Radical Product Innovation Capability: Literature Review, Synthesis, and Illustrative Research Propositions
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Product innovation is a key to organizational renewal and success. Relative to other forms of innovation, radical product innovations offer unprecedented customer benefits, substantial cost reductions, or the ability to create new businesses, any of which should lead to superior organizational performance. In other words, a radical product innovation capability is a dynamic capability, one that enables the organization to maintain alignment with rapidly evolving customer needs in high-velocity environments. Extensive research has been conducted on the antecedents to an incremental/general product innovation capability, and meta-analyses have been conducted to integrate the results from the various studies. However, whether and how a radical product innovation capability differs from an incremental product innovation capability is also critical. The purpose of this work is to develop a testable model of the antecedents to radical product innovation success. Based on an extensive literature review, a comprehensive set of organizational components that comprise a firm’s radical product innovation capability is identified. These organizational components include senior leadership, organizational culture, organizational architecture, the radical product innovation development process, and the product launch strategy. Of course, each of these components has subcomponents that provide even more texture. This review highlights how the components of a radical innovation capability function differently from those for an incremental capability. In addition, this review strongly suggests that the direct effects models that dominate this literature underestimate the complexity of the interplay of components that comprise a radical product innovation capability. Thus, a model to demonstrate this interplay of these organizational components is provided. Illustrative research propositions are offered to provide guidance to researchers. Suggestions for executives and managers who are involved in the product development process and for scholars who seek to advance the state of knowledge in this area are offered in the conclusion.

Introduction

Due to relatively short product life cycles, product innovation is the lifeblood of firms competing in dynamic environments. Indeed, a Boston Consulting Group Senior Executive Innovation Survey (Andrew, Manget, Michael, Taylor, and Zablit, 2010) found that product innovation was among the top three strategic priorities for 71% of companies and that 70% of companies considered new-to-the-world products as “important” or “very important” to the company’s future. Even during the 2008 recession, Booz & Company found that the world’s top innovators increased their research and development (R&D) spending despite decreases in their operating income. More than 90% of the executives surveyed characterized innovation as critical when preparing for the economic upturn (Jaruzelski and Dehoff, 2009). Moreover, the stock market responds rapidly and positively to announcements about innovation at all stages of the innovation project (Sood and Tellis, 2009; Tellis, Prabhu, and Chandy, 2009).

However, the Product Development Management Association Best Practices Study (Barczak, Griffin, and Kahn, 2009) found that firms deemed only about 59% of new products commercialized to be “successful” (in general terms), while 54% of commercialized new products were considered successful specifically in terms of a profit perspective. These relatively modest new product success rates have led to a burgeoning literature on the antecedents to product innovation performance. Meta-analyses (e.g., Henard and Szymanski, 2001; van der Panne, van Beers, and Kleinknecht, 2003) have found strong support for many firm-level antecedents such as:

- Extent to which product is perceived as satisfying customer needs
- Superiority over competitive offerings
- Focused commitment of personnel and R&D resources to the new product development initiative
• Functional diversity in the new product development team
• Proficiency with which the firm generates and screens ideas
• Complementarity between the requirements of the new product development initiative and firm capabilities
• Product-launch capability

However, these findings do not discriminate between incremental and radical product innovation. A radical product innovation capability provides for the development and commercialization of products/services that offer unprecedented performance benefits, substantial cost reductions, or the ability to create new businesses (e.g., Leifer, O’Connor, and Rice, 2001; Simon, McKeough, Ayers, Rinehart, and Alexia, 2003). Because radical product innovations face an inherently more uncertain development process, more complex customer adoption process and, by extension, a more difficult marketing process, radical product innovation requires a different skill set for a firm than does incremental product innovation (cf. Leifer et al., 2000).

Firms that wish to develop radical innovations must understand the configuration of components that comprise a radical product innovation capability. An extensive literature review suggests a set of important organizational components of radical product innovation capability. A key theme throughout this review is that these components differ in kind and intensity for radical versus incremental product innovation capabilities. The model of radical product innovation capability is based on the complex interplay of these components. In support of that model, a set of illustrative research propositions is offered. The implications of our findings for academics and for managers are described in the conclusion.

Why Is Radical Innovation So Difficult?

Before proceeding with the review and synthesis of the literature to develop a model of radical product innovation capability, it is important to address why it is so difficult to develop a radical innovation capability. Teece, Pisano, and Shuen (1997) argue that the competitive battles in dynamic markets require a paradigm beyond the resource-based view (cf. Barney, 1991). The ability to successfully develop and commercialize radical product innovations constitutes a “dynamic capability,” which is both difficult to develop and difficult to imitate. Dynamic capabilities enable managers to adapt, integrate, and deploy internal and external organizational skills, resources, and functional competencies to achieve alignment with the changing business environment. Moreover, dynamic capabilities are a source of sustainable competitive advantage when they are based on a configuration of useful skills, resources, and competencies. It is this configuration that is so difficult to imitate (Eisenhardt and Martin, 2000). A radical product innovation capability passes the tests of value, rarity, and inimitability of skills, resources, and/or competencies that are the foundation for competitive advantage. In a recent meta-analysis of the effect of firm innovativeness on performance, Rubera and Kirca (2012, p. 143) found that “radical innovations consistently generate more positive performance outcomes than incremental innovations.”

