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Managing the Exploitation/Exploration Paradox: The Role of a Learning Capability and Innovation Ambidexterity

Hsing-Er Lin, Edward F. McDonough III, Shu-Jou Lin, and Carol Yeh-Yun Lin

Some researchers have proposed that practices facilitating learning and knowledge transfer are particularly important to innovation. Some of the practices that researchers have studied include how organizations collaborate with other organizations, how organizations promote learning, and how an organization's culture facilitates knowledge transfer and learning. And while some have proposed the importance of combining practices, there has been a distinct lack of empirical studies that have explored how these practices work together to facilitate learning and knowledge transfer that leads to the simultaneous achievement of incremental and radical innovation, what we refer to as innovation ambidexterity (IA). Yet, a firm's ability to combine these practices into a learning capability is an important means of enabling them to foster innovation ambidexterity.

In this study, learning capability is defined as the combination of practices that promote intraorganizational learning among employees, partnerships with other organizations that enable the spread of learning, and an open culture within the organization that promotes and maintains sharing of knowledge. This paper examines the impact of this learning capability on innovation ambidexterity and innovation ambidexterity's effect on business performance. The resource-based view (RBV) of the firm is used to develop a conceptual foundation for combining these practices. This study empirically examines whether these practices constitute a learning capability by analyzing primary data gathered from 214 Taiwanese owned strategic business unit (SBUs) drawn from several industries where innovation is important.

The results of this study make four important contributions. First, they demonstrate that the combination of these practices has a greater impact on innovation ambidexterity than any one practice individually or when only two practices are combined. Second, the results demonstrate a relationship between innovation ambidexterity and business performance in the form of revenues, profits, and productivity growth relative to competitors. Third, the results suggest that innovation ambidexterity plays a mediating role between learning capability and business performance. That is, learning capability has an indirect impact on business performance by facilitating innovation ambidexterity that in turn fosters business performance. This study also contributes to our understanding of ambidexterity literature in a non-Western context, i.e., Taiwan.

Introduction

> *The test of a first-rate intelligence is the ability to hold two opposing ideas in mind at the same time and still retain the ability to function.*—F. Scott Fitzgerald

Just as juggling paradoxes is the test of a first-rate intelligence, so too is it a test of successful companies. It has become clear that success requires companies to be equally adept at engaging in different types of innovation at the same time. Too much focus on incremental product development and the firm runs the risk of becoming obsolete. But too much focus on radical innovation runs the risk of bankrupting the company before it has the chance to profit from its investment. For many firms, perhaps most, succeeding in the long term means finding the right way to undertake incremental and radical innovation at the same time. But, identifying the "right" way is not a simple task, and indeed, has consumed researchers for quite some time. Researchers who have focused on this task have been drawn to the notion of ambidexterity to help resolve this paradox.

Ambidexterity has traditionally referred to the ability to do two things at the same time (Gibson and Birkinshaw, 2004; He and Wong, 2004; Lubatkin, Simsek, Ling, and Veiga, 2006; McDonough and Leifer, 1983; Simsek, 2009). But increasingly, researchers have used the notion of ambidexterity to refer to a firm's ability to engage in exploratory activities leading to radical innovation on the

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one hand and exploitative activities leading to incremental innovation on the other (Gibson and Birkinshaw, 2004; He and Wong, 2004; Lubatkin et al., 2006; Smith and Tushman, 2005; Tushman and O'Reilly, 1996). The importance of exploration and exploitation lies in their potential for improving business performance and sustaining competitive advantage by enabling incremental and radical innovation (cf. Gibson and Birkinshaw, 2004; He and Wong, 2004).

March (1991) has noted however, that these two activities compete for the same pool of scarce resources which has often resulted in firms favoring one at the expense of the other. Thus, the challenge facing firms and researchers is to discover how to leverage a firm's capabilities in ways that will enable it to successfully engage in both types of activities simultaneously. Some researchers suggest that it is possible to balance the pursuit of exploitation and exploration by creating a behavioral context that is characterized by the interaction of stretch, discipline, support, and trust (Gibson and Birkinshaw, 2004). Beyond the importance of fostering a behavioral context (Gibson and Birkinshaw, 2004), however, there is a marked lack of understanding the specific capabilities that are required to simultaneously achieve radical and incremental innovation (Adler, Goldoftas, and Levine, 1999; Simsek, Heavey, Veiga, and Souder, 2009).

Some researchers have proposed that practices facilitating learning and knowledge transfer are particularly important to innovation (Kogut and Zander, 1992; Teece and Pisano, 1994). Some of the practices that researchers have studied include how organizations collaborate with other organizations (Lichtenhaler, 2009; Mishra and Shah, 2009), how organizations promote learning (Tsai, 2002), and how an organization's culture facilitates knowledge transfer and learning (Leonard-Barton, 1992). And while some have proposed the importance of combining practices (Kogut and Zander, 1992; Leonard-Barton, 1992), there have been few empirical studies that have explored how these practices work together to facilitate learning and knowledge transfer that leads to the simultaneous achievement of incremental and radical innovation—what we refer to as innovation ambidexterity (IA). A firm's ability to combine these practices into a learning capability is important to enable them to foster innovation ambidexterity.

In this study, learning capability is defined as the combination of practices that promote intraorganizational learning among employees, partnerships with other organizations that enable the spread of learning, and an open culture within the organization that promotes and maintains sharing of knowledge. Below, the resource-based view (RBV) of the firm is used to develop a conceptual foundation for combining these practices. Following this, this study empirically examines whether these practices constitute learning capability. The impact of this learning capability on innovation ambidexterity is examined, as well as innovation ambidexterity's effect on business performance.

The results of this paper make four important contributions. First, they demonstrate that the combination of these practices has a greater impact on innovation ambidexterity than any one practice individually or when only two practices are combined. Second, these results demonstrate a relationship between innovation ambidexterity and business performance in the form of revenues, profits, and productivity growth relative to competitors (Barney, 1991; Barney and White, 1998; Porter, 1991). Third, these results suggest that innovation ambidexterity plays a mediating role between learning capability and business performance. That is, learning capability has an indirect impact on business performance by facilitating

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innovation ambidexterity that in turn fosters business performance. This study also contributes to our understanding of the ambidexterity literature in Taiwan, a non-Western context.

Taiwan presents an interesting context for this study because of its innovation orientation including the development of high-technology products and creative design.[1] Moreover, the latest *Business Week* ranking of the 50 most innovative companies in 2010 includes a number of Taiwanese companies (e.g., HTC). Thus, it provides an ideal context for a study that focuses on new product innovation.

The rest of the paper is organized as follows. In the next section, the theoretical basis for this study is developed, and definitions for key variables are provided. This is followed by the literature review and hypothesis development. The section following this discusses the methodological approach. In the remaining sections, the results and discussion are presented and followed by concluding remarks and suggestions for future research.

