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Does Strategic Planning Enhance or Impede Innovation and Firm Performance?*

Michael Song, Subin Im, Hans van der Bij, and Lisa Z. Song

Does strategic planning enhance or impede innovation and firm performance? The current literature provides contradictory views. This study extends the resource-advantage theory to examine the conditions in which strategic planning increases or decreases the number of new product development projects and firm performance. The authors test the theoretical model by collecting data from 227 firms.

The empirical evidence suggests that more strategic planning and more new product development (NPD) projects lead to better firm performance. Firms with organizational redundancy benefit more from strategic planning than firms with less organizational redundancy. Increasing R&D intensity boosts both the number of NPD projects and firm performance. Strategic planning is more effective in larger firms with higher R&D intensity for increasing the number of NPD projects. The results reported in this study also consist of several findings that challenge the traditional views of strategic planning. The evidence suggests that strategic planning impedes, not enhances, the number of NPD projects. Larger firms benefit less, not more, from strategic planning for improving firm performance. Larger firms do not necessarily create more NPD projects. Increasing organizational redundancy has no effect on the number of NPD projects.

These empirical results provide important strategic implications. First, managers should be aware that, in general, formal strategic planning decreases the number of NPD projects for innovation management. Improvised rather than planned activities are more conducive to creating NPD project ideas. Moreover, innovations tend to emerge from improvisational processes, during which the impromptu execution of NPD activities without planning spurs "thinking outside the box," which enhances the process of creating NPD project ideas. Therefore, more flexible strategic plans that accommodate potential improvisation may be needed in NPD management since innovation-related activities cannot be planned precisely due to the unexpected jolts and contingencies of the NPD process.

Second, large firms with high levels of R&D intensity can overcome the negative effect of strategic planning on the number of NPD projects. Specifically, a firm's abundant resources, when allocated and deployed for NPD activities, signal the high priority and importance of the NPD activities and thus motivate employees to acquire, collect, and gather customer and technical knowledge, which leads to creating more NPD projects.

Finally, managers must understand that managing strategic planning and generating NPD project ideas are beneficial to the ultimate outcome of firm performance despite the adverse relationship between strategic planning and the number of NPD projects.

Introduction

Greater emphasis on the importance of increasing new product development (NPD) projects has emerged because globalization and hypercompetition essentially demand that increasing NPD projects can "reinvent the wheel" for organizational innovations (von Krogh, Nonaka, and Nishiguchi, 2000). Crawford and Di Benedetto (2007) suggest that increasing the number of NPD projects leads to higher firm performance. Past studies also argue that strategic planning becomes vital to firm growth and performance (e.g., Ansoff, 1991; Drucker, 1954; Simon, 1993). Strategic planning enables a firm to increase NPD activities and crystallizes those ideas into the firm's organizational intelligence (Nonaka, 1994). In this sense, strategic planning helps increase the number of NPD projects that can enhance firm performance.

Despite, or perhaps because of, its importance, many scholars have debated whether strategic planning enhances or impedes the generation of NPD projects (Moorman and Miner, 1997). The traditional view claims that strategic planning promotes a careful

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review of the different options in various business environments (e.g., Cooper and Kleinschmidt, 1986; Moorman and Miner, 1998a), and therefore increases the number of NPD projects and enhances firm performance. In contrast, some scholars indicate that *improvisation*, or an experiential approach that lacks formal planning, may better increase the number of NPD projects because it motivates the impromptu acquisition and application of knowledge and intelligence, which are tangential to norms, rules, and regulations (e.g., Eisenhardt and Tabrizi, 1995; Miner, Bassoff, and Moorman, 2001; Moorman and Miner, 1998a). From this perspective, strategic planning represents an inertial force that decreases the number of NPD projects.

The purpose of our study is to provide empirical evidence on the debated role of strategic planning in generating NPD projects by answering the two questions: (1) does strategic planning increase or decrease the number of NPD projects? and (2) if so, how can a firm manage controllable organizational factors to mitigate the adverse effect of strategic planning on the number of NPD projects for better performance? Parallel to Moorman and Miner's (1998a) approach, the present study explores those questions by investigating the conditions in which strategic planning leads to a higher number of NPD projects and higher firm performance. We follow Moorman and Miner's suggestion that research should examine the contingent factors that determine the relationship between strategic planning and the number of NPD projects. We propose and empirically test a contingency model in which organizational characteristics from resource-advantage theory (i.e., firm size, R&D intensity, and organizational redundancy) moderate the relationship between strategic planning and the number of NPD projects. Our study further contributes to the examination of whether strategic planning and these organizational characteristics influence firm performance. According to the resource-advantage theory, a firm's abundant resources, when allocated and managed

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Dr. Michael Song holds the Charles N. Kimball, MRI/Missouri Endowed Chair in Management of Technology and Innovation and is Executive Director of the Institute for Entrepreneurship and Innovation at University of Missouri-Kansas City (UMKC). Dr. Song also serves as Scientific Advisor to the Institute for Governance Studies at University of Twente, the Netherlands. He received an M.S. from Cornell University and an M.B.A and Ph.D. in business administration from the Darden School at University of Virginia. Dr. Song is ranked as World's #1 Innovation Management Scholar in 2007, one of the top 20 technology management scholars in 2006, and one of the most prolific researchers in the technology innovation management field by the International Association of Technology Management in 2004 and in 2008. He has conducted research and consulted with over 300 major multinational companies and government agencies. His consulting projects include evaluating R&D projects using real options, new venture strategies and evaluation, designing product innovation processes, project risk assessment and management, designing information systems for new product development processes, evaluating the values of technology portfolios, global market opportunity analysis, R&D resource allocation and project selection, and marketing strategy. Dr. Song is associate editor of six academic journals and serves on the editorial boards of several academic journals. Dr. Song has published over 80 articles in academic journals.

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through a strategic plan, help it achieve comparative advantage by generating diverse ideas for new products that often provide valuable offerings to the target market (Dodgson, 1993; Hunt and Morgan, 1995). The resource-advantage theory also supports the view that when strategic planning enhances organizational capabilities through the deployment and reconfiguration of sufficient organizational resources (Slotegraaf and Dickson, 2004), organization members search actively for NPD projects. We test the theoretical model with two empirical data sets collected from 227 firms.

The empirical evidence suggests that more strategic planning and more NPD projects lead to better firm performance. Firms with organizational redundancy benefit more from strategic planning than firms with less organizational redundancy. Increasing R&D intensity boosts both the number of NPD projects and firm performance. Strategic planning is more effective in larger firms with higher R&D intensity for increasing the number of NPD projects.

The results reported here also consist of several findings that challenge the traditional views of strategic planning. The evidence suggests that strategic planning impedes, not enhances, the number of NPD projects. Larger firms benefit less, not more, from strategic planning for improving firm performance. Larger firms do not necessarily create more NPD projects. Increasing organizational redundancy has no effect on the number of NPD projects.

