2

CORPORATE ENTREPRENEURSHIP THROUGH RADICAL INNOVATION: KEY ORGANIZATION AND INITIATIVE LEVEL MECHANISMS[1]

Donna Kelley
Babson College
Heidi M. Neck
Babson College
Gina Colarelli O'Connor
Rensselaer Polytechnic Institute
Albert Paulson
Rensselaer Polytechnic Institute

INTRODUCTION

The literature addressing the role of corporate entrepreneurship in large established organizations points repeatedly to the need for a part of the organization to focus on future paths to growth (Kanter et al., 1991; Kanter, 1989; Prahalad and Hamel, 1994) by thinking outside the firm's current lines of business (Burgelman, 1984; Chesbrough, 2000). The definitions of corporate entrepreneurship are many and varied (Sharma and Chrisman, 1999), but Covin and Miles (1999) strongly advocate that innovation is central to the corporate entrepreneurship construct stating, "without innovation there is no corporate entrepreneurship" (p. 49). Through corporate entrepreneurship, a firm takes a proactive approach to product-market innovation through the pursuit of risky ventures (Miller, 1983; Slevin and Covin, 1990).

The existing corporate entrepreneurship literature fails to adequately account for the role of innovation (Covin and Miles, 1999). This paper addresses this gap with a specific emphasis on the role of radical innovation initiatives in corporate entrepreneurship. We define radical innovation as resulting in products with an entirely new set of performance features, process improvements of five times or greater, or a minimum 30% reduction in cost (Leifer et al., 2000, p. 5). Radical innovation frequently leverages advanced technology as its basis for advantage, which ultimately results in the creation of new businesses for the firm and, frequently, the creation of entirely new markets.

Firms failing to invest in radical or breakthrough innovation may achieve a certain degree of success, but limit their growth potential and put their long-term survival at risk (Tauber, 1974; Meyer and Roberts, 1986; Day, 1994). Conversely, by being first to recognize and exploit opportunities for radical innovation, firms can control the direction of the market to their benefit, gaining competitive advantage while placing pressure on its rivals (Tushman and Anderson, 1986; Block and MacMillan, 1993; Strebel, 1992; Morone, 1993; Utterback, 1994).

Our notion of radical innovation aligns with two of the four corporate entrepreneurship forms identified by Covin and Miles (1999) – organizational rejuvenation and domain redefinition. Organizational rejuvenation entails the alteration of process, structures, and capabilities; whereas, domain redefinition involves establishing first mover advantage in new product-market areas. Radical innovation results in domain redefinition, but organizational rejuvenation is a prerequisite, due to the major impacts felt, not only in technologies and markets, but in the organizational and resource requirements necessary to get it accomplished (Leifer, et. al., 2000). In order to build the capability to radically innovate, structures, processes, and capabilities must be developed. This aspect of radical innovation is the most challenging and is the focus of our paper.

While mature organizations can invigorate and reinvent their capabilities through corporate entrepreneurship, the challenges they face have been well documented (Block and MacMillan, 1993; Leifer, et al., 2000). Investments in radical innovation, when successful, have too often been infrequent and ad hoc, highly reliant on serendipity and the persistence of individuals (Leifer et al., 2000). They tend to occur, not because of organizational systems, but because of the diligent efforts of individuals, working in spite of these systems (Dougherty and Hardy, 1996).

If we are to advance our understanding of radical innovation as a key aspect of corporate entrepreneurship, we need to move beyond the perspective that it results only from independent thinking mavericks. Dougherty and Hardy (1996) suggest this challenge cannot be resolved by

just building individual skills, because this will create "foreign bodies in a system that values the routine" (p. 1147). Instead, they recommend firms take a more lasting approach to developing an organization-wide capability. For radical innovation initiatives to exist and thrive, organizations must view themselves as entrepreneurial systems (Russell, 1999).

Mair's paper in this volume distinguishes between a macro view, at the firm-level, and a micro-view at the individual level. She focuses at the micro-level, providing insights on the entrepreneurial behavior of managers. In this paper, we adopt a macro-level perspective. Dougherty and Hardy identify two levels of problems associated with commercializing innovation at the macro level: those that affect the organizational context and those impacting the projects themselves. Likewise, we distinguish between factors relating to the broader organizational environment for entrepreneurship, and those associated with initiatives to improve the commercialization of radical innovation projects.

We address the following questions through a multi-case analysis of ten large, U.S.-based multinational organizations: (1) What key organization-level factors impact the environment for radical innovation in established firms, and how do these act as enablers or inhibitors? (2) What initiative-level factors impact, positively or negatively, the management of radical innovation projects?

This paper proceeds as follows. We describe our research methodology and sample. Then, we identify the factors emerging from our multicase analysis addressing the two research questions. We discuss these factors within the context of the corporate entrepreneurship and innovation literature.

RESEARCH METHOD AND SAMPLE

A multidisciplinary team of researchers interviewed managers at different levels and with different relationships to the organizational and radical innovation systems. The team included nine researchers with strengths in entrepreneurship, strategy, marketing, finance, risk management, technology management, organizational behavior, and political science.[2]

The research sample comprises ten large multinational firms spanning a diversity of industries: Table 1 provides summary information on the companies and the interviewees.[3] Annual sales revenues for these companies range from just under $1 billion to just over $130 billion. These companies were screened for inclusion in the study based on their intention

to develop an organization-level capability for commercializing radical innovations.

In all cases but one there was an identified organizational system, process, and set of people associated with entrepreneurial activity in the organization, or the declared intent from senior leadership to initiate one in the very near term. The newness of this objective and the comprehensiveness of the systems varied among the ten companies. Of the ten cases, three such initiatives were less than one year old, four were between one and five years old and two were more than five years old. One firm had no such system in place per se, but was included in the sample as a benchmarking firm because it is well recognized as having a highly innovative culture. This variation enabled the research team to observe challenges at different levels of systems development.

