.835</td>
</tr>
<tr>
<td>New product development capabilities</td>
<td>0.788</td>
<td>0.470</td>
<td>0.655</td>
</tr>
<tr>
<td>Production facilities</td>
<td>0.931</td>
<td>0.600</td>
<td>0.553</td>
</tr>
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</table>

Information Technology Capabilities

<table>
<thead>
<tr>
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<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Reliability α = 0.843, (\alpha_{U.S.} = 0.753, \alpha_{China} = 0.820))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information technology systems for new product development projects</td>
<td>0.657</td>
<td>0.952</td>
<td>0.942</td>
</tr>
<tr>
<td>Information technology systems for facilitating cross-functional integration</td>
<td>0.657</td>
<td>0.952</td>
<td>0.942</td>
</tr>
</tbody>
</table>

Market Linking Capabilities

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>Japan</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Reliability α = 0.921, (\alpha_{U.S.} = 0.938, \alpha_{China} = 0.943))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market sensing capabilities</td>
<td>0.689</td>
<td>0.624</td>
<td>0.770</td>
</tr>
<tr>
<td>Customer-linking capabilities (i.e., creating and managing durable customer relationships)</td>
<td>0.713</td>
<td>0.562</td>
<td>0.730</td>
</tr>
<tr>
<td>Capabilities of creating durable relationships with our suppliers</td>
<td>0.723</td>
<td>0.557</td>
<td>0.537</td>
</tr>
</tbody>
</table>

Management Related Capabilities

<table>
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<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Reliability α = 0.921, (\alpha_{U.S.} = 0.938, \alpha_{China} = 0.943))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated logistics systems</td>
<td>0.750</td>
<td>0.748</td>
<td>0.742</td>
</tr>
<tr>
<td>Cost control capabilities</td>
<td>0.703</td>
<td>0.760</td>
<td>0.801</td>
</tr>
<tr>
<td>Financial management skills</td>
<td>0.717</td>
<td>0.728</td>
<td>0.788</td>
</tr>
<tr>
<td>Human resource management capabilities</td>
<td>0.822</td>
<td>0.894</td>
<td>0.899</td>
</tr>
<tr>
<td>Accuracy of profitability and revenue forecasting</td>
<td>0.842</td>
<td>0.881</td>
<td>0.863</td>
</tr>
<tr>
<td>Marketing planning process</td>
<td>0.898</td>
<td>0.882</td>
<td>0.879</td>
</tr>
</tbody>
</table>

Note: the cells for the constructs show Cronbach alpha; the cells for the individual scale items show item-to-total correlations.

APPENDIX B

MEANS, STANDARD DEVIATIONS, AND CORRELATIONS

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>Japan</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of New Products (NRAD)</td>
<td>1.000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Linking Capabilities (MLINK)</td>
<td>-0.07</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Technology Capabilities (TECH)</td>
<td>0.273</td>
<td>-1.40</td>
<td>1.000</td>
</tr>
<tr>
<td>Marketing Capabilities (MKTG)</td>
<td>0.218</td>
<td>0.006</td>
<td>1.360</td>
</tr>
<tr>
<td>Information Technology Capabilities (ITTECH)</td>
<td>0.154</td>
<td>-0.089</td>
<td>0.385</td>
</tr>
<tr>
<td>Management Capabilities (MR)</td>
<td>1.329</td>
<td>1.564</td>
<td>8.479</td>
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<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
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<th>China</th>
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<tbody>
<tr>
<td>Mean</td>
<td>2.651</td>
<td>1.445</td>
<td>1.281</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.666</td>
<td>2.666</td>
<td>2.666</td>
</tr>
</tbody>
</table>

Acknowledgments

The authors wish to thank Editor in Chief G. Farris, Department Editor P. Bierly, and the anonymous reviewers for their helpful comments.

References


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