

# BUILDING A RADICAL INNOVATION COMPETENCY

*On-going experiments in 12 large companies to build management systems that nurture and commercialize a steady stream of radical innovations are described in this mid-study review.*

Gina Colarelli O'Connor and Alan D. Ayers

**OVERVIEW:** *As growth and profit alternatives continue to erode for many companies, the importance of radical innovation as a mechanism for organization rejuvenation is increasing. Some firms are building entire management systems to enable radical innovation over and over again. They are experimenting with different organizational structures that vary in terms of their relationship with R&D and in terms of how far down the commercialization path they oversee projects. To have a fully developed RI capability, firms find they must manage three sets of activities and ensure that the transitions between them are smooth. These are discovery, incubation, and accelerated growth of new businesses. In addition, firms with different cultures of innovation can all develop RI competencies. This article reports*

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*Gina Colarelli O'Connor is associate professor at Rensselaer Polytechnic Institute's Lally School of Management and Technology in Troy, New York, and is the academic director for Phase II of the Radical Innovation Research Program. She has been at RPI for 14 years, and has been involved in the Radical Innovation research since the beginning in 1995. She teaches and conducts research on technology commercialization, management of innovation and marketing strategy. She holds a degree in marketing and corporate strategy from New York University. [ocongg@rpi.edu](mailto:ocongg@rpi.edu).*

*Alan Ayers is manager-external technology at Energizer Battery Manufacturing, Inc. in Westlake, Ohio. He worked 29 years at Energizer leading battery R&D from very-early-stage research through cross-functional global product implementations. He holds a B.A. in chemistry from St. Lawrence University and an M.B.A. from Baldwin Wallace College. He has co-chaired the Industrial Research Institute's Radical Innovation Subcommittee since 2001 and is currently the chair of its Research-on-Research Committee.*

**[aland.ayers@energizer.com](mailto:aland.ayers@energizer.com).**

*interim results of a three-year longitudinal study of 12 well known, large industrial firms with a declared strategic intent to develop a competency in radical innovation.*

**KEY CONCEPTS:** *organization structures, innovation cultures, radical innovation hubs, radical innovation competencies.*

Companies have tried and failed to build organic growth and renewal engines. Sometimes called incubators, sometimes called corporate venturing organizations, and sometimes called radical innovation hubs, these are organizational entities charged with finding the new, really big, growth opportunities for large, established, sometimes stagnant companies. Yet history shows these internal organic growth organizations: 1) have not lasted very long and 2) few have had any real impact on their companies' growth and renewal patterns.

Arguments about whether or not large established companies can develop and commercialize radical innovations are moot. The fact is they must. Depending on unique radical innovation projects to be successful every ten years is not sufficient to fuel the organizational renewal that is so obviously necessary for an established firm. In our view, this is the next major management competency that large companies will claim as a priority.

Other writers do not believe radical innovation can be successfully nurtured within a company (1). We disagree and believe it is in companies' and society's best interest to figure out how. The challenge has been for such groups to build their competencies before senior leadership patience runs out. It has been documented that most new ventures groups (and radical innovation hubs) last, on average, 4-5 years. Just as they are coming up to speed on the appropriate tools and mechanisms to use, they are cut off. A generation later, they are resurrected, but the learning has dissipated by then.

The purpose of this article is to describe current experiments in large, established organizations with nurturing and commercializing radical innovations not once or twice, but over and over. Rather than assuming a particular organizational form (e.g., incubator, corporate venturing unit), we look at companies that have a declared strategic intent to develop a radical innovation competency, whatever form that takes. Based on a three-year, on-going, longitudinal study of 12 such firms, and informed by our earlier project-based research (2), we are arriving at important insights into how such companies can build sustainable radical innovation competencies.

### Defining Radical Innovation

Some of our liveliest debates with industry have centered around the definition of radical innovation. For the purposes of this study, we define radical innovation as the commercialization of products and technologies that have strong impact on 1) the market, in terms of offering wholly new benefits, and 2) the firm, in terms of its ability to create new businesses. We have found these impact levels to be correlated with high risk and high uncertainty in the firm, requiring it to develop new, situation-specific competencies in technology, market and organizational domains.