Theory and Definitions

Resource-based Theory of the Firm and Capabilities

The resource-based view of the firm (RBV) views the firm as a combination of resources and capabilities that have the potential to provide the firm with a sustainable competitive advantage (Amit and Schoemaker, 1993). Resources, in this view, are defined as stocks of available factors that are owned or controlled by the firm. These resources are converted into final products or services by using a wide range of other firm assets and bonding mechanisms such as technology, management information systems, incentive systems, and trust between management and labor (Amit and Schoemaker, 1993; Barney, 1991). Capabilities are distinguished from resources. They reflect a firm's capacity to deploy resources. Thus, in contrast to resources, capabilities are based on developing, carrying, and exchanging information. There is general agreement among organizational capability scholars that it is not the capabilities themselves, but rather the application and use of these capabilities that enable the firm to perform the activities they need to perform, which provide advantage (Porter, 1991; Stalk, Evans, and Shulman, 1992).

Knowledge is viewed as a resource that is core to an organization's ability to generate innovation and central in the development of new products. Partnering with other organizations, intraorganizational learning, and an organization's culture are practices that, when combined together, form a capability that assists the organization to integrate, reconfigure, gain, and utilize their knowledge resource (Leonard-Barton, 1992). To foster innovation ambidexterity, the combination of practices that are relied upon need to enable the acquisition, dissemination, integration, and development of knowledge over time (Kogut and Zander, 1992; Teece and Pisano, 1994). Interorganizational collaboration in the form of partnering with other organizations and intraorganizational learning in the form of idea exchange among the organization's employees are two practices that assist organizations in their search for knowledge. A third practice is an organization's culture, which encompasses its values and norms of behavior. Specifically, an open organization culture that emphasizes risk-taking, trust, respect for others, learning, and searching for opportunities can provide the impetus for employees to collaborate.

Ambidexterity, Exploitation, Exploration, Innovation, and Business Performance

Research on ambidexterity has focused on various levels of analysis including, a single business unit, diversified organizations with several strategic business units (SBUs), and the "realized view," which focuses on either SBUs or more diversified organizations (Simsek, 2009). This study focuses on strategic business units to understand how they achieve innovation ambidexterity.

Research on ambidexterity has also interpreted ambidexterity as either simultaneously pursuing exploration and exploitation (Beckman, 2006; Jansen, Van Den Bosch, and Volberda, 2006; Lavie and Rosenkopf, 2006; Lubatkin et al., 2006) or sequentially pursuing exploration and exploitation (Burgelman, 2002; Duncan, 1976). Sequentially pursuing exploitation and exploration may not entail ambidexterity in the sense of doing two things equally well within the same time frame. Thus, the research in this paper adopts what Simsek (2009) calls the realized view of ambidexterity, where ambidexterity is viewed as an organizational-level construct that is applicable to a single business unit whose goal is to achieve high levels of both exploitation and exploration simultaneously (Simsek, 2009). In contrast, studies that adopt a corporate level of analysis often view ambidexterity quite

[1] Taiwan ranks at the top in utility patents (i.e., patents for invention) per million people granted between January 1 and December 31, 2007. In addition, Taiwanese companies rank number 16 in terms of R&D spending. Source: World Economic Forum, Global Competitiveness Report 2008–2009, Section XII: Innovation, Executive opinion survey 2007, 2008, available at: http://www.weforum.org, accessed October 12, 2008.

differently. These studies consider firms to be ambidextrous when they have one organizational unit focused on exploration leading to radical innovation and another focused on exploitation leading to incremental innovation. Further, this study adopts the perspective on ambidexterity as an outcome resulting from the inputs of capabilities at the organizational and interorganizational levels. Thus, this study investigates the processes that drive ambidextrous outcomes.

Simultaneously pursuing exploitation and exploration within a single organizational unit is inherently challenging as a consequence of the competition for scarce resources that often leads to conflicts, contradictions, and inconsistencies (Simsek et al., 2009). In order to handle these competing claims, organizations need to find the right combination of different types of practices in order that both incremental and radical innovations can be generated (Leonard-Barton, 1992). Interorganizational partnering and intraorganizational learning are two behaviorally based practices that may help to generate a variety of innovations.

However, motivating individuals to engage in these behaviors requires using some type of social mechanism (Lawson, Petersen, Cousins, and Handfield, 2009). One such mechanism is an organization's culture. Organization culture reflects the values of the organization. It is these values that provide the impetus to engage in collaborative behaviors. Indeed, without norms and values that foster collaborating internally and externally, collaboration, by itself, will have a limited effect on promoting the exchange of information and knowledge either within or outside the organization. In this sense, these practices need to work interdependently with each other in order to become a capability that has the potential to provide competitive advantage for the organization.

It is for this reason that this combination of practices is critical to achieve innovation ambidexterity (Leonard-Barton, 1992). While a particular practice may provide some utility, it is when a set of practices are combined together that they become an organizational capability (Leonard-Barton, 1992). And it is this combinative effect among these practices that enables the simultaneous pursuit of explorative and exploitative activities that lead to simultaneously generating multiple types of innovation (Gupta, Smith, and Shalley, 2006).

This study further suggests that simultaneously attaining high levels of exploration and exploitation and the accompanying high levels of incremental and radical innovation is likely to lead to greater business performance in terms of revenues, profits, and productivity growth relative to competitors (Barney, 1991; Barney and White, 1998; Porter, 1991). Figure 1 depicts these relationships. In the following section, the hypotheses are elaborated.

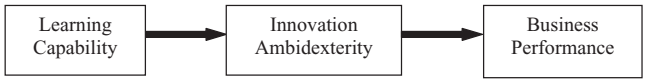

Figure 1. Proposed Relationships among Learning Capability, Innovation Ambidexterity, and Business Performance

Hypotheses

Innovation Ambidexterity and Business Performance

Prior research suggests that firms capable of achieving ambidexterity are likely to generate outcomes that are not attainable if they emphasize one of these activities at the expense of the other (Cao, Gedajlovic, and Zhang, 2009; Gibson and Birkinshaw, 2004; He and Wong, 2004; Tushman and O'Reilly, 1996). Indeed, as Colbert (2004) points out, interactions, such as the interaction between incremental and radical innovation, give "rise" to emergent properties that are irreducible because they exist only in relationship.

Studies of the outcomes from achieving ambidexterity have been quite varied. Atuahene-Gima (2005), e.g., suggests that the interaction of exploiting existing competencies and renewing and replacing them with new competencies is positively related to radical innovation performance. Prieto, Revilla, and Rodriguez (2007) found that competence is positively related to new product development performance in general. Simsek et al. (2009) found that simultaneously combining exploitation and exploration within a single unit can improve the satisfaction of stakeholders including customers and upper-level managers. Concerning financial performance, Han, Kim, and Kim (2001) suggest that a firm's pursuit of ambidexterity (versus pursuing incremental innovation only) is positively associated with market share and return on investment. He and Wong (2004) also found that the ambidexterity achieved by the interaction of exploitation and exploration learning is positively related to self-reported compounded average rate of sales growth over a 3-year period. Further, Schulze, Heinemann, and Abedin (2008) suggest that ambidexterity has a positive effect on subjective ratings of performance, measured as a latent composite of operational and strategic planning.

These studies suggest that relationships exist between exploitation, exploration, ambidexterity, and various sorts of performance outcomes. Prior research, however, has

not investigated the attainment of innovation ambidexterity, on business outcomes. Yet, there are suggestions that innovation ambidexterity (IA) may indeed lead to enhanced business performance.