However, just as it is difficult for a competitor to imitate this capability, it is difficult for a firm to develop this capability. Therefore, a thorough review of the empirical literature was conducted in order to identify the organizational characteristics that are conducive to developing a radical product innovation capability. The factors addressed in the next section are those that have been most consistently identified in the literature as critically important.

BIOPGRAPHICAL SKETCHES

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Components of a Radical Product Innovation Capability

In this section, an overview of past research on organizational characteristics related to radical product innovation is presented. Figure 1 presents the components derived explicitly from this literature review and reflects the direct effects models that dominate this literature. It is noteworthy that although many of these factors have been shown to affect both incremental and radical innovations, this review suggests that the components of a radical innovation capability function differently from those for an incremental innovation capability. More specifically, the development of a radical innovation capability differs in both intensity and flavor of how these components operate. Thus, this section also highlights, where applicable, these differences for radical product innovation capability compared to incremental product innovation capability.

Furthermore, this review reveals that the organizational components that facilitate the development of a radical product innovation capability also have important interrelationships themselves. Hence, in addition to this review of each component in the direct effects model derived from the literature (Figure 1), the interplay of these components is developed, as represented in Figure 2. Not surprisingly, the radical product innovation development process occupies the central position in the model; this process is described more fully in the appropriate section in this review. A second critical component to radical product innovation, as this literature review shows, is the firm’s launch strategy. The components of the product launch strategy are the mechanism through which the organization communicates its value proposition to the chosen target customers, key to customer adoption of these new-to-the-world products. Again, more detail on this component is provided in the appropriate section in the review. Finally, radical product innovation (RPI) performance refers to the success of the radical product innovation in the marketplace, most typically captured in terms of revenue and profit growth due to new products or services, customer satisfaction with new products or services, and number of ideas or concepts in the pipeline (Chan, Musso, and Shankar, 2008). As each component in this review is discussed, illustrative research propositions that give a flavor of the interrelationships between the various components of the radical product innovation capability are offered.

Figure 1. Components of a Radical Product Innovation (RPI) Capability**

**Direct Effects Model Is Derived Explicitly from the Review of the Extant Literature
**Senior (C-Level) Leadership**

The first task of the leader is to set an appropriate tone for innovation. Research shows that chief executive officer (CEO) attention is an important driver of innovation regardless of whether the focus of attention is specifically on innovation, on external events, or on the future (O’Connor and Veryzer, 2001; Yadav, Prabhu, and Chandy, 2007). An effective leader exhibits specific leadership traits: they (1) exude passion; (2) articulate strategic intent and market vision; (3) imbue technologists with a customer value orientation; (4) provide physical protection (insulate the radical innovation organization to minimize distractions and short-term pressures), psychological support and encouragement (to the radical innovation project team even during the inevitable low points of the project); (5) dedicate sufficient resources and apply appropriately different metrics to assess success than for conventional innovation; and (6) recruit, develop, and retain people who have the robust set of skills, knowledge, and mindset to drive radical innovation (Simon et al., 2003).

Leadership skills that support radical innovation differ from those that support incremental innovation. More specifically, based on a 10-year study of more than 700 new products, companies that produced “blockbuster” products—defined as those that not only met or exceeded the company’s goals for sales and profit but also met or exceeded customer expectations and received awards from either the company, the industry, or prestigious national publications such as Business Week—exhibited the full cooperation of the highest level of management; senior managers either were intimately involved with virtually every aspect of the process or made it clear that they completely backed the project and gave the team the authority it needed to proceed. They provided a clear and stable vision with specific goals clearly articulated to stay on course (Lynn and Reilly, 2002). Also, as noted above, leaders must use different metrics to assess success for radical innovation than for conventional innovation (Christensen, Kaufman, and Shih, 2008).

Leaders articulate strategic intent to provide a focus or rallying point for the organization and its employees. With respect to radical product innovations, strategic intent begins with a goal that seems to exceed the organization’s grasp, forcing it to compete in innovative ways (Hamel and Prahalad, 2005) and focusing the organization on achieving a leadership position. In a comparative case study to identify the characteristics of new product design consultancy firms that develop radical, as well
as incremental, innovations, Andriopoulos and Lewis (2009) found that these firms’ strategic intent emphasized breakthrough innovation rather than profit. Moreover, effective strategic intent emphasizes “a future-looking, longer-term perspective” (Kelley, 2009). Strategic intent creates a sense of urgency among employees, focuses them on achieving best-in-class status, and gives them clear milestones and review mechanisms to track progress to ensure that recognition and rewards reinforce the desired behaviors (Hamel and Prahalad, 2005). Lack of clarity may discourage the initiative of prospective innovators within the company (Kelley, 2009).