Radical innovations can fit within a current line of business, but they can also occur in the so-called "white spaces" between current lines of business. Or they can be leveraged by "multi-aligned" or "gray space" opportunities that could benefit multiple lines of business. Thus, the organizational disruptions associated with a radical innovation opportunity can vary from almost none at all, for those that exhibit a clear fit with an existing business, to extremely high for those that require an entirely new division.

A radical innovation competency, then, is the ability of a firm to successfully commercialize radical innovations again and again, and across organizational settings.

### How the Study Was Conducted

The Radical Innovation Research Program has been a joint labor of love between the Industrial Research Institute (publisher of *Research-Technology Management*) and an academic team led by researchers at Rensselaer Polytechnic Institute's Lally School of Management and Technology. The first phase of the research, which was conducted from 1995 to 2000, followed 12 radical innovation project teams in ten large, established companies, and resulted in the publication of *Radical Innovation: How Mature Firms Can Outsmart Upstarts* (Harvard Business School Press, 2000).

The second phase of the research program, which we report on in this article, began in 2001. Twelve

companies, each of which has a declared strategic intent to develop a sustainable radical innovation competency, are being studied until mid-2005. Partner companies include 3M, Air Products, Albany International, Corning, DuPont, GE, IBM, J&J Consumer, Kodak, MeadWestvaco, Sealed Air, and Shell Chemicals. A team of eight academics from a variety of disciplines conducted initial site visits, during which they interviewed the radical innovation system leader, his direct reports, and the senior leadership to whom he is responsible. We have interviewed the CTO in 11 of the 12 firms. Follow-up calls are conducted with the RI initiative leader and others emerging as critical every six months. To date, nearly 200 interviews have been conducted.

### What We Have Learned

While we cannot yet draw conclusions about factors related to success, we are beginning to gain insights into specific aspects of radical innovation management systems and how these vary across firms. We describe these as follows:

#### 1. *Organizational infrastructures for RI vary widely across companies.*

When we began Phase II of the research program, we had developed the concept of a radical innovation hub as a working model of an organizational form to help protect RI projects and provide appropriate mentoring, coaching in exploratory processes, expertise in new business creation, and organizational boundary spanning upward to senior leadership, outward to the business units and externally to funding sources, alliance partners and others as needed. What we are finding is a number of experiments regarding organizational structure, quite likely dependent upon the size of the firm and the source of initiation of the RI system. We have documented seven models, but will describe four distinctly different ones now:

■ *Idea Generators.*—Many RI systems begin as idea generation groups. In our sample, they are located within or are tightly connected to R&D as shown in Figure 1. Their original mission was to be the group responsible for overseeing radical innovation projects, but these groups quickly realized that big ideas were sorely lacking in their companies. Much of their early efforts were expended on educating members of the company about the firm's new mission to "think big" and to help build those skills throughout the organization by conducting workshops and ideation sessions.

In addition, these groups send internal staff members searching outside the firm for new ideas. They develop their own skills at evaluating, elaborating and developing raw ideas into bigger concepts. Ideas are typically selected by a board composed of leaders in the technol-

ogy community, because these groups report, for the most part, to the CTO.