Background on Strategic Planning and NPD Projects

The importance of strategic planning receives notable emphasis in terms of innovation and new product strategies because the fate of a new product depends on how the firm establishes and executes the associated rational plan (Brown and Eisenhardt, 1995). Strategic planning, defined as a formal, administrative process that calls for an explicit procedure to determine specific, long-range objectives and generate alternative strategies, requires both strict implementation and a system to monitor results (Armstrong, 1982). Such planning represents a strategically important organizational decision-making process because it establishes the means and ends of an organization, clarifies competitive threats and opportunities, and controls and implements actions, which in turn enhance firm performance (Ackoff, 1970; Ansoff, 1991; Menon, Bharadwaj, Adidam, and Edison, 1999). Many NPD studies suggest that when companies take certain planning steps in advance, their product development cycles are faster (Griffin, 1997), failure rates are lower (Cooper and Kleinschmidt, 1986; Montoya-Weiss and Calantone, 1994), firm performance is greater (Ittner and Larcker, 1997; Song and Parry, 1997), and innovation levels are higher (Moorman and Miner, 1998a; Olson, Walker, and Ruekert, 1995). Brown and Eisenhardt (1995) concur that planning helps a firm speed up the NPD process by resolving organizational conflicts and providing a clear vision. In addition, a carefully designed, formal plan provides details and tactics that ensure the successful implementation of the innovation strategy, which also enhances firm performance (Cooper and Kleinschmidt, 1986; Eisenhardt, 1989; Miller and Cardinal, 1994; Moorman and Miner, 1998a). Christensen (1997) argues that planning based on sound market research, followed by execution that accords with that plan, provide the hallmarks of efficient strategic management. Finally, strategic planning significantly enhances the quality, speed, and productivity of NPD (Clark and Fujimoto, 1991; Hayes, Wheelwright, and Clark, 1988).

Other scholars emphasize the importance of generating NPD projects as an organizational learning process because acquiring and integrating NPD knowledge inside and outside the organization contributes to the generation of NPD projects that result in future innovations (van der Bij, Song, and Weggeman, 2003; Coombs and Hull, 1998; Hamel, 1991; Huber, 1991; Leonard-Barton, 1995; Matusik and Hill, 1998; Song, van der Bij, and Weggeman, 2005, 2006). The NPD knowledge accumulated within organizational memory guides the behavior of innovation teams when initiating and implementing NPD projects (Moorman and Miner, 1998a). Moreover, a firm's competence in participating in the ongoing NPD projects can revamp product life cycles because it provides new incentives for customers (Glazer, 1991; DeSarbo, Di Benedetto, Jedidi, and Song, 2006; DeSarbo, Di Benedetto, and Song, 2007; Di Benedetto, DeSarbo, and Song, 2008; DeSarbo, Di Benedetto, Song, and Sinha, 2004). Therefore, managing NPD knowledge to generate NPD projects represents an important first step for the fuzzy front end of NPD, which leads to conceptual or predevelopment tasks and then to prototyping, product development, and commercialization (Souder and Song, 1997, 1998; Souder, Song, and Kawamura, 1998). A firm's ability to generate knowledge specific to NPD projects thus reflects a core capability because it facilitates the acquisition and transfer of knowledge about different NPD activities, which result in innovations (Leonard-Barton, 1992; Matusik and Hill, 1998; Song

et al., 2005, 2006; van der Bij et al., 2003). Despite this abundance of research that emphasizes the importance of either strategic planning or generating new NPD projects in innovation strategies, the debate continues about whether and how strategic planning influences the generation of NPD project ideas, largely because of the limited availability of empirical research.

Theoretical Model and Research Hypotheses

To address the unresolved issues pertaining to the relationship between strategic planning and the number of NPD projects, we propose a contingency framework (Figure 1) that not only explains their direct relationship, but also shows how organizational factors identified in resource-advantage theory moderate this relationship. To clarify the contested link between strategic planning and the number of NPD projects, we focus our contingency model on the conditions in which strategic planning may increase the number of NPD projects. Whereas previous studies focus on environmental variables (i.e., market and technological turbulence) that moderate this contested link (Moorman and Miner, 1998a), our contingency model argues that organizational characteristics based on resource-advantage theory can facilitate or impede the relationship. We select the variables that best represent resource-advantage theory. Because our focus is the moderating role of resource-advantage theory variables, we do not postulate the main effects on the number of NPD projects. In order to provide a more comprehensive view in the firm, our model also examines the direct relationship between strategic planning and firm performance as well as the moderating effects of resource-advantage variables on this relationship, and it also includes product innovativeness and three environmental variables as control variables that are generally believed to influence outcomes of NPD activities.

Does Strategic Planning Increase or Decrease the Number of NPD Projects?

We adopt a competing hypothesis approach that compares two plausible alternative hypotheses (Armstrong, Brodie, and Parsons, 2001) to examine the debatable link between planning and the number of NPD projects. This approach is designed to elicit more objective and reasonable explanations from the competing perspectives. Armstrong et al. (2001) recommend the more substantial use of this method because it enhances objectivity. Many studies support its use because comparing alternative perspectives generalizes the findings by evaluating the pros and cons of the different views.

In particular, one research stream offers three main arguments to suggest that strategic planning increases the number of NPD projects. First, formal strategic