By engaging in both incremental and radical innovation, firms benefit by evading the disadvantages associated with becoming overly focused on one or the other (cf., Han et al., 2001). However, pursuing radical innovation typically requires much more development time, capital investment, risk taking, and failure tolerance than incremental innovation (Amabile, 1997; Farson and Keyes, 2002). Engaging in radical innovation also takes more time as companies identify and search for sources of useful knowledge within and outside the organization. It is also relatively more difficult to estimate real-time returns from radical innovation, although there is an expectation that very large profits may result from the commercialization of radical innovations (Levinthal and March, 1993).

Incremental innovations, on the other hand, are built on existing products and exploiting proximate knowledge, information, and feedback from customers, competitors, and markets (Tushman and O'Reilly, 1996). And they are relatively effective in achieving predicted returns in the short term (Raisch and Birkinshaw, 2008). While incremental innovations are typically effective at responding to the needs of customers and markets, they are, at the same time, more easily imitated and substitutable. Thus, it has been argued that organizations that engage solely in incremental innovation risk failing to stay abreast of new knowledge (e.g., new technology and materials) thus generating small returns. Researchers also point out that a narrow knowledge search may lead to highly limited specialized knowledge and know-how that may eventually create rigidity in the organization (Atuahene-Gima, 2005; Leonard-Barton, 1992), as well as technological and knowledge obsolescence (Levinthal and March, 1993).

In contrast, the combination of radical and incremental innovation can provide significant advantage for the organization. On the one hand, radical innovation is more likely to create new markets, generate greater market share, and result in substantially higher returns for the firm in the long term (Cao et al., 2009). On the other hand, incremental innovation is more apt to improve and extend the quality and added value of existing products that will satisfy current customers' needs (Cao et al., 2009).

This suggests that advantages can be gained from undertaking both types of innovation and that the disadvantages associated with one type can be offset by the other. Thus, when organizations engage in high levels of both incremental and radical innovation, it is more likely to result in greater overall business performance than if only one form of innovation is undertaken.

Thus, it is proposed:

H1: A higher level of innovation ambidexterity will lead to higher business performance in a business unit.

Learning Capability and Innovation Ambidexterity

Prior research has focused on investigating the effects of separate practices on generating innovations (Lawson et al., 2009). In order to generate IA, organizations need to combine practices in ways that will generate high levels of radical innovation and incremental innovation simultaneously. Indeed, it has been argued that sustainable competitive advantage relies on an organization's ability to "reconfigure" its knowledge (Rosenkopf and Nerkar, 2001). Kogut and Zander (1992) refer to this as combinative capability, i.e., the ability "to synthesize and apply current and acquired knowledge."

The sources of the knowledge that is needed to generate innovation can be internal, i.e., inside the organization from other individuals, units, departments, etc., or external, i.e., outside the organization, e.g., universities, other companies, etc. (Helfat, 1994; Hull and Covin, 2010; Jansen et al., 2006; March and Simon, 1958; Nelson and Winter, 1982; Rosenkopf and Nerkar, 2001).

March and Simon (1958), Nelson and Winter (1982), and Helfat (1994) have found that the innovation activity of companies is closely related to their previous innovation activity, i.e., that it relies primarily on internal sources. But innovative products emerge from variation and from pursuing the untried instead of simply improving the existing ways of doing things (Sethi and Sethi, 2009). Thus, when learning and idea exchange occur only among others in the organization, it may limit the potential for tapping into ideas that are foreign to the firm (cf. Jansen et al., 2006). If individuals within an organization hold the same basic experiences, values, and capabilities, it makes it difficult to explore fundamentally different knowledge bases and to create opportunities for acquiring new knowledge and capabilities. And, since units operate as part of a single firm, they are more likely to exchange knowledge that is related to what they already know or that is similar to their existing knowledge base. Thus, they are more likely to pursue exploitative innovations (cf. Jansen et al., 2006), and there is less likelihood that radically new ideas will be generated when only intraorganizational learning is relied upon. It is also possible, however, that such exploitative innovation can lead to

useful and important "next generation" products that can add significantly to a company's revenues stream (Benner and Tushman, 2003).

On the other hand, other research suggests that external knowledge sourcing through interorganizational partnering is an important source of learning that can enhance a firm's innovativeness (Allen and Cohen, 1969; Laursen and Salter, 2006; Lorenzoni and Lipparini, 1999; Shan and Song, 1997). Lorenzoni and Lipparini (1999), e.g., found that a firm's ability to combine its knowledge with knowledge from external sources positively influenced its innovativeness. Rosenkopf and Nerkar (2001) found that searching beyond organizational boundaries had more impact, as measured by patent citations, than exploration within organizations. Laursen and Salter (2006) also investigated the relationship between external search and innovation performance and found that focusing on a limited number of organizations to search for new knowledge was associated with radical innovation.

The search process, whether it is externally or internally focused, involves acquiring knowledge and begins as an individual activity (Kim, 1993). But the development of innovations usually requires teams of individuals (Edmondson and Nembhard, 2009). Thus, organizations need to find ways to combine practices in ways that will facilitate the synthesis, exchange, and application of acquired knowledge across individuals in the company (Kogut and Zander, 1992; Teece and Pisano, 1994). One avenue that is available to companies to accomplish this is the use of social mechanisms such as the culture of the organization (Lawson et al., 2009).

An organization's culture (Schein, 1986) reflects the personality of the organization that arises from the assumptions, values, and norms that guide the behavior of its members (Schein, 2004). In this sense, the culture of the organization influences the way that people in the organization accomplish their work, relate to one another, and solve the problems that confront them on a daily basis (Fayolle, Ulijn, and Degeorge, 2005). Because an organization's culture represents the values and norms of behavior that are embraced by the members of the organization, it is likely to have a significant and enduring impact on the behavior of people in the organization. Thus, a culture that is competitive may cause individuals to withhold knowledge from each other, whereas a culture that promotes sharing and trust is likely to help the distribution of knowledge and ideas (Hansen, Mors, and Løvås, 2005; Lorenzoni and Lipparini, 1999).

Creating an open culture where individuals are willing to take risks, trust and respect each other, learn, and search for opportunities may be an effective means of fostering the values, behaviors, and norms that will result in the exchange, synthesis, and application of knowledge (Hurley and Hult, 1998). Organizational culture in this sense can be seen as a means of facilitating innovation. Innovation requires flexibility, openness, collaboration, and sharing. But these behaviors entail risk and indeed demand that risks be taken. Sethi and Sethi (2009) found that "teams that are strongly encouraged to take risk focus more on exploration and are expected to question and challenge the existing ways of doing things." Also, rewarding risk-taking behavior has been found to encourage people to look for new ideas, technologies, and approaches that can result in more radical new products (Amabile, 1988; Kanter, 1988; Mason and Mitroff, 1981; Van de Ven, 1986).

But managing these risk-taking behaviors cannot be accomplished through formal monitoring and control (McDonough and Leifer, 1986). Instead, facilitating these behaviors requires trust (Rousseau, Burt, and Camerer, 1998). A culture where individuals trust each other emboldens people to take risks in the form of exploring new technologies, trying out new ideas, and sharing untested ideas.