Table 1. Summary Information on Companies and Interviewees

Company Business Description	Age initiative at time of interviews	No. Interviews	Managerial level of interviewees
Diversified industrial products manufacturer	0--just beginning	8	CTO and direct reports
Producer of industrial gases and chemicals	1 year	18	CTO, BU Leaders, Incubator Director and his direct reports
Paper making machinery products	0-Just beginning	8	CTO and direct reports
Chemical ingredients and science based products	5 years	10	Executive VP for Growth Initiatives, R&D Directors and staff reports to CTO
Diversified industrial products manufacturer	7 months	16	CTO, COO of R&D and RI Team Leaders
Computer systems and related goods	2 3/4 years	14	Exec. VP of Strategy, Exec. VP of Technology, RI staff and RI team leaders
Diversified industrial and consumer products manufacturer	8 years	13	CTO, BU Leaders, Incubator Director and his direct reports
Specialty paper and packaging manufacturer	2 years	9	President of New Ventures, his direct reports and Venture team members

Specialty packaging manufacturer	7 years	11	R&D Directors and direct reports, Members of Technology Board at Corporate Level, including VP-Strategy
Chemical and plastics manufacturer	3 years	11	Research Directors, Leadership of Radical Innovation group and his direct reports.

Data Collection and Analysis

The initial round of data collection involved day long, onsite visits to each company. The research team interviewed senior leaders, R&D managers, business unit managers, project leaders and other managers involved with corporate entrepreneurship activities. A total of 118 interviews were conducted, between eight and eighteen managers per company. One co-author of this paper was present during each of these interviews, and at least one of the remaining three co-authors was also present during each. As O'Conner et al. (forthcoming) stated, "Immersion in the data, through collection, initially, is a fundamental requirement for developing insights." Additionally, multiple observers during each interview contributed significantly to data interpretation (Eisenhardt, 1989). Follow up phone interviews were made when data needed expansion and/or clarification.

Interviews were semi-structured and one researcher led the questioning, but flexibility was maintained in order to probe issues arising during the interviews. Interview length varied but the average interview lasted one hour. Detailed notes were recorded during the interviews by one researcher while others recorded impressions and observations. Immediately following the interview, recorded notes (by the primary note taker) were reviewed by each member of the team present during the interview. Impressions and observations were added, and corrections or clarifications were made. In nine of the ten cases used in this analysis, tapes of the interviews were transcribed. Both the field notes and the transcribed interviews were used in the data analysis.

Data were analyzed through multicase analysis methods (Eisenhardt 1989; Yin, 1994). More specifically, an "extended" case methodology was employed in order to build on existing theory in the corporate entrepreneurship and innovation literatures (Burawoy, 1991; Danneels, 2002). Unlike traditional grounded theory methodology (Glaser and Strauss, 1967), the extended case methodology allowed us to first compare findings across companies and then compare findings to existing theoretical

frameworks in a manner that builds on current literature. Our research questions guided the data collection, the data revealed our basic framework, and then both the data and existing literature guided our interpretation.

The goal in analyzing qualitative data is analytic induction. Researchers categorize data in a way that it can be reduced to smaller more manageable units in order to analyze within and across cases to identify patterns and recognize emerging areas of divergence and convergence. To facilitate our analysis we used a computer aided text analysis (CATA) software program called NVivo. CATA is defined as "any technique involving the use of computer software for systematically and objectively identifying specified characteristics within text in order to draw inferences from text" (Kabanoff 1996, p. 507). Using NVivo to analyze the interview data allowed for a more systematic approach to the analysis that contributed to reduced coding error, increased objectivity and process, validity, and rigor (Wolfe, Gephart and Johnson, 1993).

Despite our attempts at rigorous analysis, the process of qualitative inquiry is by definition "fuzzy" and our sense of knowing comes from our presence in the field. Or as Van Maanen (1979) stated, we are "in vivo, close to the point of origin" (p. 520). The complexity of innovation systems only leads to heightened complexity in qualitative analysis and interpretation. The tension between what the literature says we should see and what we actually see is not always in alignment. As noted by den Hertog (2002), "learning by doing" is part of the analysis and understanding *how* conclusions are reached can be just as important as *what* conclusions are reached.

Our analysis is based on a process of broad-brush coding, recoding according to the research questions, and then iteratively examining the literature and codes for insights into the key elements forming our framework. Before coding the data, an initial set of broad-brush codes was developed based on the semi-structured interview protocol. This resulted in sixteen codes. To ensure the coding process exhibited reliability, two of the authors each coded transcripts from a different company, then discussed the meaning of the codes. They then coded the same transcripts, using one interview from each of two companies. Inter-rater reliability was calculated, with 68% agreement achieved. This is close to the 70% intercoder reliability suggested by Miles and Huberman (1994). The coders then discussed the areas of variance in the coding and fine-tuned code descriptions before coding the remaining transcripts. In most cases, the researcher responsible for coding a company's data was present during the interviews for that company.

As the coders began to recognize patterns in the data, they met with the other two authors, who had reviewed and analyzed field notes, to discuss key themes emerging from the research questions. At this time the

organization and initiative-level mechanisms presented in the following section started to emerge. From the coded data and field notes we were able to construct data matrices to facilitate within-case and cross-case analyses. Then, by iterating between literature and emerging subcodes within the key themes, the story began to unfold. Finally, we looked for quotes and stories in the transcript data to provide specific supporting and contrasting evidence.

We next discuss our research findings, which are also summarized in Table 2.

Table 2. Summary of Organization and Initiative-Level Enablers and Inhibitors

	Enablers	**Inhibitors**
Organization-Level		
Mainstream Culture	● Action-oriented culture of innovation (accountability). ● Tolerance for risk and failure. ● Reward structure for innovators. ● Enhanced communication and knowledge sharing. ● Leveraging "heroes" in the organization.	● "Lip service" given to radical innovation without accountability for results. ● Fear of job loss when or if radical innovation project fails. ● Stories of failed projects and employees circulating the organization. ● Lack of urgency about need for radical innovation.
Business Unit Orientation	● Communication with aligned business units to ease transition and acquire support. ● Leverage complementary assets of BUs.	● Business units feeling threatened by initiative. ● Short-term performance mentality of business units creates resistance, or pressure on initiative to satisfy their current needs. ● Satisfactory performance creates impression radical innovation is unnecessary.
Senior Management Involvement	● High level commitment and involvement to legitimize radical innovation efforts. ● Need for experience and understanding about radical innovation. ● Need to set clear objectives for innovators.	● Turnover in senior management may stall new initiatives (e.g. new CEO) ● Inconsistency in decision-making and support.