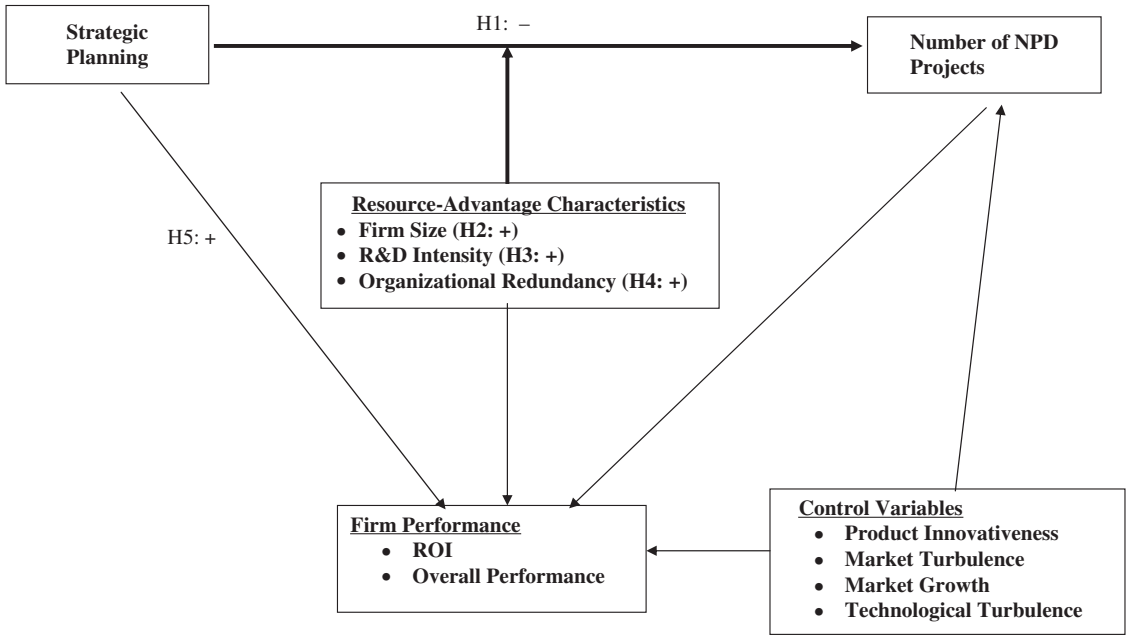

Figure 1. A Contingency Model for Examining the Effects of Strategic Planning

planning not only determines the level and direction of resources devoted to acquiring and integrating NPD knowledge from inside and outside the firm, it also enhances the synergy between the skills and resources expended for NPD activities (Dodgson, 1993; Song and Parry, 1997, 1999). This process guides the timely collection and integration of NPD knowledge, which itself can be applied to generate ideas for NPD projects. Second, strategic planning helps reduce the uncertainty and risk of NPD-related decision making because it forces the firm to review different options carefully in various business environments (Eisenhardt, 1989; Menon et al., 1999; Miller and Cardinal, 1994; Parry, Song, and Spekman, 2008; Song and Montoya-Weiss, 2001). Third, strategic planning helps create more NPD projects by enabling the firm to avoid time-consuming mistakes or inconsistent, wasteful activities through well-organized routines and frames of references, as well as the coordination of multiple actors into NP teams (Cooper and Kleinschmidt, 1986; Moorman and Miner, 1997).

In contrast, we also offer three reasons to support the view that strategic planning decreases the number of NPD projects based on recent theoretical and empirical studies. First, formal strategic planning may provide irrelevant and incomplete NPD knowledge because it cannot accommodate unexpected jolts or surprises that occur during the NPD process (Eisenhardt and Tabrizi, 1995). By its very nature, a formal strategic planning process designed to govern and control NPD activities prevents employees from being innovative because it institutes rigidities and routines to help organizational systems and memory establish structural impediments to changes against up-to-date NPD knowledge and new market trends (Leonard-Barton, 1992; Slotegraaf and Dickson, 2004). Second, innovative and entrepreneurial initiatives for NPD projects, by nature, cannot be planned precisely in advance (Hutt, Reingen, and Ronchetto, 1988; Moorman and Miner, 1998a, 1998b). Third, strategic planning promotes a culture of inertia and rigidity within which creative ideas for projects that are not part of organizational memory are often rejected (Frederickson, 1984; Miller and Cardinal, 1994; Mintzberg, 1990, 1991).

In reviewing these contradictory perspectives, we follow more recent theoretical and empirical studies and assume that the negative impact of strategic planning on NPD projects outweighs any positive impact. This decision is supported by Moorman and Miner (1998b), who indicate that an experiential approach that eschews formal planning (i.e., improvisation) helps generate more NPD projects by speeding up the ideation process. Improvisation, which they define as "the degree to which the composition and execution of an action converge in time" (Moorman and Miner, 1998b, p. 698), emphasizes simultaneous composition and execution of NPD activities without strategic planning. Because it involves an immediate response to changes during implementation of the emergent strategic plan, improvisation becomes a valuable source of flexibility and agility (Galbraith, 1990; Mintzberg, 1994). In addition, improvisation motivates the impromptu acquisition and application of NPD knowledge, which essentially helps innovation teams generate more NPD projects by increasing the speed of the NPD process in response to changes in the internal and external business environment (Eisenhardt and Tabrizi, 1995; Moorman and Miner, 1998a; Weick, 1996). A firm that emphasizes improvisation in NPD continuously, and simultaneously evaluates its activities and the outcomes of its plans and actions, then uses those evaluations to create more NPD projects that draw on resources from prior learning and strategies to fit rapidly changing market potentials, customer preferences, and environments (e.g., Chelariu, Johnston, and Young, 2002; Miner et al., 2001). Thus, in contrast to strategic planning, improvisation helps firms generate knowledge for more NPD projects because it adopts emergent organizational learning processes that involve the discovery and exploration of NPD knowledge and intelligence without planning (Moorman and Miner, 1998b). Therefore, we propose that strategic planning decreases the number of NPD projects because it prevents firms from deviating from inertia, rules, industry norms, and regulations, regardless of the positive effects it may have on idea generation. Formally, we hypothesize:

H1: Strategic planning decreases the number of NPD projects.

Contingency Factors from Resource-Advantage Theory

The resource-advantage theory (Hunt and Morgan, 1995) suggests that a firm's emphasis on the value of its resources helps it establish comparative advantage and enables it to provide new and valuable offerings to the target market (Anderson, 1982; Homburg, Workman, and Krohmer, 1999; Pfeffer and Salancik, 1978). The resource-advantage theory has received significant attention recently since firms in dynamic markets must demonstrate the management capability to coordinate and redeploy their core internal and exter-

nal resources effectively to accommodate rapid and flexible NPD that meets changing market demands. Thus, past studies have expanded the resource-advantage theory to include dynamic capabilities that firms continue to acquire and configure as markets emerge, collide, split, evolve, and die (Eisenhardt and Martin, 2000; Teece, Pisano, and Shuen, 1997).

In examining the relationship between strategic planning and the number of NPD projects, we suggest that the organization's capabilities that represent sufficient organizational resources (i.e., organizational resource factors) can enhance the relationship in several ways. First, when supported by abundant resources, a firm's capabilities to plan NPD projects provide its innovation teams with the access to up-to-date market and technological information of the competitive new products and motivate them to take initiatives for innovations (Di Benedetto and Song, 2003; Parry et al., 2008; Song, Podoynitsyna, van der Bij, and Halman, 2008; Song and Xie, 2000; Thieme, Song, and Calantone, 2000). The firm's capabilities that align strategic planning with adequate physical, financial, and human resources enable the firm to formulate a value-creating strategy that develops competitive advantages that cannot be simultaneously implemented or adopted by competitors (Barney, 1991; Hunt and Morgan, 1995; Song, Di Benedetto, and Zhao, 1999). Second, the high level of resources allocated to and invested in NPD projects signals the high priority and importance the strategic planning process places on NPD projects, which motivates employees to collect and integrate customer and technical knowledge for NPD projects. Third, with adequate resources, strategic planning is flexible in exploring and monitoring different options and opportunities, since slack resources allow higher margin of error and permit employees to take more inherently risky initiatives toward innovations. When a firm has abundant resources for NPD projects, the employees are less likely to be derided for the failure of their product ideas. Therefore, they are more likely to undertake risky NPD projects. In light of the positive impact of abundant resources from the resource-advantage theory, we hypothesize those organizational factors that measure the sufficiency of resources—firm size, R&D intensity, and organizational redundancy—and help strategic planning generate more NPD projects.