It would be incorrect to assume that individuals erect artificial boundaries in their discussions with each other by restricting their sharing to only exploitative *or* exploratory ideas. Practically speaking, it is difficult, if not impossible, to know in advance the outcome of an idea or if it will lead to a major breakthrough or a more modest advance. Thus, this study suggests that it is the presence of a culture of sharing that is important to fostering exploitative and exploratory ideas that have the potential to lead to incremental and radical innovations.

By creating an open organization culture, organizations can facilitate the synthesis, exchange, and application of knowledge that has been acquired from internal and external sources. And it is this combination of practices that enables the organization to generate radical and incremental innovations simultaneously (Lawson et al., 2009). This combination of practices becomes a learning capability that provides competitive advantage for the organization by enabling it to engage in both exploitative and explorative learning, thus leading to higher levels of both incremental and radical innovation simultaneously (Collis, 1994; Danneels, 2002; Gibson and Birkinshaw, 2004). Thus, it is proposed:

H2: When used in combination with each other, three practices—intraorganizational learning, interorganizational partnering, and an open organization culture, i.e.,

a learning capability—will have a positive impact on innovation ambidexterity.

The Mediating Effect of Innovation Ambidexterity

Finally, innovation ambidexterity may *mediate* the relationship between business performance and learning capability. That is, the combination of intraorganizational learning, interorganizational partnering, and an open organization culture impact performance *by* achieving innovation ambidexterity. A learning capability, by itself, is likely to have limited influence on performance. In the view of the RBV theory of the firm, it is the application and use of a firm's capabilities that enable the firm to perform the activities it needs to perform that provide advantage. Thus, the reason for hypothesizing a mediating effect is that it is the outcome of the application and use of this learning capability that enables the firm to perform the exploitative and exploratory activities that are needed to produce both incremental and radical innovations, which, in turn, generate greater business performance (Porter, 1991; Ray, Barney, Waleed, and Muhanna, 2004; Stalk et al., 1992). Therefore, this study suggests that unless these practices are combined together so as to generate innovation ambidexterity, a learning capability, in and of itself, will have a less positive impact on business performance than will the combined effects of a learning capability and innovation ambidexterity.

Organizational capability theorists have indicated that the importance of capabilities to organizations today is much greater than it was before as a result of the relatively open and diverse sources of innovation now available to organizations (Teece, 2000). However, most scholars also acknowledge that in order for a capability to provide competitive advantage for a company, it must be relatively scarce, difficult to imitate or duplicate through other means, and contribute positively to performance (Barney, 1991; Eisenhardt and Martin, 2000; Ray et al., 2004).

This logic suggests that while every firm may possess practices such as culture, intraorganizational learning, and interorganizational partnering, not every firm can effectively and efficiently combine them so as to create a valuable and difficult to imitate learning capability (Colbert, 2004). When the practices are effectively combined together, however, the combination creates properties that exist only as a consequence of the individual practices being part of the whole. And these properties, in turn, create an outcome, in the form of a capability that is unavailable in their absence (Colbert, 2004). Based on the above logic, it is proposed that the effect of a learning capability will be felt through the process of innovation ambidexterity that will subsequently generate greater business performance (Porter, 1991; Ray et al., 2004; Stalk et al., 1992). Thus, it is proposed:

H3: Innovation ambidexterity mediates the relationship between a learning capability and business performance.

Methodology

Empirical Context

The empirical setting was the companies listed on the General Chamber of Commerce of Taiwan and operating in the chemicals, pharmaceuticals, financial management, mechanical engineering, and electronic engineering sectors. These sectors have been shown to be more innovation oriented than others in the textiles, mining, and steel industries in terms of the number of commercialized products and services. Additionally, Taiwan has demonstrated an innovation orientation in many aspects, e.g., Taiwan ranks number one in patents per million people granted between January 1 and December 31, 2007, and Taiwanese companies rank number 16 in the world in terms of R&D spending (see the World Economic Forum, Global Competitiveness Report 2008–2009). Prior research has suggested that this context could provide insights on innovation processes and their effectiveness (cf. Elenkov, Judge, and Wright, 2005; Jibu et al., 2007). The sampled companies had to meet two criteria including (1) the importance of innovation to their industry, and (2) the importance of innovation to the company. Companies were contacted directly to ascertain their interest in participating. Companies in these sectors that fit the above criteria were invited to participate in the survey within this sampling frame.

Following the suggestion of research on ambidexterity that a business unit is a meaningful level at which to examine organizational ambidexterity (Simsek, 2009), this study was focused on the SBU level. An SBU is defined as a profit center responsible for performance in one or more markets with the authority to influence the choice of the business' competitive strategy in its target markets. By focusing on the SBU, the likelihood that each respondent is well acquainted with the strategies, general processes, management, and performance of the SBU is increased (Narver, Slater, and MacLachlan, 2004).

Data

To test the proposed hypotheses, primary data were gathered from the sample. Following the suggestions of

Podsakoff, MacKenzie, Lee, and Podsakoff (2003), separate questionnaires were constructed to gather data for the independent and dependent variables in order to avoid self-report and self-evaluation that can result in common method bias. To mitigate the potential problem of self-report bias because the senior managers filled out the questions about both business and innovation performance, a combination of prevention and detection methods were used, as suggested by Podsakoff et al. (2003). Prevention methods included collecting data at two different points in time, approximately 1 year apart (Jansen et al., 2006). Company contacts were also asked to give the questionnaire in person to the best qualified person to answer. The detection method consisted of conducting a validity check as described in the measurement validation section. As Podsakoff et al. (2003) suggest, using these methods minimizes self-report bias as a concern in this study.

The set of survey questionnaires was distributed via mail, fax, e-mail, or in person. Surveys were administered to senior and middle level managers of 580 SBUs from 558 parent companies. One questionnaire was administered to a senior level manager in each SBU who was asked about the innovation and business performance of the SBU. A different questionnaire was administered to middle-level managers who were asked about organization culture, intraorganizational learning, and interorganizational partnering. After the initial survey mailing, follow-ups were conducted via reminder letters and telephone calls to the company contacts. Two hundred fourteen sets of completed surveys were received from multiple informants including 729 middle managers (1–12 respondents per SBU) and 214 senior managers in 214 SBUs. Responses were received from between 2 and 13 respondents per SBU and 943 respondents from 214 SBUs. The response rate for this study was 37% (214 SBUs completed out of the 580 SBUs that were initially approached). Ten SBUs were dropped from further analyses because of missing data such as incomplete data on size, revenue, radical, or incremental innovation performance.

Following Kanuk and Berenson (1975), potential nonresponse bias was further assessed by looking for differences between early and late respondents. The order of responses to the survey was recorded and found to be nonsignificantly correlated with SBU industry ($r = .05$, $p = .32$) or SBU size ($r = .01$, $p = .47$). Performance differences on the early versus late-responding SBUs were further compared and found to be nonsignificantly correlated with responding SBUs' revenue ($r = .02$, $p = .42$), suggesting that the concern regarding nonresponse bias is minimal (Combs and Ketchen, 1999).