While strategic intent provides a general frame of reference to guide the organization’s innovation efforts, market vision is more specific and reduces innovation risk by focusing the firm’s customer, technological, and competitor-relating activities (discussed later). Like strategic intent, an effective market vision has a clear goal that focuses employee effort. The goal is “a desired and important product-market for a new advanced technology” (Reid and de Brentani, 2010, p. 500). The market vision must be grounded in an inspirational view of the future based on proactive use of market learning tools. Then, by networking that drives the vision through the organization, organizational members will work in a coordinated manner to achieve the goals that are implicit in the vision (e.g., Lynn and Akgün, 2001; Reid and de Brentani, 2010).

In addition to being a critical component of a radical product innovation capability, visionary leadership has a more complicated interplay with the other components of this capability, including organizational culture, organizational characteristics, and the radical product innovation process itself. For example, a firm’s senior leaders also significantly influence organizational culture and, in turn, are influenced by the organization’s culture. In particular, the organizational culture that supports radical product innovation, established in part by senior leadership and embodied in the recruitment, development, and motivation of employees, requires a different mentality (values and beliefs) on the part of senior leadership than for incremental innovation. For example, Bill Campbell, Chairman of the Board of Intuit, when asked whether a company can build a culture of innovation, said:

I'm absolutely convinced you can build that. You need a leader. You have to go out and recruit the best person you can who knows how to create an innovation culture. He or she doesn’t need to be personally the most innovative person, but he or she needs to know how to foster innovation. Then give that person license to hire. Go get yourself some teams. Recruit people who have the “DNA” that you want. . . For me, growth is the goal, and growth comes through having innovation. (Mendonca and Sneader, 2007, p. 72)

Moreover, the leader communicates important organizational values both symbolically and substantively (in storytelling, behaviors, and decisions), and the firm’s culture affects both how leaders lead and how new leaders are selected. As shown in Figure 2, the model of the interrelationships between the components of a radical product innovation capability, this interplay is captured in P1:

P1: The characteristics of senior leadership shape the characteristics of organizational culture and vice versa.

In addition, senior leadership has a profound effect on the organization’s characteristics that affect the radical product innovation capability (such as organizational structure and performance metrics) as well as the radical product innovation process itself (say, by empowering product champions, etc.). For example, Fortune’s 2011 list of the “World’s Most Admired Companies” featured General Electric (GE) as the most highly regarded firm in electronics sector. GE has long been known for CEO and other senior management involvement in setting the tone for major program initiatives. In 2006, GE launched the “Leadership, Innovation, and Growth” (LIG) initiative to create new ways to stimulate innovation and organic growth. Leadership teams from GE’s top 60 businesses have participated in the program and learned how to translate innovative ideas into innovative products by developing appropriate organizations, processes, systems, and launch strategies (Govindarajan and Peters, 2011). Hence, the model captures two additional propositions that reflect the important role of senior leadership:

P2: Senior leadership has a direct effect on the radical product innovation development process.
P3: Senior leadership has a direct effect on organizational characteristics.

Organizational Culture

Deshpandé and Webster (1989, p. 4) described culture as “the pattern of shared values and beliefs that help members of an organization understand why things happen and thus teach them the behavioral norms in the organization.” This literature review on the role of organizational culture in facilitating the development of a radical product innovation capability revealed various ways in which these values and beliefs are addressed in
the literature: (1) the competing values framework (Deshpandé, Farley, and Webster, 1993; Quinn and Rohrbaugh, 1983), including the various components of (1) an adhocracy culture; (2) a firm’s customer, competitor, and technological orientations; (3) a firm’s learning orientation whose values amplify the value of the previously mentioned orientations; (4) a firm’s “willingness to cannibalize” (Chandy and Tellis, 1998) represented in its values and beliefs about investments in next-generation technologies.

The competing values framework is an established model for representing culture (e.g. Deshpandé et al., 1993; Quinn and Rohrbaugh, 1983). This framework recognizes that managers must make choices that reflect two kinds of tensions that exist in organizations—internal versus external orientation and the need for control versus the need for flexibility. This two-dimensional representation produces four culture types. The adhocracy type is characterized by flexibility and willingness to take risks, and an external orientation that produces entrepreneurial and creative behaviors. The market type is distinguished by control and an external orientation that produces highly competitive behaviors including aggressive product development and market expansion programs, intense brand building, or even price competition. The clan type is exemplified by flexibility and an internal orientation that produces relationship-building behaviors such as focus on segments of value conscious customers, provision of superior customer service, and use of a strongly supported internal sales force. The final type is the hierarchy, characterized by control and an internal orientation that produces behaviors focused on predictability and smooth operations (Quinn and Rohrbaugh, 1983).

Because the adhocracy culture is characterized by the values of entrepreneurship, innovation, adaptability, propensity for risk, as well as an external orientation, this culture type is the best foundation for a radical product innovation capability (Deshpandé et al., 1993; Slater, Olson, and Finnegan, 2011). We next explicate the different components of the adhocracy culture, including customer orientation, competitor orientation, technological orientation, learning orientation, and willingness to cannibalize that are conduciive to an effective radical product innovation capability.