Firm Size. Among many different measures for firm size (i.e., sales, assets, number of employees), we use the number of employees because it is the most commonly used measure in NPD research (Chandy and Tellis, 2000; Cohen and Levin, 1989; Song et al., 2008). We propose that a firm's size reflects the abundance of its resources. For example, Chandy and Tellis (2000) show that large firms have produced significantly more radical products than small firms. Moreover, large firms are willing to generate more radical ideas by establishing a strategic plan that includes cannibalizing existing products (Chandy and Tellis, 1998). The larger the firm is, the more human, physical, and financial resources it can deploy to implement its strategic planning beyond existing rules and norms, which improves its chances of increasing the number of NPD projects. In addition, a large firm tends to implement its strategic planning with flexibilities, which helps employees explore more alternatives and opportunities and thereby improves the odds of creating more NPD projects. Therefore, we hypothesize,

H2: The effect of strategic planning on the number of NPD projects is stronger in larger firms than in smaller firms.

R&D Intensity. We define R&D intensity as the firm's R&D expenditures as percentage of total revenue. As one of a firm's resources, R&D intensity should positively moderate the link between strategic planning and the number of NPD projects. Financial resources dedicated to R&D enable the strategic planning to exercise different engineering and technical options to create more NPD projects (Dodgson, 1993). Furthermore, a relatively large R&D expenditure helps a firm generate more NPD projects for radical products because it can implement strategic planning to search for scientific breakthroughs by investing in risky, uncertain technologies (Chandy and Tellis, 2000).

High R&D intensity implies that the firm can afford to actively collect and research up-to-date market and technological knowledge and it allows strategic planning to explore alternative options and risky opportunities (van der Bij et al., 2003). In addition, the higher R&D budget permits the firm to commit human, physical, and financial resources to effectively explore the different NPD projects as a part of strategic planning, which lead to greater number of NPD projects. Hence, we hypothesize a positive moderating effect of R&D intensity, as follows:

H3: The effect of strategic planning on the number of NPD projects is stronger in firms with high R&D intensity than firms with low R&D intensity.

Organizational Redundancy. Organizational redundancy refers to the intentional overlap of company skills and resources, company information, business activities, and management responsibilities (Nonaka, 1994). Similar to the size of the firm and its R&D intensity, organizational redundancy reflects an abundance of resources and may positively influence the link between strategic planning and the number of NPD projects. Organizational redundancy helps a firm implement the strategic plan to collect and integrate knowledge through communication and collaboration across functional groups (Nonaka, 1994). In addition, organizational redundancy motivates employees from different functional groups to explore different perspectives and options to create new initiatives in strategic planning and can highlight the significance of the NPD projects. Finally, organizational redundancy indicates a firm's commitment to deploying its human, physical, and financial resources for NPD projects, which again encourages the strategic plan to explore options and opportunities and thereby generates diverse NPD projects. Therefore, we hypothesize,

H4: The effect of strategic planning on the number of NPD projects is stronger in firms with high organizational redundancy than in firms with low organizational redundancy.

Does Strategic Planning Enhance or Impede Firm Performance?

It has been traditionally believed that strategic planning enhances a firm's growth and financial performance (e.g., Ansoff, 1991; Drucker, 1954). A carefully designed, formal strategic plan provides details and tactics that ensure the successful implementation of the innovation strategy, which also enhances firm performance (Cooper and Kleinschmidt, 1986; Eisenhardt, 1989; Miller and Cardinal, 1994; Moorman and Miner, 1998a). Such planning reflects a strategically important organizational decision-making process because it establishes the means and ends of an organization, clarifies competitive threats and opportunities, and controls and implements actions, which in turn enhance firm performance (Ackoff, 1970; Ansoff, 1991; Menon et al., 1999). In a recent study of planning and innovation success, Salomo, Weise, and Gemünden (2007) find a positive impact of proficient business planning on innovation success. They argue that planning gives a better understanding of the business case of the intended innovation. In building such a business case, the fit between the firm's competences and the intended product is discussed as one of the main potential drivers of success. In general, planning leads to more rationality in the decision processes, more involvement of team members in that process, and an increased possibility to share rich information, which enhances firm performance.

Therefore, we hypothesize,

H5: Strategic planning enhances firm performance.

Control Variables

To control the possible effects of other variables on dependent variables, we include four additional variables—product innovativeness, market turbulence, market growth, and technological turbulence—that are generally believed to influence outcomes of NPD activities. Product innovativeness, defined as the degree to which the products are innovative to the firm, industry, and market, may affect the number of NPD projects and firm performance. For example, the degree of innovativeness, which often ranges from radical to incremental during NPD, often determines the number of NPD projects initiated and firm performance as evidenced by the meta-analysis (Im and Workman, 2004; Szymanski, Kroff, and Troy, 2007). Technological turbulence has been found to be positively related to NPD outcomes and new product performance (Calantone, Garcia, and Dröge, 2003), as does market turbulence (Baker and Sinkula, 2005). Finally, market growth has been found to significantly enhance NPD outcomes and firm performance (e.g., Brown and Eisenhardt, 1995; Miller and Friesen, 1977; Zirger and Maidique, 1990).

Research Methodology

Study Measures

All study measures were adopted from well-validated measures (see Appendix for measurement items and the sources). To assess the appropriateness of the existing measures for the context of this research, we conducted in-depth interviews with 22 senior executives from seven organizations in the pre-test stage. After some minor modifications of the survey format and several items, we developed the final surveys for this study. The unit of analysis is the strategic business

unit (SBU), and we asked survey respondents to refer to NPD projects of all NPD teams governed by their own SBUs when they filled out the survey.

Dependent Variable. We measure the dependent variable, the number of NPD projects, by the number of NPD projects initiated during the previous 12 months at the SBU level. We adopt this objective measure to avoid the common method bias that can result from using perceptual measures for both independent and dependent variables. To examine whether the number of NPD projects really matters for NPD outcomes, we also collected firm performance data: return on investment (ROI) and subjective overall performance (Song and Parry, 1997). The three-item subjective overall performance scale was adopted from Song and Parry (1997). The scale consists of three performance measures relative to firm objectives.

Independent Variables. Strategic planning refers to a formal process that calls for an explicit procedure to determine specific, long-range objectives and generate alternative strategies (Armstrong, 1982). Moreover, it requires a strict implementation of the plan and an explicit system to monitor the results (Armstrong, 1982). We adopt a well-validated five-item Likert-type scale from Armstrong (1982) to measure the extent to which planning reflects a formal decision-making process, the extent to which the strategic plan is strictly implemented, and whether it includes an explicit process for determining specific, long-range objectives and a process for generating alternative strategies. Moreover, we measure the availability of an explicit system to monitor the results of the strategic plan.

Resource-Advantage Variables. Firm size is measured by the natural logarithm of the number of employees (Chandy and Tellis, 2000; Cohen and Levin, 1989). For R&D intensity, we use R&D expenditures as a percentage of the total revenue. Organizational redundancy is defined as the conscious overlap of company skills and resources, company information, business activities, and management responsibilities and is measured by a four-item Likert-type scale adapted from Nonaka (1994).