In this sample, the size of the SBUs in terms of the number of employee ranged from 45 employees to over 3000. The mean size equaled 1037. Average age of the SBUs in the sample was 17 years. One hundred and ninety SBUs (89%) were privately owned. Twenty-eight percent of the SBUs in the sample are in the business of producing consumer products, 36% produce industrial products, 22% produce consumer services, and 8% produce industrial services. Thirty-five SBUs had revenues of $15–29 million, 66 had revenues of $30 million to $1.5 billion, and 34 SBUs had revenues of $1.6–3 billion. Revenues were converted based on an exchange rate of 1 US$ = 33 NTD.

Measures

The instruments were originally constructed in English and were then translated into Chinese and back-translated into English to ensure the accuracy of the meaning of the questions. This study also used a mixture of positive and negative questions in order to minimize response bias. The questionnaires were then pretested using a sample of managers in Taiwan. All constructs in this study were measured on a 9-point Likert-type scale.

Dependent Variable

Business performance. Raisch and Birkinshaw (2008) suggest that studies that use one-dimensional indicators of firm performance "run the risk of producing biased estimations of organizational ambidexterity's contributions to the firm's overall success." With this in mind, a set of measures that provide a broader perspective on firm performance were used. Specifically, the dependent variable was measured by using three items that required senior management respondents to reflect on performance relative to their competitors along three dimensions: revenues, profits, and productivity growth (Cao et al., 2009; He and Wong, 2004; Wakelin, 2001). The Appendix contains these items. Respondents were asked to indicate on a 7-point Likert scale where they felt their SBU belonged on each of these dimensions. Responses could range from much lower (= 1) to much higher (= 7). Common factor analyses were conducted on these items. Principal components extraction with an Equamax rotation method (Eigenvalue > 1) resulted in one factor. The Cronbach's alpha was .82.

Mediating Variable and Independent Variables

Innovation ambidexterity. Innovation ambidexterity is defined as attaining high levels of both incremental and

radical innovation simultaneously. Because there was no existing measure of ambidexterity exactly reflecting our research purpose, a 6-item measure that reflected the combination of incremental and radical product innovation performance was developed. The measures for each type of innovation performance were adapted from the work of Atuahene-Gima (2005) and Cooper and Kleinschmidt (2000). (The Appendix contains these items.) Because senior managers are in the best position to provide responses to our questions concerning innovation performance, these managers were asked to look back over the past 3 years and provide their perceptions of innovation performance. It was felt to be important to use a 3-year time period because of the lag effects that are likely to exist between a firm's innovativeness and its actual impact on innovation performance.

In order to operationalize the combined concept of innovation ambidexterity, the approach of He and Wong (2004) and Cao et al. (2009) was followed to generate a product term including incremental product and radical product innovation. The reliability of the items used to measure incremental product and radical product innovation was assessed. The Cronbach's alpha for the items measuring incremental product innovation was .78. These items were combined into a single factor. The Cronbach's alpha for the items measuring radical product innovation was .77. These items were combined into a single factor. The overall Cronbach's alpha for this factor was .82.

Traditionally, variables are centered before generating product terms to avoid multicollinearity. Thus, the incremental product and radical product innovation scales were mean-centered before obtaining their product to mitigate the potential for multicollinearity (Cao et al., 2009; He and Wong, 2004). These scores were then multiplied from these two factors for the overall measure of innovation ambidexterity.

Learning capability. Middle managers were asked to assess the practices of the firm. The measure of practices was drawn from the work of O'Reilly, Chatman, and Caldwell (1991), Tsai (2002), and Faems, Van Looy and Debackere (2005) and consisted of 11 questions in total. Because O'Reilly et al.'s (1991) measure of organization culture was broader in scope than required for the purposes of this study, a subset of their items consisting of 5 items representing open organizational culture was used. The measure of intraorganizational learning was derived from work conducted in the area of knowledge sharing and learning (cf. Tsai, 2002) and consisted of three questions. The measure of interorganizational partnering was adapted from the work of Faems et al. (2005) and consisted of three questions. All of the items comprising learning capability are included in the Appendix.

To determine the number of items that contribute to common variance actually needed to describe practices, a common factor analyses was conducted on these items. Principal components extraction with an Equamax rotation method (Eigenvalue > 1) resulted in three factors, which paralleled the original three dimensions of practices. One factor consisted of 5 items representing open organizational culture. Cronbach's alpha was .91. One factor consisted of three items representing intraorganizational learning. Cronbach's alpha was .90. The other factor consisted of 3 items representing interorganizational partnering. Cronbach's alpha was .90. These items were combined into a single factor (the overall Cronbach's alpha was .92).

In order to operationalize the concept of learning capability, He and Wong (2004) and Cao et al.'s. (2009) approach was followed to generate a product term. In order to avoid multicollinearity, the open organizational culture, intraorganizational learning, and interorganizational partnering scores were mean-centered before obtaining their product to mitigate the potential for multicollinearity (Cao et al., 2009; He and Wong, 2004). Then, the scores from these three factors were multiplied to derive our overall measure of learning capability.

Control Variables

Recognizing that innovation can be influenced by firm and industry attributes, it is necessary to control for these effects. Accordingly, two firm specific factors—SBU age and size—as well as an industry-specific factor were included as control variables, because prior studies have documented their potential effects on organizational innovation (cf. Elenkov et al., 2005; Jung, Wu, and Chow, 2008). The SBU size effects were controlled for by including dummy variables. The sample was distributed across four categories: 1 (50 employees and below), 2 (51–500 employees), 3 (501–1000 employees), and 4 (1001 and above). Therefore, three SBU size dummy variables were constructed: 1 (50 employees and below), 2 (51–500 employees), and 3 (501–1000 employees).

Industries may differ in terms of technological orientations and innovation types, specifically, incremental and radical innovation. The industry idiosyncratic effects were controlled for by including dummy variables. The sample was distributed across six sectors: (1) Chemicals, (2) Pharmaceuticals, (3) Financial Management, (4) Mechanical Engineering, (5) Electronic Engineering, and (6) others. Thus, five industry dummy variables were

constructed: (1) Chemicals, (2) Pharmaceuticals, (3) Financial Management, (4) Mechanical Engineering, and (5) Electronic Engineering.

Aggregation

Because the theory and hypotheses of the study require an SBU level of analysis, respondents' individual scores on each variable were aggregated, and the SBU mean response was computed for each question (Keller, 1986). After aggregation, the aggregation of SBU-level variables was justified by calculating an interrater agreement score for each variable (γ_{wg}), and then using intraclass correlation (ICC) to examine the degree of agreement among respondents on each measure (cf. Goodman, Ravlin, and Schminke, 1990; James, Demaree, and Wolf, 1984). The average interrater agreement score (γ_{wg}) was .70 for open organizational culture, .72 for intraorganizational learning, and .73 for interorganizational partnering. All were above the cut-off value of .70. The ICC (1) and ICC (2) values were .62 and .91 for open organizational culture, .63 and .90 for intraorganizational learning, and .75 and .90 for interorganizational partnering. All ICC values are greater than or equal to .60 indicating acceptable reliability (Schneider, White, and Paul, 1998). Accordingly, aggregation was justified for these variables and provided substantial support for the scales.