	Enablers	**Inhibitors**
Initiative-Level		
Coaching	● Work with team to identify markets and connect projects to corporate strategy. ● Link technical and market perspectives.	● Does not eliminate need for business skills within the project teams. ● Designated coaches often lack entrepreneurship experience
Innovation Processes	● Guidance for idea generation, screening, and development. ● Need for formal, yet highly adaptive processes.	● Rigid processes and traditional metrics that kill projects too early. ● Lack of mechanisms for killing poorly-performing projects in a timely manner. ● Inappropriate use of traditional tools to manage radical innovation.
Platforms & Domains	● Opportunity for entry into new technology and business domains. ● Reduced risk of expanding into uncertain territories by producing learning that will benefit multiple applications. ● Better focus and direction for radical innovation efforts.	● Challenge in managing across multiple businesses. ● Difficulty justifying longer term investment without nearer-term benefits.

RESEARCH FINDINGS

Enablers and Inhibitors of Radical Innovation at the Organization Level

Structures for entrepreneurship have been discussed in the literature, the most common being the formation of new venture divisions (Burgelman, 1983, 1984; Souder, 1987; Jones and Butler, 1992; Chesbrough, 2000). We observed, however, neither consistency in how the organizations in our research sample structured their radical innovation initiatives, nor agreement about the most optimal approach for this activity. Rather, we observed a broad array of initiatives ranging from informal product development committees to formal systems with evaluation boards and dedicated program leaders, and from separate venturing divisions to distributed structures. As

Tushman and Nadler (1986) emphasize, there is likely no one best form for stimulating and commercializing innovation; it is more important for the organization to develop facilitating mechanisms.

Our data revealed three key elements emerging as enablers or inhibitors of entrepreneurial environments at the organization level: mainstream culture, business unit orientation, and senior management involvement.

Mainstream Culture

As organizations age, patterned behaviors become norms and values, creating shared expectations about how things get done. Corporate culture can serve as an informal governance system that guides activities in an organization with less dependence on more formal administrative methods (Teece and Pisano, 1994; Tushman and O'Reilly, 1996).

An entrepreneurial culture contains both a value system that views innovation, not only as appropriate and even expected, but critical to the company's competitive advantage, as well as a climate that fosters experimentation and open-mindedness to new ideas (Russell, 1999). On the other hand, the conformity and shared truce that emerge from an organization's culture can create preferences for maintaining an internal political equilibrium and preserving special interests, leading to a collective resistance to new initiatives that pose a threat (Nelson and Winter, 1982). Thus, the mainstream culture of an organization can either limit or support entrepreneurial activity.

One senior manager in our study summed up the important elements of a culture enabling entrepreneurship:

> 'Our culture is that we try to hold onto the values that we hold important. Some fundamental tenants: one is that innovation is important and people make it happen. We try to lower the barriers to communication around the company. We foster an environment where people can take risks. Of course performance matters, and if you mess up a lot, there will be questions. But if you've gone about it the right way, failure is accepted... Good ideas can come from anywhere. Through various programs, they can be done. It's reflective of the culture.'

A broader-level, more mainstream, entrepreneurial culture can be reinforced by specific behaviors and actions of senior management. In the above company, research directors set up formal mechanisms for cross company idea exchange within the research community, to ensure that cross fertilization and opportunity seeking were always taking place. To reinforce this mentality, participation in idea sharing activities were listed as evaluation criteria in R&D employees' performance reviews.

In contrast, another company's venturing program served as no more than a promotional tool, a "sort of a public relations thing…something [management] puts in their slides and says, yeah, we've got [the corporate venture division], but in fact nothing happens. You see, we're doing stuff but they still don't pay any attention to you." Another company manager stated, "If a group is going to do this, we need top management to make this a corporate goal and force people to cooperate with us. But we never got certification from top management."

Leaders also play a role in setting culture through objectives that focus the organization and guide innovators (Burgelman and Sayles, 1986; Tushman and Nadler, 1986; Hornsby, Kuratko and Zahra, 2002). In our research, we found problems with a lack of clearly articulated boundaries, or implied boundaries that did not accommodate entrepreneurial activities. One CEO had not articulated a strategy to guide innovators, despite the organization's top-down management style. As a result, innovators had little guidance for the type of projects they should be working on, but would see their projects routinely rejected because they were "not in a strategic fit area." This problem was exacerbated by the CEO's refusal to commit dedicated resources and people to entrepreneurial initiatives, while at the same time expressing frustration they were not moving faster. A manager in another company noted that, "My people will talk and say we've got some ideas, but we know they won't fly because we know what the boundaries are and you don't go out of the boundaries."

Tolerance of risk and failure is an important element of an entrepreneurial culture (Burgelman and Sayles, 1986; Tushman and Nadler, 1986; Sitkin, 1992; Gillett and Stekler, 1995; Hornsby, Kuratko and Zahra, 1999; Russell, 1999). As one manager pointed out, the costly and risky nature of radical innovation means companies have to commit huge resources to something that may not pan out.

Aversion to risk and fear of failure were common themes among companies citing inhibiting cultures. Fear of job loss could stem from downsizing practices common in US-based companies during economic downturns. But this fear was also fueled when employees in failed projects moved to "no mans land" or experienced uncertainty as to their next job. For example, one manager described how stories were circulated in the

organization about careers coming to a dead end because someone focused on something very innovative and lost their ability to rise in the company.

Stories like the one above are often used as tangible ways to express an organization's culture (Tushman and Nadler, 1986; Tushman and O'Reilly, 1996). Organization members at another company, for example, talked about failed attempts at innovative initiatives in the 60s, and an incubator in the 80s that was shut down. This, according to a manager, "gets put into the organization's memory." As a result, future innovation attempts are taken less seriously and perceived as the "next fad."