Customer-oriented firms place the highest value on creating superior customer value (e.g., Narver and Slater, 1990) by developing and using market-based information. However, there seems to be a gulf between the practitioner and scholarly perspectives on the value of a customer orientation when it comes to radical product innovation. When accepting the Industrial Research Insti-
products and services that address these latent needs in a compelling fashion delights and excites customers and inspires loyalty. A structured customer visit program, ethnographic/observational research, and working with lead users (customers whose needs are advanced relative to the rest of the market), among others may provide insight into customers’ latent and future needs (e.g., Slater and Narver, 1998).

Firms must be ambidextrous, combining both responsive and proactive customer orientations. While a responsive customer orientation may generate only incremental innovations, satisfying existing customers through incremental innovations both reduces firm risk and produces the cash flow that is necessary to fund development of radical innovations. A proactive customer orientation is necessary for development of the market intelligence that leads to the development of radical innovations that are the foundation for future cash flows (Atuahene-Gima, Slater, and Olson, 2005). The expectation of these cash flows is what drives stock prices.

Because technological progress is a source of many radical innovations (Govindarajan and Kopalle, 2004), a firm’s technology orientation is another key aspect of its culture that affects its radical product innovation capability. Technology-oriented firms not only believe that technology is the foundation for radical product innovation; they also have the ability to acquire substantial technological knowledge by regularly scanning for information regarding technological opportunities and threats, and they exploit it in their product development activities ( Gatignon and Xuereb, 1997; Srinivasan, Lilien, and Rangaswamy, 2002; Zhou, Yim, and Tse, 2005). Exceptional innovators consider technology as a primary input to strategy formation, regularly revise strategy to take advantage of evolving technologies, plan for market disruptions caused by technological change, and focus technology on customer priorities (Berman and Hagan, 2008).

In addition, a firm’s competitor orientation can facilitate a radical product innovation capability. First, an understanding of competitors’ products, capabilities, goals, and strategies may help avoid direct confrontation or may enable the firm to develop products that have a significant advantage. Second, Day and Shoemaker (2007) argued that a focus on current competitors often leads to imitative strategies and convergence on the same value propositions and scope of offerings. And, because future competitors may come from an entirely different industry and have unique capabilities or value propositions, companies must pay careful attention to competitors. Thus, the most successful firms must “scan the periphery” (Day and Shoemaker, 2007). This means, among other things, considering low-end competitors that might have been ignored; taking cues from complementors who can provide insight into the likely moves of rivals; assessing firms that compete in other industries but have the capability to satisfy the needs of the company’s customers; and listening to “market visionaries,” industry executives who can anticipate emerging marketplace or technology trends (e.g., Steve Jobs). In fact, many of the most successful highly innovative products are initially targeted to niche markets where there are few competitors (Hultink, Griffin, Hart, and Robben, 1997). This seems to discourage competitor retaliation (Debruyne et al., 2002) since competitors do not seem to view the new product as a direct threat. While some argue that a competitor orientation is secondary to a customer orientation (e.g. Ohmae, 1988), it can still be a critical component of a firm’s radical product innovation capability. A competitor orientation is revealed through the priority placed on in-depth assessment of a set of existing and potential competitors.

One of the key aspects of an innovative firm’s organizational culture is the strength of its learning orientation. A learning orientation influences “the propensity of the firm to create and use knowledge” (Sinkula, Baker, and Noordewier, 1997, p. 309). The values that comprise a learning orientation include commitment to learning; open-mindedness; and shared principles, ideals, and beliefs about the market (Sinkula, 1994; Sinkula et al., 1997). Fundamental to learning is the value that members of the organization’s top management team place on understanding the causes and effects of the firm’s actions. Open-mindedness is concerned with the strength of the mental models. Mental models are deeply held pictures of how the marketplace and even the world work. Over time, as markets change, mental models may constrain creative thinking. Open-mindedness, related to the construct of unlearning, supports proactive questioning the value of long-held routines, assumptions, and beliefs. This is essential to developing radical product innovations.

Two critical learning styles that impact the development of innovations are exploratory market learning which requires “a firm to engage in the pursuit of very new and radical market information, going beyond the current product market knowledge domain” (Kim and Atuahene-Gima, 2010, p. 522) and exploitative market learning which focuses on the refinement and extension of information that already has been acquired (Kim and Atuahene-Gima, 2010; March, 1991). Exploratory market learning leads to the development of unique products/services, while exploitative market learning...
Enhances cost-effectiveness (Kim and Atuahene-Gima, 2010). In this sense, exploratory market learning is more likely to be associated with radical innovation while exploitative market learning is more likely to be associated with incremental innovation (Atuahene-Gima, 2005; Danneels, 2002).

Willingness to cannibalize refers to the firm’s willingness to sacrifice sales of existing products or reduce the actual or potential value of investments by introducing new innovations that directly compete with or challenge those existing products (Chandy and Tellis, 1998; Govindarajan and Kopalle, 2004). Although not previously examined as a component of organizational culture, managers’ values and beliefs regarding their willingness to cannibalize is a key component of a firm’s radical product innovation capability. Managers who expect a substantial change in technology invest more heavily and more aggressively in radical innovation (Chandy, Prabhu, and Anita, 2003). Moreover, managers who are more fearful of obsolescence are also more willing to cannibalize existing products (Chandy and Tellis, 1998).