Measurement Validation

Following Anderson and Gerbing's (1988) suggestion, a multistage process was performed to further assess convergent and discriminant validity of learning capability and innovation ambidexterity through exploratory and confirmatory factor analysis. Exploratory factor analysis clearly replicated the five-factor model and did not reveal any evidence of a single underlying construct. Next, a confirmatory factor analysis was used on all items pertaining to learning capability and innovation ambidexterity. This analysis yielded a measurement model that fitted the data adequately ($\chi^2 = 18.30$, $p < .05$, $\chi^2/\mathrm{DF} = 2.29$, CFI = .98, NFI = .96, RMSEA = .06). Item loadings were as proposed ($\geq .6$) and significant ($p < .01$), providing evidence for convergent and discriminant validity. As noted in the measures subsection, Cronbach's alphas for all scales were greater than .70.

Analytical Procedures

Multiple regression analyses were performed to test the hypotheses. Preacher and Hayes's (2008) Macro syntax was used to conduct the tests for Sobel and bootstrapping directly within SPSS (SPSS, Chicago, IL, USA). The approach combines the Sobel (1982) test and bootstrapping method to calculate standard errors and confidence intervals. While using Baron and Kenny's (1986) four-step criteria informally judges whether or not mediation is occurring, the Sobel test and bootstrapping methods proposed by MacKinnon and Dwyer (1993) are a formal, statistically based assessment for mediation. The Sobel test was estimated with a normal distribution. Thus, it needs to look at the standard error, standard score, and confidence interval to indicate the reliability of an estimate. Bootstrapping is a resampling method that generates 95% bias-corrected and accelerated bootstrap confidence intervals for the indirect effect using bootstrap samples. The results of the Sobel and bootstrapping test are reported to provide powerful estimation for the mediating effect.

First, the control variables (i.e., SBU industry dummy, SBU age, and SBU size dummy) and innovation ambidexterity were included to examine the direct effect on business performance. Second, the control variables and learning capability were included to examine the direct effect on innovation ambidexterity. Then, the mediating effect of innovation ambidexterity on the relationship between learning capability and business performance was examined. In addition to testing the hypotheses, the direct effects of individual practices, as well as the set of two-way interactions of combinations of pairs of practices on business performance was also examined.

Results

The means, standard deviations, and pairwise correlations for the variables in this study are listed in Table 1. Since significant correlations were found among a number of the variables, potential multicollinearity using variance inflation factors (VIFs) was further investigated. The maximum VIF obtained in any of the models for substantive variables was substantially below the rule-of-thumb cutoff of 2 for regression models (O'Brien, 2007). Therefore, multicollinearity was not considered an important issue for these results.

Table 2 summarizes the results for the direct effects of innovation ambidexterity on business performance and learning capability on innovation ambidexterity. Model 1 is the unconstrained controls-only model. The results showed that only SBU age and the SBU industry dummy 2 (i.e., pharmaceuticals) were positively associated with business performance. This finding is not surprising since more established companies are more conducive to

Table 1. Descriptive Statistics and Correlation Matrix

	Mean	Std. Dev.	Correlation																		
1	.04	.20	—																		
2	.23	.64	−.07	—																	
3	.24	.81	−.06	−.11	—																
4	.34	.70	−.06	−.11	−.09																
5	.60	.49	.18	.30	.25	.25	—														
6	17.58	13.88	.07	.12	−.05	.08	.23	—													
7	.35	.48	−.05	−.05	.18	−.04	−.01	.13	—												
8	.79	.98	−.03	.13	−.13	.07	−.05	.06	.58	—											
9	.15	.66	.06	−.02	−.07	.16	−.02	−.02	−.17	.19	—										
10	4.23	1.34	−.03	.14	−.16	.03	−.15	.12	−.11	.09	−.01	—									
11	19.18	11.54	−.06	.07	−.11	−.06	−.02	.01	.01	.17	−.06	.49	—								
12	115.62	59.91	−.02	.15	.01	.05	−.11	.03	.03	.01	.04	.33	.34	—							
13	22.79	8.28	.02	.13	.02	.05	−.08	.01	−.05	.02	.04	.30	.31	.44	—						
14	22.59	8.40	−.05	.16	.01	.05	−.11	.02	−.07	.02	.05	.33	.33	.46	.39	—					
15	24.02	9.11	−.03	.14	.01	.06	−.09	.05	−.04	.01	.01	.32	.32	.44	.35	.38	—				
16	4.57	1.00	−.01	.13	.03	.04	−.08	−.03	−.08	.06	.07	.29	.29	.31	.40	.37	.34	—			
17	4.80	1.08	−.09	.14	.01	.07	−.09	.06	−.06	.02	.03	.29	.29	.34	.28	.38	.51	.47	—		
18	4.84	.99	.03	.09	.02	.06	−.06	.02	−.04	.01	.01	.26	.26	.35	.39	.24	.39	.34	.38	—	
19	4.38	1.43	−.02	.04	−.07	−.08	−.02	.02	−.12	.08	−.02	.36	.46	.30	.30	.28	.29	.25	.24	.29	—
20	4.06	1.44	−.07	.08	−.12	−.06	−.01	−.04	−.10	.17	−.05	.40	.50	.31	.28	.34	.31	.29	.32	.23	.34

N = 204.
1 = chemicals industry, 2 = pharmaceuticals industry, 3 = financial management industry, 4 = mechanical engineering industry, 5 = electronic engineering industry, 6 = SBU age, 7 = below 50 employees, 8 = 51–500 employees, 9 = 501–1000 employees, 10 = business performance, 11 = innovation ambidexterity, 12 = learning capability, 13 = open organizational culture * intraorganizational learning, 14 = open organizational culture * interorganizational partnering, 15 = intraorganizational learning * interorganizational partnering, 16 = open organizational culture, 17 = intraorganizational learning, 18 = interorganizational partnering, 19 = incremental innovation, 20 = radical innovation.
p-value < .05 for correlation values greater than .15; p-value < .01 for correlation values greater than .20.

higher business performance than less established ones (Henderson and Clark, 1990), and companies in the pharmaceutical industry are relatively more highly innovative, and higher innovativeness is typically associated with greater business performance (Jibu et al., 2007).

Model 2 included the control variables and innovation ambidexterity to test whether innovation ambidexterity is positively related to business performance. The result showed a positive association between innovation ambidexterity and business performance ($\beta = .45$, $p < .05$). Thus, H1 was supported. To test H2, which predicted that the interaction of learning capability is positively related to innovation ambidexterity, Model 3, 4, and 5 were tested proceeding in steps. Model 3 included the control variables and the three practices: intraorganizational learning, interorganizational partnering, and organization culture. Model 4 included the control variables, the three practices and three two-way interactions of pairs of practices and their product. Lastly, Model 5 included the control variables, the three practices, and three two-way interactions of pairs of practices and the three-way interaction term that is referred to as learning capability in this study. The results showed that open organizational culture was positively related to innovation ambidexterity when there were no interaction terms included ($\beta = .16$, $p < .1$; $R^2 = .17$). When considering the three two-way interactions, the cross-product term of intraorganizational learning and interorganizational partnering was positively related to innovation ambidexterity ($\beta = 1.25$, $p < .1$; $R^2 = .19$). When the three-way interaction term—learning capability—was included, only learning capability had a positive relationship to innovation ambidexterity ($\beta = .21$, $p < .1$; $R^2 = .21$). The results supported H2 where it was argued that learning capability has a stronger effect on innovation ambidexterity than any of the individual practices or any pair of practices.