Heroes are another mechanism for articulating culture (Tushman and Nadler, 1986; Tushman and O'Reilly, 1996). In a few of the companies, heroes served as examples that radical innovation was rarely possible, that such drastic moves could only be taken by rare individuals willing to take high risks. In addition, where heroes were not rewarded there was little motivation to emulate them, as one manager emphasized: "not only is there a question of 'can,' there's a question of 'why' would anybody want to? Because I've never seen people like that get rewarded in the past. They're sort of outcasts."

One company on the other hand, holds its successful innovators up as role models and encourages others to emulate the "heroes" because of their positive impact on the organization. The company manager acknowledged, "Singling out people as heroes resonates well within our organization, recognizing them publicly."

A strong entrepreneurial culture encourages communication and information sharing among organization members (Burgelman and Sayles, 1986; Tushman and Nadler, 1986; Kanter, 1989; Russell, 1999). Where corporate cultures were seen as enabling entrepreneurship in our sample, resources (people and funds) were shared rather than defended, communication was widespread, even among geographically dispersed and functionally dissimilar units, and accountability for innovation at all levels compelled participation between functional and divisional work units and innovating teams.

A short-term performance mentality permeated some companies, however, and a sense of urgency for entrepreneurship failed to occupy their culture. As noted in one researcher's field notes after a site visit, "The company needs to turn up the heat in terms of creating a culture of intensity. They don't perceive the sense of urgency to change."

Business Unit Orientation

Whether and when entrepreneurial activity should occur apart from the mainstream organization has been debated repeatedly in the literature (Galbraith, 1982; Burgelman and Sayles, 1986, Kanter, 1989; Bower and Christensen, 1995; Spender and Kessler, 1995; Day et al., 2001). Entrepreneurship does not fall within the boundaries of one department, such as R&D, however, but requires the collective efforts of those across the organization (Dougherty, 1992; OECD, 1992). Too much isolation can cause the project to ignore the benefits that can be gained from the resources, experience, and range of skills a large company possesses (Burgelman and Sayles, 1986; Day et al., 2001, Leifer et al., 2000).

Our research generally revealed the need for business unit support because radical innovation requires complementary assets beyond what is reasonable to maintain within an innovating project or program. Teams therefore needed to be able to communicate with the units critical to their projects' eventual success. We observed, however, a paradox with regard to business unit orientation toward longer term entrepreneurial projects among half the companies we studied. When performance was less than satisfactory they were focusing their limited resources on current businesses and short term financial performance. Chasing "the next big idea," as one manager put it, was seen as inappropriate compared to solving the problems the business units were struggling with in the present. Another manager commented:

> '...the business units are very driven to be aligned with their current strategy and they very seldom have the luxury to go off in an area where it's not aligned...you have to prove the linkage and you're competing within the business unit for development and commercialization and go to market money. It's very difficult to do outside of that and try truly new category things. It could be done and I've done it and I've seen it done but it's much more difficult.'

On the other side of the paradox, when performance was satisfactory there was a tendency to perceive radical innovation as unnecessary, as another manager detailed:

> "One of the challenges that I find most is in businesses where they think they have a leadership position; they take a very strong position to not want to reinvent another wheel..." This could reveal

> reluctance toward cannibalizing well-performing current businesses, a threat commonly underlying resistance from the organizational mainstream (Bower and Christensen, 1995; Christensen, 1997). Yet we also observed recognition that, as one manager emphasized, "if there is something that can displace it, it will happen. And it would be better for us to displace ourselves than for someone else to displace us."

In companies with separate units devoted to radical innovation activities, we observed resistance from mainstream units threatened by activities they felt they should be working on. If, for example, an ad-hoc group was working on a radical innovation project and a business unit perceived the project to be in its domain, the business unit felt vulnerable. One company's tension resulted from its R&D lab's mandate to spend 10-15% of its time on new ideas, which it did not. There was a resulting tension over what innovators in a separate group were doing and what the lab realized it should be doing.

Where business unit resistance was high in companies with more formalized initiatives, we observed attempts to gain acceptance by targeting shorter-term wins. This was often coupled with a pull from the business units toward satisfying their needs. In addition, attempts were made to avoid stepping on business units' toes by working on projects that did not interfere with existing businesses. This was problematic, however, when organizational objectives for innovation demanded alignment with core businesses.

Senior Management Involvement

High level support by top management is central to building competitive advantage through entrepreneurship (Twiss, 1986; Maidique, 1988; OECD, 1992; Morone, 1993). Support by top management increases a project's visibility, signals the importance of the venture, and legitimizes the project (Spender and Kessler, 1995). This early legitimacy is especially important for costly, radical ventures that need significant resources and time to develop, and which are likely to face internal resistance (Day, 1994).

Senior management's role in corporate entrepreneurship, as the previous sections suggest, involves setting and reinforcing the culture and ensuring alignment with business units. But we also observed a need for involvement on the part of senior management. Senior management

involvement can encompass selecting key team members and setting goals, leaving the team to define and implement the details (Quinn, 1985; Kanter, 1989; Amabile, 1998; Simon and Houghton, 1999). They can play the role of champions and sponsors, protecting the project (Kanter, 1989; Morone, 1993; Simon and Houghton, 1999; Hornsby, Kuratko, and Zahra, 2002) and providing resources and expertise (Kanter, 1989; Garud and Van de Ven, 1992; Hornsby, Kuratko, and Zahra, 2002).

Strategically significant projects tend to be given more attention and priority by top management (Kanter, 1989; Bart, 1993). "The bigger ideas need a little more senior level involvement," confirmed one of our interviewees. Too much attention from management, however, may prevent the team from revealing delays, or admitting difficulties (Burgelman and Sayles, 1986). This could also be problematic if senior management attention is accompanied by unrealistic expectations, as one R&D manager noted during an interview: "Top management has a tendency to reach down everyday and pull the plant up and check if the roots are growing, and that doesn't always help."