Based on the notion that product life cycles follow an S-shaped curve (e.g., Utterback, 1994) that proceeds from introduction, to growth, to maturity, and to decline, willingness to cannibalize means that firms will engage in creative destruction earlier rather than later in an industry’s evolution. In other words, willingness to cannibalize means that rather than waiting for the maturity stage—when revenues and profits are likely to be greatest—to introduce a radical innovation, the firm should be working on the next-generation innovation and be prepared to introduce it during the growth stage of the current generation; it should also be working on game changing radical innovations that defy competitors’ imitative efforts. While this strategy is likely to take revenues and profits from the earlier generation product, willingness to cannibalize enables the firm to develop radical innovations and to stay ahead of competitors. Indeed, Andrew Grove (1999), former CEO of Intel, articulated the position that when a “strategic inflection point” is reached, standard operating procedures are no longer relevant. Strategic inflection points may occur with the emergence of hypercompetition, changes in regulations, or the development of a new technology.

In addition to being a critical component of a firm’s radical product innovation capability, organizational culture exhibits important inter-relationships with other components. For example, a firm’s culture has a significant effect on how its cross-disciplinary teams function and its reliance on partners (both components of organizational characteristics, P4). Moreover, by providing norms for behavior, culture has a powerful impact on the radical product innovation processes (P5). Culture also influences the behavioral norms regarding product launch strategy (P6). For example, in 2006, Ford’s executive team saw that it needed to develop a new strategy to remain competitive, but they also realized that the firm’s entrenched culture posed a barrier to doing so. To bring home the point that strategic changes cannot succeed without an organizational culture that facilitates new strategic thinking, the executive team hung a banner saying, “Culture eats strategy for breakfast” (McCracken, 2006, p. B1).

P4: Organizational culture (values, beliefs, assumptions) shapes organizational characteristics.

P5: Organizational culture has a direct effect on the radical product innovation development process.

P6: Organizational culture has a direct effect on the firm’s product launch strategy.

Organizational Characteristics

Our review of the components of a radical product innovation capability identified the effect of the following organizational characteristics: organizational structure, reliance on partnerships, cross-functional integration, and the use of a marketing performance management system in the innovation process.

O’Connor (2008) argued that radical innovation requires an identifiable organizational group that is responsible for developing and maintaining the radical innovation capability and is measured on its results. Marketing and R&D are equally likely to be the function that owns the radical innovation project (Barczak et al., 2009).

Conventional wisdom suggests that an organic structure—which encourages both horizontal and vertical communications that enable the firm to respond rapidly to the organization’s changing environment (e.g., Miles and Snow, 1992)—best facilitates innovation. However, Jelinek and Schoonhoven (1993; see also O’Connor, 2008) found that institutionalized mechanisms provide the structure and clear reporting relationships necessary for both the discipline and creativity needed for radical product innovation. Even while using institutionalized mechanisms, they recognized the need for unique processes within the radical innovation subgroup and did not advocate a mechanistic, hierarchical organization. The organization’s structure and processes should be allowed to evolve as objectives become more clear (Kelley, 2009).
Finally, while a radical product innovation should eventually be embedded in an SBU, initially, resources, networks, and operating systems should be loosely coupled to the mainstream organization so as not to become burdened by its core rigidities (O’Connor, 2008).

Given the complexity and resource intensity of radical product innovation projects, more than 50% of those projects involve collaboration with partner organizations (Barczak et al., 2009). In a study of biotech firms, Powell, Koput, and Smith-Doerr (1996, p. 116) concluded that “when the knowledge base of an industry is both complex and expanding and the sources of expertise are widely dispersed, the locus of innovation will be found in networks of learning, rather than in individual firms.” The strategy of collaborating with other organizations is often referred to as open innovation, “the pooling of knowledge assets for innovative purposes where the contributors have access to the inputs of others and cannot exert exclusive rights over the resultant innovation” (Chesbrough and Appleyard, 2007, p. 57). Reasons for partnering in the innovation process include risk sharing, access to new markets and/or importing knowledge, technologies, and pooling complementary capabilities (e.g. Powell et al., 1996).

Research on alliances formed for new product development shows that the “logic of alliances” clashes fundamentally with the “logic of innovation” (Sivadas and Dwyer, 2000) in that governance structures designed to specify goals and responsibilities of the partners may inhibit the flexibility and spontaneity needed for innovation. Hence, firms must develop a “cooperative competency” that allows them to successfully juggle the disparate skills involved in navigating new product development alliances. Interestingly, Sivadas and Dwyer’s (2000) research found no significant differences in cooperative competencies between radical and incremental innovations. They surmise that “the unpredictability and greater risk of [radical innovations],” which would negatively affect the development of the requisite cooperative competence, may be neutralized by the greater emphasis and longer time horizon of such projects—traits that would be likely to enhance the development of a cooperative alliance competence.