Model 6 and Model 7 were also tested to predict whether the joint effect of learning capability and innovation ambidexterity has a stronger impact on business performance than learning capability itself. The result showed that learning capability itself has *less* impact on business performance than the joint effect of learning capability and innovation ambidexterity ($R^2 = .19$ versus .30, respectively).

The Sobel test and bootstrapping approach was used to test the mediating effect of innovation ambidexterity on the relationship between learning capability and business performance (H3). According to Sobel (1982), for

Table 2. Regression Results of Direct Effects

Model No.	1	2	3	4	5	6	7
(DV)	(BP)	(BP)	(IA)	(IA)	(IA)	(BP)	(BP)
IDVs	Beta	Beta	Beta	Beta	Beta	Beta	Beta
	(t)	(t)	(t)	(t)	(t)	(t)	(t)
Chemicals ind.	−.05	−.02	−.05	−.05	−.05	−.02	−.01
	(−.58)	(−.28)	(−.68)	(−.72)	(−.73)	(−.30)	(−.14)
Pharmaceuticals ind.	.05	.03	−.06	−.06	−.06	.01	.01
	(.57)	(.38)	(−.81)	(−.83)	(−.82)	(.10)	(.16)
Financial management ind.	−.20**	−.13*	−.15**	−.14*	−.14	−.21**	−.14*
	(−2.43)	(−1.69)	(−1.98)	(−1.84)	(−1.83)	(−2.69)	(−1.92)
Mechanical engineering ind.	−.04	.02	−.13	−.12	−.12	−.05	.004
	(−.51)	(.26)	(−1.75)	(−1.61)	(−1.61)	(−.68)	(.06)
Electronic engineering ind.	−.21	−.15*	−.08	−.07	−.07	−.18**	−.14
	(−2.29)	(−1.83)	(−.99)	(−.89)	(−.89)	(−2.01)	(−1.70)
SBU age	.04	.05	−.02	−.02	−.02	.05	.05
	(.54)	(.71)	(−.25)	(−.22)	(−.22)	(.67)	(.76)
Below 50 employees	−.10	−.05	.03	−.04	−.04	−.07	−.05
	(−.99)	(−.59)	(−.28)	(−.46)	(−.47)	(−.74)	(−.50)
51–500 employees	−.01	−.05	.12	.12	.12	.01	−.04
	(−.08)	(−.56)	(1.35)	(1.31)	(1.31)	(.10)	(−.40)
501–1000 employees	−.04	−.01	−.04	−.05	−.04	−.04	−.02
	(−.41)	(−.17)	(−.58)	(−.60)	(−.59)	(−.54)	(−.28)
IA		.45**					.38**
		(6.45)					(5.04)
Learning capability					.21*	.33**	.18**
					(1.51)	(4.50)	(2.50)
Open organizational culture			.16*	.50	.42		
			(1.73)	(1.25)	(.47)		
Intraorganizational learning			.08	.42	.49		
			(.76)	(.83)	(.55)		
Interorganizational partnering			.15	.41	.49		
			(1.56)	(.84)	(.54)		
Open organizational culture * Intraorganizational learning				.28	.13		
				(.35)	(.08)		
Open organizational culture * Interorganizational partnering				.28	.14		
				(.33)	(.08)		
Intraorganizational learning * Interorganizational partnering				1.25*	1.39		
				(1.91)	(.89)		
R^2	.09	.28	.17	.19	.21	.19	.30
F	1.74*	6.12***	3.15***	2.84**	2.64**	3.69***	6.19***
Number SBUs	204	204	204	204	204	204	204

Standardized regression coefficients are shown; DV, dependent variable; BP, business performance; IA, innovation ambidexterity; IDVs, independent variables. * $p < .1$,** $p < .05$,*** $p < .01$.

either partial or complete mediation to be established, the reduction in variance explained by the independent variable must be significant. The results found a significant reduction in variance ($Z = 3.938$, $p < .05$). Accordingly, it can be concluded that innovation ambidexterity mediated the relationship between learning capability and business performance, providing support for H3 (Table 3). Table 3 first shows the results of the mediator variable model that assessed Baron and Kenny's four-step criteria (1986). Subsequently, the table shows the results of the Sobel and bootstrapping test including the standard error (s.e.), confidence interval (CI), and the standard score (Z).

Discussion and Conclusions

As Simsek and his colleagues (2009) have pointed out, prior research has not provided answers to the question of what organizations need to do in order to simultaneously attain exploitation and exploration. Put differently, researchers have not been able to suggest to managers the specific levers they can pull to generate incremental and

Table 3. Results of Sobel and Bootstrapping Tests for Mediating Effect

		Mediator Variable Model			
Step	Variables	Coefficient	s.e.	*T*	*P*
1	*YX*	.007	.002	4.676	.009***
2	*MX*	.068	.013	5.255	.007***
3	*YM, X*	.048	.008	6.056	.003***
4	*YX, M*	.004	.002	2.537	.01**

	Results of Sobel Test				
	Value	s.e.	LL 95 CI	UL 95 CI	*Z*
Total indirect effect	.003	.001	.002	.005	3.938**

Remark: Y = business performance, X = learning capability, M = innovation ambidexterity. * $p < .1$, ** $p < .05$, *** $p < .01$

radical innovation simultaneously. This study suggests that one lever that may be important is a learning capability.

Scholars have explicitly cited the need for additional research that examines the combined effects of practices for achieving incremental and radical innovation simultaneously (He and Wong, 2004). These researchers note that doing so "may shed additional light on the subtle and complex processes through which organizations achieve and benefit from various combinations of exploration and exploitation." These results provide some intriguing insights into how firms may be able to foster higher firm performance using innovation ambidexterity to do so.

Understanding how to manage the paradoxes that crop up in organizations has vexed management researchers for many years (March, 1991). Our results lend support to the notion that a learning capability may be one way of effectively managing at least one of the paradoxes of organization life—how to foster exploitation and exploration activities simultaneously thus generating innovation ambidexterity. By combining two practices that facilitate internal learning and external partnering with a third practice—an open culture, organizations are apparently able to overcome the barriers that so often arise in sharing knowledge and fostering learning. Doing so seemingly has the follow-on effect of simultaneously stimulating explorative and exploitative activities that lead to more effectively generating incremental and radical innovation simultaneously.

Further, when practices are combined, the combination creates properties that exist only as a consequence of the individual practices being part of the whole. And these properties, in turn, create outcomes that are unavailable in their absence (Colbert, 2004). While an open organizational culture, in and of itself, does have a positive influence on the simultaneous generation of incremental and radical innovation (see Model 3), its effect is less strong than the combined practices of intraorganizational learning and interorganizational partnering (Model 4). Similarly, the effect of the combination of these two practices is not as strong as the combination of the three practices (i.e., learning capability). These results suggest that innovation ambidexterity is fostered most effectively through the interaction of these three practices as opposed to only one or two. Apparently, building an open organizational culture provides the impetus for individuals to engage in collaborative behaviors that are needed to foster incremental and radical innovation simultaneously. Once cultural values have been infused into the members of the organization, they motivate individuals to engage in collaborative behaviors in terms of intraorganizational learning and partnering with other organizations. In this way, these practices need to work interdependently with each other in order to become a capability that has the potential to provide competitive advantage for the organization over time. In this sense, a learning capability represents a means for organizations to create sustained competitive advantage. Stated differently, while a particular practice may provide some utility for generating IA, it is when all three practices are combined together that they become a sustainable organizational capability (Leonard-Barton, 1992) that fosters the generation of incremental and radical innovation (Gupta et al., 2006).