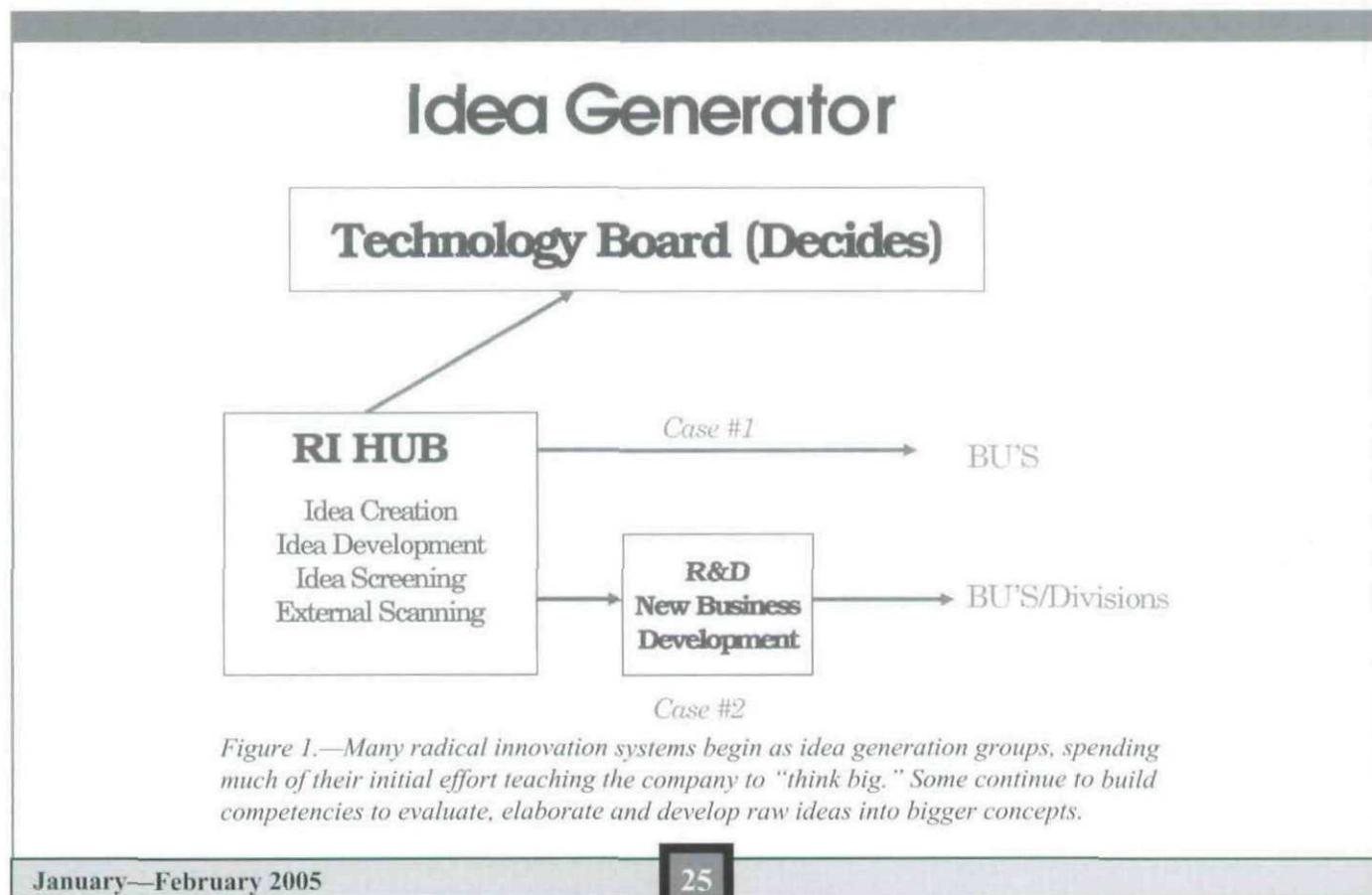
Ideas are typically aligned with divisions' markets and business models, and are transferred there in a fairly raw state. We observed with the passage of time that these idea-generating hubs began to assume a greater incubation capability as they grew frustrated with the lack of divisional investment in their initial ideas. When transitioned in too raw a form, divisions would not invest in developing those ideas, and any aspect of the innovation that stretched the division's strategy or business processes would be ignored. Consequently, incubation capabilities are frequently added to this organizational form as the group extends its thoughts to white space or multi-aligned opportunities.

■ *R&D Management Systems.*—Several of the companies in our sample explained that their entire Central R&D function was dedicated to radical innovation. They are such large firms, they told us, that any single division is the size of many large companies. As a result, divisional R&D was expected to furnish the projects that were aligned completely with the division's immediate, near-term and even longer-term needs. This leaves Central R&D with the responsibility for the "game-changing" innovations that will ultimately renew the company, whether or not they are aligned with a division, applicable to multiple divisions, or require an entirely new organization to be formed. Figure 2 illustrates this organization.

Several of the companies have dedicated their entire Central R&D function to radical innovation.

One of the most interesting aspects of this structure is the emergence of an exploratory marketing group within Central R&D. Two of our companies are experimenting with this model. Exploratory marketing's role is to learn about markets the firm is not familiar with, and to develop proposals for potential new businesses in those domains based on their knowledge of the R&D lab's technical richness. These proposals are then sent to the "bench," which is the inventory of ideas and potential projects. As people with appropriate skills become available to staff a particular proposal, it is "activated" from the bench.