Control Variables. Product innovativeness is measured with a three-item scale adopted from Song and Parry (1997). Market turbulence, market growth, and technology turbulence are multi-item scales adopted form Jaworski and Kohli (1993).

Data Collection Procedures

We drew 686 firms from the *High-Technology Industries Directory* for the final sampling frame in the cross-sectional survey, after verifying correct contact information by phone. In administering the mail survey, we followed the total design method for survey research (Dillman, 1978). To reduce potential common method biases, the data for this study were collected from multiple sources through two different data collections. For the first-wave data collection, we sent a first mailing packet with a personalized letter, an express postage-paid envelope with an individually typed return-address label, and the first survey questionnaire to a senior marketing manager to collect information about the independent variable (i.e., strategic planning), R&D intensity (i.e., R&D expenditures as percentage of the total revenue), size of the firm (i.e., the number of employees), organizational redundancy, product innovativeness, market turbulence, market growth, and technology turbulence. We sent up to three follow-up letters, including another questionnaire with a reminder letter to each firm that did not respond after three weeks. To increase the response rate, we offered a free one-day executive seminar in our executive education programs to all participating firms.

For the second-wave data collection, one year after the first data collection, we collected follow-up data on the number of NPD projects initiated by the firm in the past 12 months, firm performance, and return on investment from the same marketing manager. From the original sample of 686 firms, we collected 227 matched sets of data from each firm (33% response rate). The final sample included companies in the following industries: telecommunications equipment; semiconductors and computer-related products; software-related products; Internet-related services and equipment; instruments and related products; electronic and electrical equipment; pharmaceuticals, drugs, and medicines; and industrial machinery and equipment.

To test for possible non-response bias, we followed the extrapolation method of Armstrong and Overton (1977) comparing early (responses received within three weeks of the initial mailing) and late responses on the major constructs in the model. The results indicate no significant differences at a 95% confidence interval. We also compared respondent and non-respondent firms in terms of number of employees using the secondary data. The results again indicate no significant differences at a 95% confidence interval. We therefore conclude that non-response bias does not exist and that the results may be generalized to firms that did not respond.

Analyses and Results

Before testing our hypotheses, we carry out principal factor analyses on multi-item scales and retain measures for each construct according to the following criteria: (1) each measure must have a loading of greater than 0.5; (2) each measure must not have a loading of greater than 0.4 to more than one factor; (3) each measure must load into the correct factor. Table 1 presents descriptive statistics. The final factor loadings are provided in Table 2.

The final set of scale items and construct reliability are provided in the Appendix. The results indicate that all multiple-item constructs have good reliabilities with coefficient αs between 0.78 and 0.99. We use hierarchical regression models to test the hypotheses. For each of the multi-item variables, we use the respondents' ratings of the relevant items of each construct and divide them by the number of items to obtain the composite scale for each variable. We mean-center all variables, as recommended by Aiken and West (1991) to test interaction effects. Our application of Belsley, Kuh, and Welsch's (1980) multicollinearity diagnostic test indicates no serious multicollinearity problems in the mean-centered regression models (all Condition Indices <30, and all Variance Inflation Factors <10).

Table 3 reports the results of three hierarchical regressions for the number of NPD projects. Model 1, which contains the four control variables, has an R-square of 0.05 and the F statistic (2.71) is significant ($p<0.05$). Model 2 includes the four control variables plus the strategic planning, log (firm size), R&D intensity, and organizational redundancy variables. The R-square of Model 2 is 0.09 and the F statistic (2.86) is significant ($p<0.05$). Model 3 adds the three interaction variables from the resource-advantage theory into Model 2. The R-square of Model 3 is 0.19 and the F statistic (4.56) is significant ($p<0.05$).

Examining the results in Table 3 reveals three consistent results. First, the effect of strategic planning on the number of NPD projects is negative and significant for both Model 2 and Model 3 ($p<0.10$). Therefore, as predicted by H1, strategic planning reduces the number of NPD projects. Second, although we did not hypothesize the main effects of moderating variables, the results indicate that R&D intensity has a positive and significant effect on the number of NPD projects ($p<0.05$). Third, among the four control variables, market growth is the only variable that has a positive and significant effect on the number of NPD projects ($p<0.05$). The coefficients of the

Table 1. Descriptive Statistics

	Mean (Standard Deviation)	1	2	3	4	5	6	7	8	9	10	11
1. Number of NPD Projects	40.30 (9.98)	1.00										
2. Strategic Planning	4.42 (1.32)	−0.10	1.00									
3. Log (Firm Size)	5.73 (0.87)	0.02	−0.05	1.00								
4. R&D Intensity	11.09 (5.86)	0.18**	0.24**	0.01	1.00							
5. Organizational Redundancy	5.13 (1.23)	−0.01	0.33**	−0.03	0.33**	1.00						
6. Overall Performance	3.89 (1.14)	0.44**	0.28**	−0.02	0.41**	0.45**	1.00					
7. ROI	39.87 (27.93)	0.42**	0.33**	−0.04	0.36**	0.43**	0.83**	1.00				
8. Product Innovativeness	4.53 (1.29)	−0.07	0.35**	−0.02	0.30**	0.37**	0.24**	0.28**	1.00			
9. Market Turbulence	4.58 (1.21)	−0.01	0.18**	0.12*	0.30**	0.45**	0.33**	0.24**	0.32**	1.00		
10. Market Growth	3.68 (1.55)	0.16*	0.19**	−0.00	0.31**	0.35**	0.35**	0.34**	0.25**	0.39**	1.00	
11. Technological Turbulence	4.54 (1.70)	0.11	0.18**	−0.03	0.32**	0.27**	0.27**	0.27**	0.21**	0.31**	0.46**	1.00

For multiple-item measures, descriptive statistics are based on the average scores of the composite scales.
* Significant at $p<0.05$;
** Significant at $p<0.01$.

Table 2. Factor Loadings from Factor Analysis

	Strategic Planning	Overall Performance	Market Turbulence	Market Growth	Product Innovativeness	Organizational Redundancy	Technological Turbulence
Plan1	**0.97**	0.11	0.04	0.07	0.11	0.10	0.04
Plan4	**0.97**	0.10	0.03	0.06	0.11	0.10	0.05
Plan3	**0.97**	0.10	0.03	0.05	0.12	0.10	0.04
Plan2	**0.97**	0.08	0.07	0.05	0.11	0.08	0.05
Plan5	**0.96**	0.10	0.03	0.06	0.13	0.11	0.06
Perf1	0.11	**0.92**	0.11	0.12	0.04	0.15	0.07
Perf3	0.16	**0.89**	0.14	0.15	0.06	0.14	0.11
Perf2	0.13	**0.89**	0.11	0.13	0.10	0.19	0.05
MT2	−0.05	0.01	**0.84**	0.09	0.09	0.04	−0.02
MT1	0.01	0.13	**0.83**	0.05	0.14	0.20	0.17
MT3	0.32	0.15	**0.68**	0.11	0.16	0.07	0.13
MT4	−0.01	0.14	**0.58**	0.30	0.00	0.28	0.04
MG2	0.11	0.05	0.03	**0.84**	0.14	0.03	0.23
MG1	0.04	0.16	0.16	**0.81**	0.02	0.06	0.12
MG3	0.07	0.17	0.23	**0.71**	0.06	0.22	0.13
PI1	0.07	0.01	0.15	−0.02	**0.86**	0.04	−0.02
PI3	0.22	0.12	0.11	0.05	**0.81**	0.14	0.17
PI2	0.23	0.07	0.08	0.25	**0.78**	0.18	0.02
OR2	0.14	0.25	0.22	0.09	0.19	**0.80**	0.13
OR4	0.05	0.09	0.25	0.25	0.02	**0.76**	0.10
OR1	0.27	0.21	0.04	−0.01	0.18	**0.69**	−0.01
TT3	0.06	0.07	0.06	0.21	0.07	0.15	**0.88**
TT2	0.10	0.13	0.19	0.24	0.05	0.02	**0.85**