Symptoms of a lack of support, on the other hand, were evident in four companies, where innovators exhibited frustration with senior management's lack of clear objectives, or the inconsistency they exhibited in decision making. Senior managers at one company met on an ad hoc basis to review specific high risk projects that had advanced far enough to require substantial resource decisions. An R&D manager commented, "I tend to walk out of those meetings like...what happened? There was no response. Did we get supported or didn't we get supported? Are they interested or not interested?"

In addition, we observed a need for experience and understanding about radical innovation on the part of senior management. This was clearly lacking in one company where senior management, in evaluating five early opportunities, allocated an equal, but paltry, amount of seed funding to each project so they could continue to the next phase. This lack of differential investment incensed the project team leaders and lessened the overall probably of success for the more feasible projects.

In contrast, senior managers in six companies exhibited high levels of involvement and experience. In one of these companies, for example, senior management made noteworthy time commitments to teams developing new technology platforms. Three senior leaders (Executive VP of R&D, Executive VP of Corporate Strategy, Director of Corporate Strategy) each spent an average of twenty hours per month with the teams. They used their extensive experience to coach the teams and, through their position and networks, they ensured team support and appropriate resource allocation. In their performance evaluation of operating units, they included

measures relating to participation in the development of these emerging platforms.

Enablers and Inhibitors of Radical Innovation at the Initiative Level

The decision to invest in and commercialize high risk innovation must be conducted under conditions of great uncertainty (Tushman and Nadler, 1986; Morone, 1993). At the outset, the market is ill-defined, and the required infrastructure for delivering a radically new product is not in place (Morone, 1993; Betz, 1993). It is difficult to predict or control, at various project stages, how technology development will proceed, how the competition will act, and the timing and acceptance characteristics of the market (Morone, 1993).

We identified three key initiative-level elements the companies recognized a need for, yet presented challenges in managing radical innovation: coaching provided to project teams, processes for evaluating the progress and prospects of the venture, and the use of platform and domain thinking to guide decisions.

Coaching

Despite little mention of the role of coaching in the corporate entrepreneurship or innovation literature, our research revealed a clear need for this function. All of the entrepreneurial activities in the organizations we studied operated within or in close conjunction with technical units, such as R&D or engineering. This, coupled with the technical origins of the ideas, led to a tendency for project teams to be staffed with deep technical expertise and a preference for solving technical problems, but without equal attention paid to connecting the projects to market issues.

One manager commented, "We're trying to move them [technical staff] into thinking about, not what's the next product or 'neat new thing' but really the business...some of them will always like to be the tinkerers and will come up with the next neat little widget and it will never define a large business opportunity." And as another manager acknowledged, "You need to have coaching. People have great ideas, but they don't have a clue how to begin to define what the business model might be."

In some companies, coaching was integrated into the evaluation roles, where the person or group providing resources also gave advice. In

others, the coaching role was more distinct, with deep and frequent involvement by the coaches. Specific managers were appointed coaching roles, and senior managers often played these roles themselves, thereby not only bringing their rich expertise to the project, but using their status and networks to create linkages to other parts of the organization. Coaches worked with project team members to move beyond finding ideas and developing technologies, to finding markets for what they have done, and developing the link to the company's strategy and the venture's eventual business case. They helped direct the team toward the critical business issues and prepared them to address the questions most important to those providing funding.

Yet there were challenges regarding coaching even when there were dedicated and experienced coaches. One company had strong business management people working with the technology-oriented teams to write business cases for their ideas. Yet they still found this a challenge, and articulated a need for more emphasis on multifunctional teams, indicating that actual involvement of marketing people on the teams themselves, not just coaching in these areas, is important.

Across all the companies we saw the coaching role in flux, even in the four that identified formal coaching roles. In one of these four companies, the managers involved in a corporate venturing group turned their attention toward hunting out and screening ideas, at the expense of guiding the venture teams in finding customers. The group's manager had to recruit part-time coaches from within the organization to fill this role. In the other six cases, organizations gave little thought to developing coaching competency, or it happened sporadically or informally. One common problem, and perhaps the most significant, across all the cases, was coaches lacking adequate business development experience.

Innovation Processes

Processes evolve from finding ways to do activities more efficiently. While this improves productivity and predictability, organization members may begin to follow processes simply because they are familiar and comfortable, not because they are effective for the particular activity in which they are applied (Sull, 1999). When uncertainty is high, as in the domain of commercializing radical innovation, deterministic systems and procedures designed to bring order out of chaos may, in fact, stamp out the chaos that is necessary for successful innovation (Cheng and Van de Ven, 1996).

Although nearly all the companies were establishing formal processes for managing radical innovation projects, we observed a clear tension across our sample between needing more processes to guide decision making and feeling these are too restrictive. One manager thought innovators should just "pick up the phone and get help and boot leg. If you try to show a process out of it you would go nuts." Likewise, a manager in another company commented, "We need guidelines, not process... The use of tools and processes wastes time." Similarly, most of the companies had governance or evaluation boards in place to help with decision making, but relied on instinct over clearly defined processes for actually pursuing the concept.

It is not yet clear in the literature whether and how much 'codified' process is necessary for innovation projects involving high uncertainty (Zollo and Winter, 2002). But we observed a need for some formal processes to displace individual opinions and informal estimations, which, according to one manager, did not produce a good sense of which technologies might be worthwhile. Yet where companies attempted to develop processes, these were in some cases ignored because they were too stringent, or viewed as no more than a general framework. In other cases, the processes had undergone frequent change, heightening frustration among innovators.

A somewhat surprising finding was the effort put into generating and screening novel ideas, at the expense of developing processes that could effectively move these ideas toward commercialization. In some companies, this focus on idea generation was needed as they put in place new innovation initiatives. Yet the organizations' struggles with processes beyond screening may reveal the lack of good tools for managing in highly uncertain domains. Stage gate, a technique used for product development (Cooper, 1990), was being used for project management in nearly all the companies. Several companies recognized that stage gate was less applicable to more uncertain projects, but were attempting to modify it.