A benefit of this approach is that it reduces the "fear of failure." The bench inventory of projects generated by



# R&D Management System

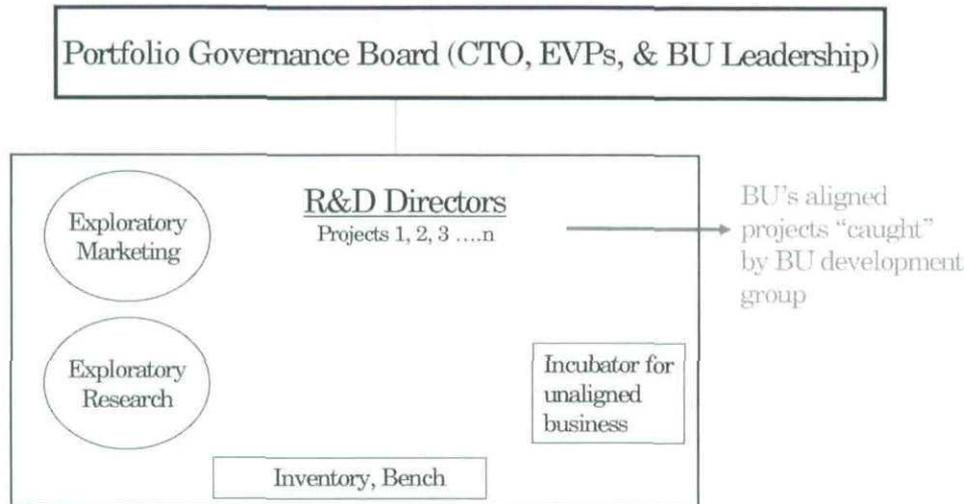


Figure 2.—Central R&D is responsible for game-changing innovations to renew the company, whether aligned with a business unit or not. Note the emergence of an exploratory marketing group operating alongside exploratory research.

the exploratory marketing group was constantly sifted through by R&D staff who, in some cases, advised R&D leadership that their current project should be terminated in favor of more exciting projects on the bench.

In addition to this system, these labs have individuals responsible for incubating novel businesses that do not fit within the company's current organizational structure while the firm continues to explore and experiment not just with the technology but with a business proposition as well.

■ *Self-Similar Model.*—We observed this structure in only one of our participating firms. Just like fractal geometry, a self-similar model is one whose RI infrastructure is modeled at the top level of the corporation but is mimicked throughout the rest of the company, as shown in Figure 3. A senior leadership team composed of the Chief Technology Officer, the Chief Strategy Officer and the Controller of the company spend a combined 60 hours per month coaching, advising and problem solving with a set of 10–15 fledgling RI businesses that appear to have potential to impact multiple divisions across the company. At the same time, a similar structure is set up within each division for projects that appear to have potential impact within that division specifically.

■ *Mirrored Model.*—In two of our companies, we are witnessing the emergence of a very different model, depicted in Figure 4. The projects are identified, selected and incubated within or in close connection to the R&D organization. But simultaneously, in divisions that

appear to be the ultimate appropriate home for a particular RI initiative, a complementary capability is being developed, even before there is anything close to a marketable product. This complementary activity might be appropriately called an acceleration capability. A general manager is hired or appointed to begin building the business' infrastructure, including searching for potential acquisition candidates, value chain partners and appropriate talent to bring into the organization.

2. *Radical Innovation is not just one competency set but rather three (at least).*

We are beginning to see that a Radical Innovation Capability actually consists of three distinct capabilities, each of which requires unique skills, processes and metrics, as shown in Figure 5. In addition, these subset capabilities and activities must be tightly linked in order for the RI system to operate successfully, we believe.

■ *Discovery.*—The first capability is Discovery. This is about the creation, recognition, elaboration, and articulation of opportunities. The skills needed are exploratory, conceptualization skills, in terms of both technical, scientific discovery and external hunting for opportunities. Discovery activities can be the internally focused laboratory research we are used to thinking of, but also include hunting inside and outside the company for great ideas and opportunities, and licensing technologies or placing equity investments in small firms that hold promise. Nearly every one of our participating companies is involved in all of these activities simulta-

# Self-Similar Model



Figure 3.—Radical innovation is championed from the top of the company with senior corporate officers spending a significant portion of their time nurturing fledgling new radical innovations. This structure and approach are followed at the divisional level as well, nurturing radical innovations aligned with the business unit.