The meaning of each question in the first column is shown in the Appendix.
Bold numbers indicate that the measures loaded to the factor.

remaining control variables are not significant at the 0.05 level ($p<0.05$).

We perform an incremental *F*-test to examine differences between Model 2 and Model 3. The test suggests that Model 3 is a significant improvement over Model 2 ($p<0.05$). Therefore, the results suggest that the negative relationship between strategic planning and the number of NPD projects is moderated by the three resource-advantage theory variables. Furthermore, the coefficient for firm size is positive ($\beta = 1.26$) and significant ($p<0.05$). The coefficient for R&D intensity is also positive ($\beta = 0.34$) and significant ($p<0.01$). These results provide empirical support for H2 and H3. Contrary to H4, we do not find empirical support for the positive moderating effect of organizational redundancy on the relationship between strategic planning and number of NPD projects. Therefore, H4 is not supported.

To test H5 and to examine for possible effect on the number of NPD projects and firm performance, we perform additional hierarchical regression analyses using ROI and subjective overall performance as dependent variables. To be consistent with the earlier analyses, we also include all the variables of the earlier regression models as control variables. The results are presented in Tables 4 and 5. The *R*-square of ROI final regression (Model 3) is 0.47 and the *F* statistic (16.12) is significant at the 99 % level of confidence. The *R*-square of overall performance final regression is 0.48 and the *F* statistic (16.66) is again significant at the 99 % level of confidence.

H5 predicts that strategic planning has a positive effect on firm performance. The results in both Table 4 and Table 5 support this hypothesis ($p<0.01$). While strategic planning is found to have a negative effect on the number of NPD projects, it has a positive effect on ROI ($\beta = 4.84$, $p<0.01$) and overall firm performance ($\beta = 0.14$, $p<0.01$). Therefore, H5 is supported by our data.

The empirical results in Tables 4 and 5 also suggest that increasing the number of NPD projects increases ROI ($\beta = 1.17\%$, $p<0.01$) and overall performance ($\beta = 0.05$, $p<0.01$). These results provide important justification for studying determinants of the number of NPD projects initiated by the firms.

Discussion

Does strategic planning increase or decrease the number of NPD projects? In response to the debate, this study developed a contingency model in which organizational characteristics from the resource-advantage theory moderate the relationship between strategic planning and the number of NPD projects. Overall,

Table 3. Results from Hierarchical Regression Analyses

	Model 1 Coefficient Estimate (Standard Error)	Model 2 Coefficient Estimate (Standard Error)	Model 3 Coefficient Estimate (Standard Error)
Intercept	0.00	0.00	−0.90
	(0.65)	(0.64)	(0.66)
Strategic Planning		−0.96*	−0.98*
		(0.54)	(0.52)
Log (Firm Size)		0.23	−0.06
		(0.75)	(0.71)
R&D Intensity		0.37***	0.27**
		(0.12)	(0.12)
Organizational Redundancy		−0.31	0.04
		(0.64)	(0.61)
Strategic Planning × Log (Firm Size)			1.26**
			(0.61)
Strategic Planning × R&D Intensity			0.34***
			(0.09)
Strategic Planning × Organizational Redundancy			0.64
			(0.41)
Product Innovativeness	−0.89	−0.83	−0.78
	(0.54)	(0.57)	(0.55)
Market Turbulence	−0.54	−0.70	−0.65
	(0.61)	(0.64)	(0.61)
Market Growth	1.17**	1.09**	1.16**
	(0.50)	(0.50)	(0.49)
Technological Turbulence	0.43	0.28	0.29
	(0.44)	(0.44)	(0.43)
F value	2.71	2.86	4.56
R^2	0.05	0.09	0.19

Dependent Variable: Number of NPD Projects; N = 227.
* Significant at $p < .10$ (2-tail test);
** Significant at $p < .05$ (2-tail test);
*** Significant at $p < .01$ (2-tail test).

our empirical findings provide support for the hypothesized relationships in our proposed contingency model. Consistent with H1, we find a negative and significant relationship between strategic planning and the number of NPD projects, in support of Moorman and Miner's (1998a, 1998b) claim that improvisation represents an experiential, emergent learning process rather than an institutional process and therefore provides a viable path to generating NPD projects.

Does this finding mean that strategic planning is always bad for the number of NPD projects? In our search of conditions in which strategic planning may be beneficial, we empirically test a contingency model, in which resource-advantage theory variables moderate the effect of strategic planning on the number of NPD projects. The results in Table 3 suggest that firm size and R&D intensity positively moderate the negative effect of strategic planning on the number of NPD projects. Figure 2 further presents the interaction effects between firm size and strategic planning and between R&D intensity and strategic planning on the number of NPD projects. The results in Figure 2 clearly show that large firms benefit more from strategic planning than smaller firms do. In addition, firms with high R&D intensity also benefit from strategic planning more than the firms with low R&D intensity. However, small firms with low R&D intensity may suffer from the role of formal strategic planning in decreasing the number of NPD projects. These empirical findings imply that a firm's strategic planning, when supported by abundant resources reflected by firm size and R&D intensity, enhances the synergy between its resources and skills and its ability to generate NPD projects for innovations (Dodgson, 1993; Nelson and Winter, 1982; Nonaka, 1994; Zucker, 1987).