Another challenge faced by all the companies was the lack of clear mechanisms for "killing" ideas. One manager commented that "Many people will say, one of the main reasons we're not very good at new things is because we will not kill anything." Any attention paid to killing ideas focused on weeding them out in the initial screening. While intended to conserve resources, it carried the risk of rejecting good prospects when they were most vulnerable—before they had a chance to reveal their potential. In many cases, where ideas made it through the initial screening but were later proven less promising, they received no further funding and were left to languish, nonetheless consuming time and resources at a low level.

But a general lack of discipline for killing projects was due to both inadequate process and wider organizational problems, such as a lack of

either a mechanism for recycling people once projects have disbanded or a reward system for killing projects, as the discussion on culture revealed. While one company would like project teams to indicate when projects were going nowhere, they let them drag on because people were afraid of losing their jobs. Another acknowledged the problem as resulting from innovators "falling in love with ideas and fabricating strategies to keep working on them." In addition, the absence of metrics to evaluate project progress contributed to the inability to kill projects.

Platform and Domain-Level Thinking

The creation of a new platform, according to Kim and Kogut (1996), requires new, broad-based skills, and enables the company to expand into future, but uncertain, markets. Platforms can lead to a wide variety of new product opportunities, they maintain, and are more effective in building future advantage than forecasting specific products. A platform, one of our interviewee explained, is "an agglomeration of different projects that are aligned to the same general end."

Nearly all of the companies in our sample identified, or intended to identify, emerging technology platforms in which the company would invest. These comprised emerging technology arenas that have the potential to impact the organizations' core businesses, or produce new businesses through multiple applications.

By proactively articulating specific platforms, says one manager, the organization has better focus and direction for its radical innovation activities, and a strong base for stretching outward from the organization's current strategic domain. In one case, a project leader was able to sell his project to senior management by emphasizing the ability to expand as a platform beyond the initial target customer. In this respect, other markets could be sought if the initial application failed and later applications of the technology could benefit from the learning gained with these initial efforts.

Platforms were typically identified by looking to the outside, where teams of technologists or strategists scan the industry and technical environment, determining which technologies could be strategically important to the organization's future. These tended to adopt an R&D focus, which created two related challenges: verifying their perception of market relevance for the emerging technologies and extracting early application concepts. The latter was in some cases accompanied by senior management impatience with the lack of tangible results, which could be perpetuated by the difficulty of measuring progress for such long term commitments that have fewer near-term applications. One company intends to measure

progress by the number of projects generated for its business units; fortunately, senior management also understands the need to protect the long term nature of these projects.

Another way companies in the sample focused their development activities was through business domains, representing an intersection between technologies and markets. Two companies, for example, formed domains from analyzing all the projects they had in development, and arranging them into business arenas. Switching from projects to domains enabled them to think about multiple applications and look at wider opportunities.

If the goal of corporate entrepreneurship is to be the engine of strategic renewal for the company (Schendel, 1990), independent initiatives operating in various corners of the organization will cause more fragmentation than purposive, directed, strategic growth. Both platforms and domains have the ability to positively impact corporate entrepreneurship by directing attention away from individual, high-risk projects, to maximizing the overall success of a platform or domain. But it also, as one manager put it, could lead to greater success because the firm has specific domain expertise.

DISCUSSION AND CONCLUSIONS

Underlying an organization's corporate entrepreneurship efforts are innovations that redefine or rejuvenate organizations and their market and competitive environments (Covin and Miles, 1999). The current challenge in advancing our understanding about corporate entrepreneurship lies in moving beyond conceptualizations of individual renegades, focusing instead on the organization as an entrepreneurial system with lasting capabilities for this activity (Dougherty and Hardy, 1996; Russell, 1999). Following Dougherty and Hardy's (1996) suggestion that problems with innovation are rooted at both the organization and project level, we identify key elements associated with both the organizational environment and with initiatives for advancing projects. We emphasize that it is neither enough to simply create an organizational environment with no means for advancing projects, nor to develop systems for managing projects without an appropriate organizational environment.

Business units will naturally resist attempts to integrate radical innovations into their current businesses, compelling researchers to attempt to identify appropriate structures for innovation activities and argue whether and when these should be conducted separately from the organizational

mainstream. Our research reveals less concern with finding one best structure or location for radical innovation activities. Instead, we see a need for maintaining connections with core business units important to the commercialization of the radical innovation projects, particularly when a key objective is to infuse the organization with new growth. To reinforce this link most effectively, we emphasize the importance of conscious efforts to create and maintain an appropriate culture. This challenge falls on senior management, who must additionally communicate and reinforce objectives, as well as exhibit the necessary commitment and involvement needed to legitimize the pursuit of radical innovation as an organization-wide mandate.

An interesting observation was made relative to the four companies citing enabling cultures. These four companies also identified high senior management commitment as well as fewer constraints from short-term business unit thinking. Innovation activities in these four companies were dispersed throughout the organization. The remaining companies either were struggling with getting programs started or were setting up systems separate and distinct from the organization's mainstream. This elicits one question for future research: are separate systems an appropriate remedy for poor organization-level factors? But it also suggests that senior management involvement, culture, and business unit orientation must likely integrate closely to address Dougherty and Hardy's (1996) call for an organizational capability for radical innovation.

The misalignment of expectations between innovators and business units, and the resultant tensions that follow, implies a need for unified governance across corporate entrepreneurship activities. If there is no clear corporate level strategy for long term growth and renewal via radical innovation, the direction, focus, and evaluation criteria applied to each project are dependent on individuals seeking to fulfill their own local objectives. This results, as we observe in our data, in projects being invested in at the outset by one set of evaluators with one set of criteria and objectives, and later allowed to fall off the radar screen by the business units tasked with commercializing developing opportunities. There needs to be clear responsibilities for radical innovation at multiple levels of the organization to avoid the previous problem. And this needs to be accompanied by senior management support and involvement so the innovators themselves do not have to struggle with attempts to gain credibility.