In related research, Rindfleisch and Moorman (2001) found that knowledge redundancy and relational embeddedness are positively associated with new product creativity. They found that these effects are most pronounced in horizontal new product alliances (between competitors), possibly due to knowledge redundancy and overlapping skills that provide greater absorptive capacity to leverage partner insights. Collaborations with universities or suppliers may have a stronger impact on product innovation than do collaborations with customers or competitors, since the university and supplier collaborations generally are characterized by the relative ease of knowledge transfer (Un, Cuervo-Cazurra, and Asakawa, 2010). Clearly, partners are a key part of a firm’s radical product innovation capability.

Most technology companies, 69% according to Barczak et al. (2009), organize new product development through cross-functional product development teams comprised of individuals from different functional areas (e.g., marketing, R&D, manufacturing, engineering, and purchasing). To maximize the likelihood of success, all functional areas must be closely integrated (Gatignon and Xuereb, 1997). The effectiveness of cross-functional teams is a function of the degree to which team members interact, communicate, coordinate, and share values with one another to collect and synthesize market information for decision-making (e.g., Berchicci and Tucci, 2010; Sethi, 2001).

As the difficulty of the development task increases, so too does the interdependence of the functional specialists. This results in a greater need for cross-functional exchange of ideas, information, and other resources (Olson, Walker, and Ruekert, 1995). Specifically, high levels of cooperation between marketing and R&D during the early stages of the innovation project are positively related to project performance while high levels of cooperation between marketing and operations during the early stages of the product development process are negatively associated with performance for highly innovative projects (Olson, Walker, Ruekert, and Bonner, 2001). Although the importance of cross-functional teams is well accepted, the integration of team members’ values and expertise is difficult to achieve. Cross-functional integration is most likely to occur when team members view each other as colleagues, and identify with the group and have a stake in collective success or failure. At the project level, cross-functional integration is more likely to occur when the team leader involves team members in decision-making and goal setting, appropriate reward systems are in place, a formal planning process is utilized, and managers encourage risk taking (Nakata and Im, 2010; Sarin and O’Connor, 2009).

The following team characteristics also are critical in bringing successful blockbuster products to market (Lynn and Reilly, 2002):

- Team flexibility and willingness to try all kinds of different ideas and iterations in rapid succession until
they developed a prototype that clicked with their customers

- Information exchange practices that were not limited to formal meetings—knowledge is shared in dozens of small ways, from coffee klatches to video conferencing to streaming in and out of a room covered in Post-it notes to hundreds of emails
- Collaboration under pressure, with a focus on goals and objectives as opposed to interpersonal differences; teams were not especially concerned about building friendships or even insisting that everyone like each other but rather on coherent goals in working on the project.

Homburg, Artz, and Wieseke (2012) found strong support for the proposition that use of a comprehensive marketing performance measurement system was associated with performance in dynamic environments. Two studies conducted among high-tech firms (O’Sullivan and Abela, 2007; O’Sullivan, Abela, and Hutchinson, 2009) found that marketing performance measurement is positively associated with both firm performance and CEO satisfaction with marketing. On average, businesses use about eight metrics to assess the performance of their innovation program (Chan et al., 2008). The five most commonly used metrics are: (1) revenue growth due to the new products/services, (2) customer satisfaction with new products/services, (3) number of ideas or concepts in the pipeline, (4) R&D spending as a percentage of sales, (5) percent of sales/profits from new products/services. The major reasons for the use of metrics in the innovation process are to assess whether employees’ individual performance incentives are aligned with innovation program priorities, provide direction for innovation activities, guide the allocation of resources to the most appropriate projects, and diagnose and improve overall innovation program performance (Chan et al., 2008).

The prospector (Miles and Snow, 1978), the strategy type that is most likely to engage in radical product innovation, places greater emphasis on measurement of numbers of customers, customer satisfaction, technological advantage, product quality, perceived innovativeness, and launch timeliness than do any of the other strategy types (Manion and Cherion, 2009; Olson and Slater, 2002). Radical product innovation projects also require leading performance indicators (Reid and de Brentani, 2010). These include satisfaction with and acceptance of a new product and the ability to attract capital (Griffin and Page, 1996). The companies that realize the highest growth from their innovation projects are more likely to utilize metrics across the entire innovation process and are the most satisfied with their measurement systems.

The illustrative propositions regarding the interrelationships of these organizational characteristics—organizational structure, partnerships, cross-functional teams, and performance metrics—are presented after first introducing the other components of a radical product innovation capability that arise from this review.

The Radical Product Innovation Development Process

Slightly more than 70% of the ideas for radical and more innovative projects are generated through formal planning activities (Barczak et al., 2009) compared to about 60% for incremental projects. The Stage-Gate, Idea-to-Launch Process (e.g., Cooper, 1986, 2008) may be the most popular system for developing and taking new products to market. In this process, stages are comprised of best-practice activities that are necessary to take the project to the next decision point/gate. The stages of the full process are discovery, scoping, business case, testing, and launch. However, use of the full stage-gate process may hamper the development of novel products by increasing time-to-market, reducing flexibility, and inhibiting learning (Kelley, 2009; Sethi and Iqbal, 2008). To mitigate this problem, Cooper (2008) noted that the stage-gate process is adaptable and may be streamlined by determining which activities can be combined or even eliminated. This may enable the organization to develop a distinct, but evolving, product development process (Kelley, 2009).