The idea of a learning capability is in line with the notion of higher level capabilities (cf. Collis, 1994; Danneels, 2002; Gibson and Birkinshaw, 2004). Prior research has proposed that creating combinations of practices enables organizations to avoid the inability of their current practices to enhance innovation (Danneels, 2002; March, 1991), thus suggesting that a learning capability is a higher level capability that goes beyond the separate practices of external partnering, learning among employees, and organizational culture.

Potentially, this finding has important implications for managers in general and for managers in our sampled industries in particular. It suggests relatively specifically which levers they need to pull in order to overcome the conflicts and competition that arise in developing two different types of innovations. Building an open culture appears to have an impact on developing not only radical new products but also on incremental ones. Knowledge gained and integrated is not inherently or naturally divided according to its utility in developing breakthrough innovations versus line extensions. Oftentimes, where an idea will lead is not knowable in advance. But

what is known is that sharing those ideas increases the likelihood that the idea will grow and blossom into an innovation of some sort.

Clearly, more work is needed to understand more thoroughly what is going on here. How does an open culture influence the circulation of ideas and knowledge coming from both external as well as internal sources? What is the process by which this takes place? What does it look like? These are questions that require further inquiry.

Our findings also provide additional insight into the debate about the value of achieving high levels of incremental and radical innovation, versus a balance between the two, as well as the debate about achieving both types of innovation simultaneously versus sequentially. Within the context of Taiwanese SBUs, it appears that achieving simultaneously high levels of both types of innovation has a significant impact on a firm's performance. In short, high on both is better than balanced, and simultaneous is better than sequential. The implications of this finding are profound. It suggests that those firms that are able to achieve high levels of both incremental and radical innovation by effectively combining the appropriate set of practices will have a substantial competitive advantage, while those firms that are less capable of doing so will find themselves at distinct competitive disadvantage.

It will be interesting and important for future research to investigate the ease with which the combining process takes place and over what time period so that a sense of the sustainability of this advantage may be obtained. It will also be important to identify other combinations of practices that may also provide advantage. While this study has identified one important combination, it is unlikely to be the only important one.

This research has also been an attempt to peek inside the black box of relationships among a firm's capabilities, innovation ambidexterity, and performance. This study has done so by examining the possibility that innovation ambidexterity plays a mediating role between a learning capability and performance. The results suggest that it does. It is innovation ambidexterity and not the firm's learning capability itself that has the most direct and significant impact on business performance. From a managerial perspective, affecting business performance requires identifying and developing a very specific capability that will result in innovation ambidexterity. Our findings also suggest that separate practices or pairs of practices are less effective in stimulating innovation ambidexterity than is the combination of all three practices. Apparently, the learning capability that results from this combination enables the organization to acquire information from sources that are external to the firm and foster learning within it while providing the motivation for individuals to share their acquired knowledge. Our results also suggest that shared learning may be induced through a variety of means including fostering mutual trust and respect among employees, as well as risk-taking.

It is also important to point out that these results may be contextually derived. The sample is of SBUs in innovation-focused Taiwanese industries. This raises the question of their generalizability to larger organizations, as well as ones in other industries and countries. Taiwan is an emerging economy with deep ties culturally and historically to mainland China. As such, it is influenced by the Confucian tradition and Chinese way of thinking. It is thus interesting to speculate on whether what this study found in Taiwanese firms could be expected to hold for firms in more developed economies, in Western countries, or in companies in China. Research relating to country culture indicates that Taiwan is group versus individual oriented. That is, it values collective action over individual action. Does this group orientation have an impact on an organization's ability to combine the three practices that have been examined or on the ability to create an open culture that promotes risk-taking and sharing across the organization? These are questions that require additional research.

Limitations and Future Research

While this study is limited as a consequence of our having investigated only a few practices and indicators of business performance, it makes a strong argument for the importance of taking a "fine-grained" approach in order to understand more deeply and accurately how practices create capabilities that influence ambidexterity and business performance. It points to the need for future research to investigate multiple practices, types of innovation, and different indicators of business performance, within the same study. For example, an important extension of this study would be to examine more systematically a broader array of practices and contextual factors in an effort to understand how they help create innovation ambidexterity.

This study is also limited by the sampling method within highly innovative industries. While the hypotheses were supported in the contextual setting of these innovative industries, our sample constrains the generalizability of these findings to other industries. Future research investigating an even greater array of industries, varying even more than those in our sample in terms of business

environment, would be another important extension of this study.

Additionally, in order to determine whether our findings hold in other contexts, it is important to replicate this study in other industries and in the other countries, including developed and emerging economies.

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Appendix: Survey Items

Business Performance

- Compared to your major competitor, this SBU had revenues that were. [Respondents were asked to respond to a 7-point scale ranging from 1 = much lower to 7 = much higher.]
- Compared to your major competitor, this SBU's operating profit was. [Respondents were asked to respond to a 7-point scale ranging from 1 = much lower to 7 = much higher.]
- Compared to your major competitor, this SBU's growth in productivity was. [Respondents were asked to respond to a 7-point scale ranging from 1 = much lower to 7 = much higher.]

Innovation Ambidexterity [1 = Strongly disagree; 7 = Strongly Agree]

Incremental product innovation performance

- This SBU frequently introduced incremental new products into new markets in the last 3 years.
- Compared to your major competitor, this SBU introduced more incremental new products in the last 3 years.
- Compared to your major competitor, the percentage of new incremental product innovation implemented in this SBU in the last 3 years was greater.

Radical product innovation performance [1 = Strongly disagree; 7 = Strongly agree]

- This SBU frequently introduced radical new products into new markets in the last 3 years.
- Compared to your major competitor, this SBU introduced more radical new products in the last 3 years.
- Compared to your major competitor, the percentage of new radical product innovation implemented in this SBU in the last 3 years was greater.

Learning Capability

Open organizational culture [1 = Strongly disagree; 7 = Strongly agree]

- Knowledge is widely shared in this SBU.
- Mutual trust and respect are very important in this SBU.
- This SBU continually searches for new opportunities.
- This SBU rewards those who take risk.
- This SBU helps our customers anticipate developments in their markets.

Interorganizational partnering [1 = Strongly disagree; 7 = Strongly agree]

- This SBU partners with other organizations for the specific purpose of innovating.
- This SBU considers it important to partner with other organizations for the purpose of innovating.
- Partnerships have been an important source of innovations for the SBU.

Intraorganizational learning [1 = Strongly disagree; 7 = Strongly agree]

- The employees of this SBU learn from one another.
- The employees of this SBU exchange ideas with people from different areas of the SBU.
- If I am working on a problem or new idea I am likely to seek out someone in the SBU with whom to collaborate.