The positive moderating effect of firm size also supports Chandy and Tellis's (2000) reasoning that larger firms with sufficient resources are more motivated to establish strategic planning that provides incentives for employees to generate NPD projects. In a large firm, strategic planning encourages employees to generate NPD projects, especially if it uses its abundant human, physical, and financial resources to

Table 4. Results from Hierarchical Regression Analyses

	Model 1 Coefficient Estimate (Standard Error)	Model 2 Coefficient Estimate (Standard Error)	Model 3 Coefficient Estimate (Standard Error)
Intercept	0.00	0.00	− 1.07
	(1.70)	(1.41)	(1.49)
Number of NPD Projects		1.16***	1.17***
		(0.15)	(0.15)
Strategic Planning		4.47***	4.84***
		(1.19)	(1.18)
Log (Firm Size)		− 1.04	− 1.14
		(1.64)	(1.61)
R&D Intensity		0.41	0.51*
		(0.28)	(0.28)
Organizational Redundancy		6.07***	6.41***
		(1.40)	(1.38)
Strategic Planning × Log (Firm Size)			− 2.98**
			(1.39)
Strategic Planning × R&D Intensity			− 0.01
			(0.21)
Strategic Planning × Organizational Redundancy			1.71*
			(0.93)
Product Innovativeness	3.96***	1.89	1.37
	(1.42)	(1.26)	(1.25)
Market Turbulence	1.55	0.02	− 0.22
	(1.60)	(1.41)	(1.39)
Market Growth	3.91***	1.38	2.05*
	(1.31)	(1.11)	(1.12)
Technological Turbulence	1.78	0.46	− 0.15
	(1.15)	(0.97)	(0.97)
F value	11.34	19.57	16.12
R^2	0.17	0.45	0.47

Dependent Variable: Return on Investment; N = 227.
* Significant at $p < .10$ (2-tail test);
** Significant at $p < .05$ (2-tail test);
*** Significant at $p < .01$ (2-tail test).

explore different options and opportunities for NPD projects. In a similar vein, R&D intensity facilitates the impact of strategic planning on creating NPD projects. Greater R&D intensity helps strategic planning create more NPD projects because it enables firms to invest in scientific breakthroughs that inherently involve high financial risk (Chandy and Tellis, 2000; Dodgson, 1993).

Finally, our additional analysis confirms the positive direct effects of strategic planning on ROI and overall performance measures, which supports the conventional wisdom of the positive role of strategic planning in firm performance (Ansoff, 1991; Drucker, 1954).

Theoretical Implications

Our research provides both empirical evidence and theoretical insights into a contingent framework where a firm's resource-advantage factors moderate the relationship between strategic planning and the number of NPD projects. We clarify the debate about whether strategic planning, in lieu of improvisation, enhances or impedes the number of NPD projects through a competing hypothesis approach (Armstrong et al., 2001; Miller and Cardinal, 1994; Mintzberg, 1991). Our results provide a counterexample that supports the view that unplanned NPD activities, as an emergent learning process in favor of improvisation, contribute to a firm's capabilities to generate divergent NPD projects (Burgelman, 1983; Eisenhardt and Tabrizi, 1995; Hutt et al., 1988; Moorman and Miner, 1998a, 1998b). Our follow-up analysis further shows that strategic planning and the number of NPD projects significantly enhances new product performance reflected by ROI and overall firm performance. These results respond to the question of whether setting up strategic planning and creating NPD projects really matters for the firm performance, even though the relationship between strategic planning and the number of NPD projects is negative.

Table 5. Results from Hierarchical Regression Analyses

	Model 1 Coefficient Estimate (Standard Error)	Model 2 Coefficient Estimate (Standard Error)	Model 3 Coefficient Estimate (Standard Error)
Intercept	−0.14**	−0.14**	−0.17***
	(0.07)	(0.06)	(0.06)
Number of NPD projects		0.05***	0.05***
		(0.01)	(0.01)
Strategic Planning		0.13***	0.14***
		(0.05)	(0.05)
Log (Firm Size)		−0.04	−0.05
		(0.07)	(0.07)
R&D Intensity		0.03***	0.03**
		(0.01)	(0.01)
Organizational Redundancy		0.26***	0.26***
		(0.06)	(0.06)
Strategic Planning × Log (Firm Size)			−0.08
			(0.06)
Strategic Planning × R&D Intensity			0.01
			(0.01)
Strategic Planning × Organizational Redundancy			0.01
			(0.04)
Product Innovativeness	0.09	0.01	0.00
	(0.06)	(0.05)	(0.05)
Market Turbulence	0.18***	0.11*	0.10*
	(0.06)	(0.06)	(0.06)
Market Growth	0.15***	0.04	0.06
	(0.05)	(0.04)	(0.05)
Technological Turbulence	0.06	0.00	−0.01
	(0.05)	(0.04)	(0.04)
F Value	12.33	21.72	16.66
R^2	0.18	0.47	0.48

Dependent Variable: Overall Performance; N = 227.
* Significant at $p < .10$ (2-tail test);
** Significant at $p < .05$ (2-tail test);
*** Significant at $p < .01$ (2-tail test).

Implications for NPD Managers

Managers should be aware that, in general, formal strategic planning decreases the number of NPD projects for innovation management. Improvised rather than planned activities are more conducive to create NPD project ideas, as Moorman and Miner (1998a, 1998b) assert. Moreover, innovations tend to emerge from improvisational processes, during which the impromptu execution of NPD activities without planning spurs "thinking outside the box," which enhances the process of creating NPD project ideas. Therefore, more flexible strategic plans that accommodate potential improvisation may be needed in NPD management since innovation-related activities cannot be planned precisely due to the unexpected jolts and contingencies of the NPD process (Eisenhardt and Tabrizi, 1995; Moorman and Miner, 1998a).

Given the negative effect of strategic planning on the generation of NPD project ideas, should managers give up the formal process of strategic planning? In response to this question, our contingency model suggests that managers should note that strategic planning is more effective in increasing number of NPD projects in larger firms with abundant R&D resources, consistent with the findings of Chandy and Tellis (2000). Large firms with high levels of R&D intensity can overcome the negative effect of strategic planning on the number of NPD projects. Specifically, a firm's abundant resources, when allocated and deployed for NPD activities, signal the high priority and importance of the NPD activities and thus motivate employees to acquire, collect, and gather customer and technical knowledge, which leads to creating more NPD projects.

Our results from additional analyses also show that, in general terms, strategic planning and the number of NPD projects initiated enhances ROI and overall firm performance. These results imply that managers must understand that managing strategic planning and generating NPD project ideas are beneficial to the ultimate outcome of firm performance despite the adverse