O’Connor and DeMartino’s (2006) study of 12 large multinational firms (including IBM, DuPont, GE, and 3M, among others) based on their declared intention to develop a radical product innovation capability identified three competencies of a mature (fully developed) radical product development innovation capability: discovery, incubation, and acceleration. Coincidentally, these competencies parallel those of Cooper’s (2008, p. 223) “Stage-Gate Lite” process, a streamlined approach, efficient and lean, for rapidly bringing innovative products to market. The purpose of discovery is to identify, evaluate, elaborate, and develop novel ideas into radical innovation opportunities. While many good ideas may come from within the company, both the quality and quantity of those ideas is usually insufficient. Thus, groups tasked with discovery of potential innovation ideas also encourage organizational members to think big, and conduct workshops and ideation sessions. These groups generally are located in, or are tightly connected to, R&D.
However, some firms form exploratory marketing groups within central R&D to learn about markets that the firm is not familiar with but where the firm’s technology may have applications.

During incubation, the organization cultivates and refines the product by prospecting potential market opportunities, identifying complementary technologies/products, and exploring potential partnership opportunities (e.g., Reinders, Frambach, and Schoormans, 2010). Finally, accelerator capabilities take those radical innovation projects that have demonstrated commercial potential and refine them to the point where they can be self-sustaining.

Another critical part of the RPI process is the role of product champions. Product champions promote and sell a project internally to obtain resources and organizational support, and are willing to assume significant risk to make it happen (e.g., Maidique, 1980). Day (1994) found that the lower the principal champion’s hierarchical level, the more likely the individual was to possess the most current and relevant marketing and technical knowledge, and the more likely the project was to be highly innovative. Conversely, product champions from corporate headquarters, particularly those in staff positions, were less likely to have that relevant knowledge and connections to promote highly innovative projects. However, for champions from corporate headquarters, the higher the product champion’s level, the greater the innovativeness of the project. Moreover, the most innovative projects had champions who controlled sufficient resources to also be sponsors. Thus, a trade-off is involved between the knowledge requirements and other resource requirements (e.g., human, financial) for a radical innovation project as product champions emerge within the organizational hierarchy. If, for example, a product champion emerges at a relatively lower level, there must be processes in place for a senior executive to mentor and support the product champion. On the other hand, a senior product champion may need mentoring by a technical person at a more junior level to understand better the technology or marketing aspects of a radical innovation.

Organizational characteristics (structure, reliance on partners, and cross-functional integration) exhibit important interrelationships with the radical product innovation process itself. For example, partners and interdisciplinary teams are a key part of the discovery process for innovation. Hence, for illustrative purposes, we offer a general proposition regarding this interplay:

_P7: Organizational characteristics have a direct effect on the radical product innovation development process._

### Product Launch Strategy

The literature review identified the important role of a firm’s product launch strategy in its decisions for the radical product innovation. When customers have little experience and familiarity with a new product concept, the go-to-market strategy is more difficult than when the new product concept is an incremental modification or extension of an existing product (Olson et al., 1995). Calantone and Montoya-Weiss (1993) argued that product launch is often the most expensive and risky, and the least well-managed part of the product development and commercialization process. Their launch process includes the following steps: (1) identify target markets, (2) establish a marketing mix, (3) forecast financial results, and (4) establish a control and adjustment system. Indeed, a variety of factors in the product launch strategy is related to a radical product innovation capability, including focus, timing, marketing mix variables, and bundling.

Launch strategies should also allow for differences in product innovativeness or desired speed of time-to-market (Hultink et al., 1997). More specifically, Hultink et al. (1997) found that the marketing mix for the most successful launch strategies for highly innovative products focused on niche markets with three or fewer competitors, positioned the product as a technological solution to customer needs, utilized an exclusive distribution strategy to ensure appropriate customer education and service, and employed a skimming price strategy. Bundling products with high perceived fit helps enhance the evaluation and purchase intention of radical innovations (Reinders et al., 2010). In support of those findings, competencies at market research, market segmentation, targeting, pricing, advertising, and integration of marketing activities are positively related to radical product innovation launch success (e.g., DeSarbo, Calantone, and Song, 2008; Slater and Olson, 2001).