The corporate entrepreneurship literature has yet to develop sufficient understanding, at the program level, about how radical innovations are most effectively commercialized. Our insights have helped fill this gap by identifying some key initiative-level enablers and inhibitors. Our findings on the nature of coaching in the radical innovation sphere could develop

further through future research: for example, the expertise of coaches and the skills of team members, as well as the content and process of coaching.

Additionally, while our research reveals fewer problems with early-stage screening, there is a clear need for better process management techniques for radical innovation. The corporate entrepreneurship literature, however, has not produced effective tools beyond, for example, Cooper's stage gate, which was primarily developed for incremental product development. The challenge posed to the research community is in developing techniques that can balance accountability and flexibility in a way that moves projects forward, with allowance for termination or change of direction when appropriate, resulting in the most effective routing of resources toward productive outcomes.

Corporate entrepreneurship research needs to evolve our understanding of platforms and domains beyond theoretical conceptualizations to a better understanding about how to manage in these multiple application arenas. Critical issues identified in our research are how to show early results or progress within longer-term, resource-consuming big projects, and how to account for platform or domain-wide learning that benefits many applications over time.

While we focus our research on corporate entrepreneurship activities involving radical innovation, we recognize this is only one road to increasing the entrepreneurial ability of an established company. Radical innovative initiatives are designed to create significant market and product shifts and we recognize the difficulties of using radical innovation as the one path to corporate renewal.

In addition, the factors we identify in this research are by no means comprehensive. They represent factors the organizations in our research sample are struggling with, but identify as critically important to the advancement of their ability to commercialize radical innovations. We did not observe, for example, a compelling drive toward developing specific incentive programs for innovators. All of our companies motivated entrepreneurs through more traditional means such as promotions, recognition, and salary advances. Perhaps this factor, and others, will become more important as our companies reach a more mature state in their pursuit of corporate entrepreneurship through radical innovation activity.

NOTES

[1] An earlier version of this paper was presented at the 2002 Babson College/Kauffman Foundation Entrepreneurship Research Conference and was published in the conference proceedings: Frontiers of Entrepreneurship Research 2002.

[2] This work comes from the second phase of the Radical Innovation Research Program, which the Industrial Research Institute (IRI) has sponsored since 1995. The IRI is a professional organization of R&D managers of Fortune 1000 firms.

[3] The identities of the companies will be concealed in the discussion of specific managerial practices in accordance with confidentiality agreements between the organizations and the researchers.

REFERENCES

Amabile, T.M.,1998, 'How to Kill Creativity', *Harvard Business Review 76* (Sept. Oct.), 77-87.

Bart, C.K., 1993, 'General Managers Control New and Existing Products Differently', *Journal of Business Venturing 8*(4), 341-361.

Betz, F., 1993, *Strategic Technology Management,* New York: McGraw-Hill.

Block, Z. and I.C. MacMillan, 1993, *Corporate Venturing,* Boston: Harvard Business School Press.

Bower, J.L., and C.M. Christensen, 1995, 'Disruptive Technologies: Catching the Wave', *Harvard Business Review 73*(1), 43-53.

Burawoy, M. 1991, *Ethnography Unbound.* University of California Press: Berkeley, CA.

Burgelman, R.A. 1983, 'A Process Model of Internal Corporate Venturing in the Diversified Major Firm', *Administrative Science Quarterly 28*(2), 223-244.

Burgelman, R.A., 1984, 'Designs for Corporate Entrepreneurship in Established Firms', *California Management Review 26*(3), 154-166.

Burgelman, R.A. and L.R. Sayles, 1986, *Inside Corporate Innovation,* NY: The Free Press.

Cheng, Y.-T. and A.H. van de Ven, 1996, 'Learning the Innovation Journey: Order Out of Chaos?', *Organization Science 7*(6), 593-614.

Chesbrough, H., 2000, 'Designing Corporate Ventures In the Shadow of Private Venture Capital', *California Management Review 42*(3), 31-49.

Christensen, C., 1997, *The Innovator's Dilemma,* Boston: Harvard Business School Press.

Cooper, R., 1990, 'Stage-Gate Systems: A New Tool for Managing New Products', *Business Horizons 33*(3), 44-54.

Covin, J.G. and M.P. Miles, 1999, 'Corporate Entrepreneurship and the Pursuit of Competitive Advantage', *Entrepreneurship, Theory and Practice 23* (3), 47-63.

Danneels, E., 2002, 'The Dynamics of Product Innovation and Firm Competences', *Strategic Management Journal 23,* 1095-1121.

Day, J.D., P.Y. Mang, A. Richter and J. Roberts, 2001, 'The Innovative Organization: Why New Ventures Need More Than a Room of Their Own', *McKinsey Quarterly 2,* 20-31.

Day, D.L., 1994, 'Raising Radicals', *Organization Science 5*(2), 148-172.

Den Hertog, F., 2002, *Learning by Doing Organization Research: Inside Views From a Dutch Nephew,* Maastricht: Maastrcht Economic Research Institute on Innovation and Technology.

Dougherty, D. and C. Hardy, 1996, 'Sustained Product Innovation in Large, Mature Organizations: Overcoming Innovation-to-Organization Problems', *Academy of Management Journal* *39*(5), 1120-1153.

Dougherty, D., 1992, 'Interpretive Barriers to Successful Product Innovation in Large Firms', *Organization Science* *3*(2), 179-202.

Eisenhardt, K.M., 1989, 'Building Theories from Case Study Research', *Academy of Management Review* *4*(4), 532-550.

Galbraith, J.R, 1982, 'Designing the Innovating Organization', *Organizational Dynamics* *10*(3), 4-25.

Garud, R. and A.H. van de Ven, 1992, 'An Empirical Evaluation of the Internal Corporate Venturing Process', *Strategic Management Journal* *13* (Special Issue), 93-109.

Gillett, D. and H.O. Stekler, 1995, 'Introducing Technologically Advanced Products: Strategies in the Commercial Aircraft Industry', *Technological Forecasting and Social Change* *48*(2), 129-142.

Glaser, B. and A. Strauss, 1967, *The Discovery of Grounded Theory: Strategies of Qualitative Research*, London: Wiedenfeld & Nicholson.