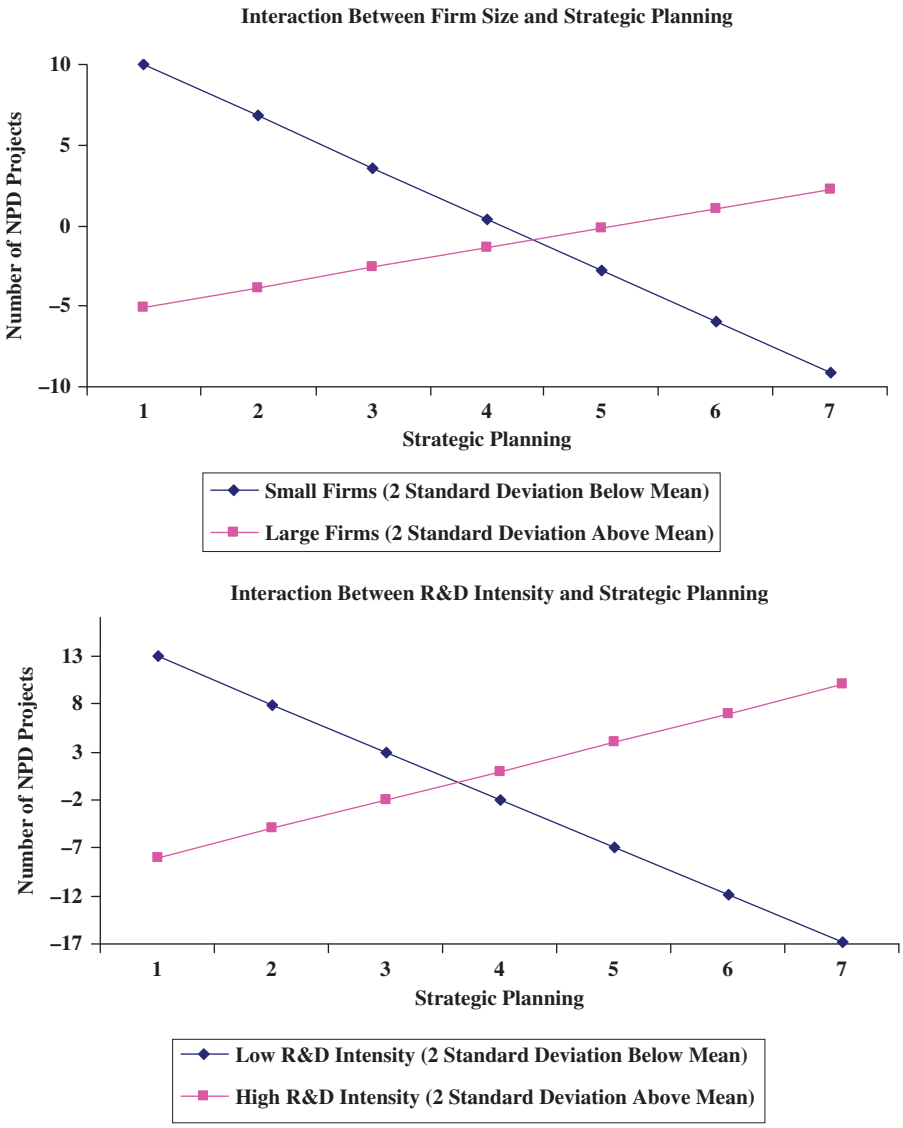

Figure 2. Interaction Effects

relationship between strategic planning and the number of NPD projects.

Limitations and Future Research Directions

Our study has several limitations. First, this study is limited to the specific sample we chose. Because it includes only firms in high-tech industries, it may exclude certain aspects of the generation processes of NPD projects that are common in other industries. Testing our model in other industries (e.g., consumer product or service industries) would help generalize these findings across sectors.

Second, we suggest a contingency framework that explains how resource-advantage theory factors moderate the impact of strategic planning on the number of NPD projects. Additional research also should include other variables from different theoretical backgrounds (e.g., institutional theory) as suggested by previous literature (e.g., Ansoff, 1991; Armstrong, 1982; Moorman and Miner, 1998a).

Third, we tested the direct impact of strategic planning on the number of NPD projects to provide empirical evidence about this widely debated relationship. Our findings not only provide insights into this debate (Armstrong, 1982; Miller and Cardinal, 1994; Mintzberg, 1991), but also show empirical evidence of the significant positive relationship between the number of NPD projects and firm performance. Although strategic planning has an adverse effect on the number of NPD projects, further study must address its impact on other dependent variables (e.g., product competitive advantage, pioneering advantage).

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Appendix. Study Measures

Dependent Variables (the data were collected one year after the first data collection):

ROI = Return on investment in this business unit (in %)

Overall Performance: Adopted from Song and Parry (1997). (Construct Reliability = 0.94)

Please rate the extent to which your business unit has achieved the following outcomes during the last year. (Eleven-point scale, where 1 = low and 7 = high)

Perf1. Overall profit margin relative to the objective for this business unit
Perf2. Overall sales relative to the objective for this business unit
Perf3. Overall return on investment relative to the objective for this business unit

Number of NPD Projects: Number of new product development projects initiated in the past 12 months at your strategic business unit.

Independent Variables (the data were collected from first data collection):

Strategic Planning: Adapted from Armstrong (1982). (Construct Reliability = .99)

Plan1. In our strategic business unit, our strategic planning process is (1 = a very informal process; 7 = a very formal process).
Plan2. In our strategic business unit, we are expected to strictly implement our strategic plan (1 = we have flexibility in the implementation; 7 = we are supposed to strictly implement our strategic plan).
Plan3. In our strategic business unit, our strategic planning process includes (1 = a very vague process; 7 = a very explicit process) for determining specific long-range objectives.
Plan4. In our strategic business unit, our strategic planning process contains (1 = a very vague procedure; 7 = a very explicit procedure) for generating alternative strategies.
Plan5. As part of our strategic planning process, we (1 = do not have an explicit system; 7 = have an explicit system) for monitoring the results of our strategic plan.

Firm Size: Total number of employees (adopted from Chandy and Tellis, 2000)

R&D Intensity: R&D expenditures as percentage of the total revenue (in %)

Organizational Redundancy: Adapted from Nonaka (1994). (Construct Reliability = .78)
Or1. Organizational redundancy is a characteristic of our firm (1 = strongly disagree; 7 = very strongly agree).
Or2. The degree of overlapping of skills and resources in this organization is (1 = none; 7 = very high).
Or4. The degree of overlapping of business activities across different divisions/departments in our company is (1 = none; 7 = very high).

Control Variables (the data were collected from first data collection):

Product Innovativeness: Adapted from Song and Parry (1997). (Construct Reliability = 0.83)

PI1. Most of our new products introduced in the past three years relied on technology which has never been used in the industry before.
PI2. Our products are perceived as highly innovative—totally new to the market.
PI3. Most of our new products introduced in the past three years were totally new to our company.

Market Turbulence: Adopted from Jaworski and Kohli (1993). (Construct Reliability = 0.79)

MT1. In our kind of business, customers' product preferences change quite a bit over time.
MT2. Our customers tend to look for new products all the time.

MT3. We are witnessing demand for our products and services from customers who never bought them before.
MT4. New customers tend to have product-related needs that are different from those of our existing customers.

***Market Growth*:** Adopted from Jaworski and Kohli (1993). (Construct Reliability = 0.80)

MG1. Sales growth in this industry is high.
MG2. The market is growing at a very high rate.
MG3. The demand for products in this industry increases rapidly.

Technological Turbulence: Adopted from Jaworski and Kohli (1993).
(Construct Reliability = 0.82)

* TT1. Technological developments in our industry are rather minor. (R)
TT2. The technology in our industry is changing rapidly.
TT3. It is very difficult to forecast where the technology in our industry will be in the next two to three years.

Notes: * *indicates that the item was deleted based on item-to-total correlation and factor analysis. (R) indicates that the item is reversed coded.*