Other aspects of the product launch strategy also appeared in the literature, including the use of cross-functional teams in the launch strategy and the use of supplier involvement in commercialization. Di Benedetto’s (1999) description of product launch strategy found that effective companies utilize cross-functional teams to develop launch strategy and marketing plans, study feedback from customers both during and after the product launch, and contract for specialized market research. Supplier involvement in market intelligence generation for commercialization tasks (during launch) has a greater impact (than supplier involvement in predesign activities) for both product performance and...
market share in radical innovations (Song and Thieme, 2009). Hence:

**P8: Organizational characteristics have a direct effect on product launch strategy.**

Moreover, the aspects of the radical product innovation process also have an effect on the product launch strategy. For example, Chandy, Hopstaken, Narasimhan, and Prabhu (2006) studied the firm’s ability to convert an idea into a launched product in the pharmaceutical industry. They found that companies that focus on ideas with important technical and commercial implications, and on ideas that are related to scientific fields in which they have expertise, are better at converting ideas into approved drugs than firms that do not. Moreover, they found that focusing on a moderate number of promising ideas and setting a moderately aggressive schedule—rather than one that was either too aggressive or had too much slack—was most effective.

**P9: The radical product innovation development process has a direct effect on product launch strategy.**

“Marketing strategies only result in superior returns for an organization when they are implemented successfully” (Noble and Mokwa, 1999, p. 57). Based on their review of the strategy implementation literature, Slater, Hult, and Olson (2010) concluded that implementation is most effective when the characteristics of the marketing organization “fit” the business’s product-market strategy. The notion of “fit” implies a moderator effect, such that the right configuration of organizational characteristics and launch strategy is required in order to yield optimal outcomes in the market. For example, organizational structure and cross-functional integration may enhance coordination, communication, decision-making, and the flexibility to handle the change that is endemic to dynamic markets. This is but one possible path to explore the nature of this moderator effect, adding a flavor of the interaction effect between organizational characteristics and the product launch strategy on RPI performance.

**P10: Organizational characteristics moderate the product launch strategy—radical product innovation performance relationship.**

**Contributions and Insights: Implications for Managerial Practice and Future Research**

This literature review identified a set of organizational components related to a radical product innovation capability. Certainly, as in developing any dynamic capability, developing a radical product innovation capability is a difficult task. Managers must be willing and able to articulate a strategic intent with a “stretch goal” that forces the company to compete in novel ways. Moreover, to develop a radical product innovation capability, company leaders need to support their key personnel with resources, psychological support, and appropriate metrics. The RPI capability is a complex configuration of components that requires juggling an array of seemingly paradoxical skills. Companies must simultaneously manage both a proactive and a responsive customer orientation, a technological orientation, and a competitor orientation. They must also be willing to develop new, radical innovations, even when such innovations cannibalize their existing successful products. Organizational structure must simultaneously juggle organic and more institutionalized mechanisms, such as horizontal and vertical communications and clear reporting relationships as well as unique processes to stimulate creativity. At a minimum, the organizational structure must be able to support the three processes related to a radical innovation capability: discovery, incubation, and acceleration (O’Connor and Ayers, 2005; O’Connor and DeMartino, 2006). Managing discovery and incubation processes requires exploration learning skills, while managing acceleration activities requires exploitation skills. Planning processes must be team-based, fast, and iterative in order to navigate the complexities of a highly dynamic market environment. Metrics are critical to assessing the performance of the innovation program, with metrics linked to the type of innovation. Finally, product launch strategies must be highly focused in order to maximize success. In combination, these factors significantly affect the development of a firm’s radical product innovation capability.

Another major implication that arises from our review is that in order to fully understand a firm’s radical product innovation capability, one must understand how it is similar to, yet different from, an incremental product innovation capability. Mohr, Sengupta, and Slater (2012) provide a comprehensive review of research utilizing this contingent-type thinking in high-technology marketing. The differences between radical and incremental product innovations suggest an important methodological consideration in empirical testing: At a minimum, researchers must consider type or level of innovation. Better yet, a robust approach would explicitly compare how these factors operate differently for radical innovations compared to incremental innovations. Moreover, an extension of this thinking could further address whether the model of radical innovation capability suggested here needs to
be modified depending upon whether the radical innovation is a physical product, an intangible service, or a new business model.

A final major point that emerges from this review is that most of the previous literature tends to examine each component of a radical product innovation capability in isolation from the others. However, this review suggests that the various components in the model affect each other, implying a complex interplay between and among them, as was suggested in Figure 2. For example, the propositions that we offered, while general, give a flavor of the nature of these inter-relationships. This notion of an interplay is consistent with emerging work on the principles of radical management (Denning, 2010). Denning developed a set of self-reinforcing and interlocking principles of radical management and suggested that an organization that relies piecemeal on only some of the principles will not be successful. Day (2011) argued that although dynamic capabilities—those that enable the organization to adapt to environmental changes over time—are important, “they are simply not sufficient for the chaotic marketing environments today” (p. 187). Rather, he recommended augmenting and extending the existing view of the development of dynamic capabilities with adaptive capabilities—those that are interwoven and function more as a web than more familiar approaches. Consistent with this thinking, scholars should seek to advance the state of knowledge in this area by exploring the complex interplay between and among the various factors identified in our review. In addition to examining the inter-relationships, identifying which factors are more important in the development of a radical product innovation capability would provide guidance on where investments should be made more or less (e.g., in organization-wide processes or in hiring individual talent) in pursuit of a radical product innovation capability.

References