Hornsby, J.S., D.F. Kuratko and S.A. Zahra, 2002, 'Middle Managers' Perception of the Internal Environment for Corporate Entrepreneurship: Assessing a Measurement Scale', *Journal of Business Venturing* *17*, 253-273.

Jones, G. and J.E. Butler, 1992, 'Managing Internal Corporate Entrepreneurship: An Agency Theory Perspective', *Journal of Management* *18*(4), 733-749.

Kabanoff, B, 1996, 'Computers Can Read as Well as Count: Computer-Aided Text Analysis in Organizational Research', *Journal of Organizational Behavior* *18*, 507-511.

Kanter, R.M., J. North, L. Richardson, C. Ingols and J. Zolner, 1991, 'Engines of Progress: Designing and Running Entrepreneurial Vehicles in Established Companies: Raytheon's New Product Center, 1969-1989', *Journal of Business Venturing* *6*, 145-163.

Kanter, R.M., 1989, 'Swimming in Newstreams: Mastering Innovation Dilemmas', *California Management Review*, *31*(4), 45-69.

Kim, D.-J. and B. Kogut, 1996, 'Technological Platforms and Diversification. *Organization Science* *7*(3), 283-301.

Leifer, R., C. McDermott, L. Peters, M. Rice and R. Veryzer, 2000, *Radical Innovation: How Mature Companies Can Outsmart Upstarts*, Boston: Harvard Business School Press.

Maidique, M., 1988, 'Entrepreneurs, Champions, and Technological Innovation'. In M. L. Tushman and W. L. Moore, *Readings in the Management of Innovation*, Cambridge, MA: Ballinger.

Meyer, M.H., and E.B. Roberts, 1986, 'New Product Strategy in Small Technology-Based Firms: A Pilot Study', *Management Science 32*(7), 806-820.

Miles, M.B., and M.A. Huberman, 1994, *Qualitative Data Analysis,* Thousand Oaks, CA: Sage Publications, Inc.

Miller, D., 1983, 'The Correlates of Entrepreneurship in Three Types of Firms', *Management Science 29*(7), 770-791.

Morone, J.G., 1993, *Winning in High Tech Markets*, Boston: Harvard Business School Press.

Nelson, R.R., and S.G. Winter, 1982, *An Evolutionary Theory of Economic Change,* Boston: Harvard University Press.

O'Connor, G. C., M.P. Rice, L. Peters, and R.W. Veryzer, (2003), 'Managing Interdisciplinary, Longitudinal Research Teams: Extending Grounded Theory Building Methodologies', *Organization Science,* July-Aug., pp. 1-21.

Organization for Economic Co-operation and Development, 1992, *OECD Proposed Guidelines for Collecting and Interpreting Technological Innovation Data--Oslo Manual,* Paris: OECD.

Prahalad, C.F. and G. Hamel, 1994, *Competing for the Future,* Boston: Harvard Business School Press.

Quinn, J.B., 1985, 'Managing Innovation: Controlled Chaos', *Harvard Business Review 63*(3), 73-84.

Russell, R.D, 1999, 'Developing A Process Model of Intrapreneurial Systems: A Cognitive Mapping Approach', *Entrepreneurship: Theory and Practice 23*(3), 65-84.

Schendel, D. 1990, 'Introduction to the special issue on corporate entrepreneurship'. *Strategic Management Journal 11,* 1-3.

Simon, M. and S.M. Houghton, 1999, 'Succeeding at Internal Corporate Venturing: Roles Needed to Balance Autonomy and Control', *Journal of Applied Management Studies 8*(2), 145-159.

Sitkin, S., 1992, 'Learning Through Failure: The Strategy of Small Losses', *Research in Organizational Behavior 3,* 231-267.

Slevin, D.P., and J.G. Covin, 1990, 'Juggling Entrepreneurial Style and Organizational Structure: How to Get Your Act Together', *Sloan Management Review 43*(2), 43-53.

Souder, W.E, 1987, *Managing New Product Innovations,* Lexington, MA: Lexington Books.

Spender, J. C., and E.H. Kessler, 1995, 'Managing the Uncertainties of Innovation: Extending Thompson', *Human Relations 48*(1), 35-56.

Strebel, P., 1992, *Breakpoints: How Managers Exploit Radical Business Change,* Boston, MA: Harvard Business School Press.

Sull, D.N., 1999, 'Why Good Companies Go Bad', *Harvard Business Review 77*(4), 42-52.

Tauber, E.M, 1974, 'How Market Research Discourages Major Innovation', *Business Horizons 17*(3), 22-26.

Teece, D. and G. Pisano, 1994, 'The Dynamic Capabilities of Firms: an Introduction', *Industrial and Corporate Change 3*(3), 537-556.

Tushman, M.L., and P. Anderson, 1986, 'Technological Discontinuities and Organization Environments', *Administrative Science Quarterly 31*(3), 439-465.

Tushman, M.L., and C.A. O'Reilly, 1996, 'Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change', *California Management Review 38*(4), 8-30.

Tushman, M.L., and D. Nadler, 1986, 'Organizing for Innovation', *California Management Review 28*(3), 74-92.

Twiss, B.C, 1986, *Managing Technological Innovation*, London: Pitman Publishing.

Utterback, J.M., 1994, *Mastering the Dynamics of Innovation*, Boston: Harvard Business School Press.

Van Maanen, J, 1979, 'Reclaiming Qualitative Methods for Organizational Research: A Preface', *Administrative Science Quarterly, 24*(4), 520-526.

Wolfe, R. A., R. P. Gephart and T. E. Johnson, 1993, 'Computer-Facilitated Qualitative Data Analysis: Potential Contributions to Management Research', *Journal of Management, 19*(3), 637-660.

Yin, R.K, 1994, *Case Study Research*, Thousand Oaks, CA: Sage Publications.

Zollo, M., and S. Winter, 2002, 'Deliberate Learning and the Evolution of Dynamic Capabilities', *Organization Science 13*(3), 339-351.