# Mirrored Model

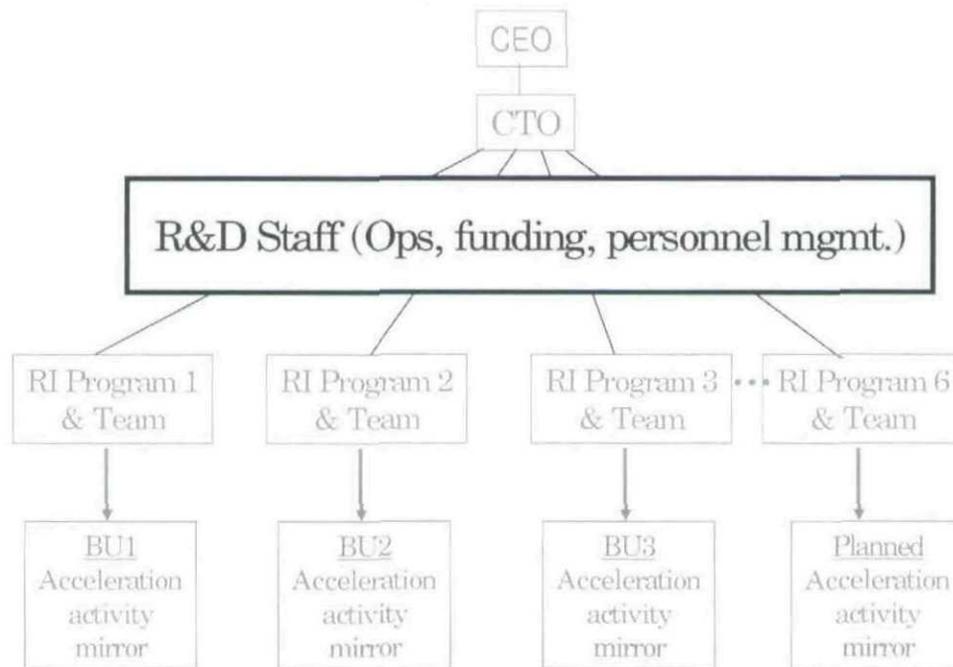


Figure 4.—Radical innovation projects are identified, selected and incubated within or close to R&D, while a complementary capability is established in the business unit, which is expected to be the future commercial home of the innovation. This mirrored capability provides an acceleration through building the business infrastructure, value chain, partners, and talent in parallel with the R&D effort.

neously, to increase the opportunity space for radical innovation.

■ *Incubation.*—Second, an Incubation capability is necessary in order to evolve opportunities into business propositions. A business proposition is a working hypothesis about what the technology platform could enable in the market, what the market space will ultimately look like, and what the business model will be. Incubation is not complete until that business proposal (or, more likely, a number of proposals based on the initial discovery) has been tested and found to be exciting. The skills needed for Incubation are experimentation skills. Experiments are conducted not only on the technical front but, simultaneously, for market learning, market creation, and for testing the match of the business proposition against the company's strategic intent.

■ *Acceleration.*—The third capability is an Acceleration capability. We (and our industry partners) define Acceleration as ramping up the fledgling business to a point where it can stand on its own relative to other business platforms in the ultimate receiving unit. The skills needed are those required for managing high-growth businesses. According to those of our participating companies that have invested in Acceleration capabilities, it is about exploitation rather than either exploration (Incubation) or experimentation (Discovery). The activities of acceleration include investing to build the

business and its necessary infrastructure, focusing and responding to market leads and opportunities.

A radical innovation opportunity cannot move into the traditional stage-gate process during this time. Acceleration is about getting to the point where early customer leads can be turned into predictable sales forecasts, and on moving from a focus on top line revenue to bottom line profitability. Only at that point can the RI program be transferred into the operating unit to stand on its own. Our observations are that activities necessary to getting the business to that point are handled in the Acceleration phase, and typically by a separate group of people who are evaluated by metrics associated with growth rather than profitability.

Most of the firms in our study are excelling at one or two of these; few are good at all three. Of those couple of firms that are, the linkages between these competencies and activities are not tight. Unless the three activities are tightly coupled and perceived as an integrated system by everyone in the firm, productivity for radical innovation will be suboptimal. In one firm, for example, the focus of the RI initiative has been on incubating and accelerating promising new businesses. In addition, the company is famous for its R&D depth, and so its discovery capabilities are well honed and highly respected. Interestingly, however, the RI system struggles to find new programs to feed its pipeline. The link between discovery and the rest of the system is too weak.

## Radical Innovation Capability

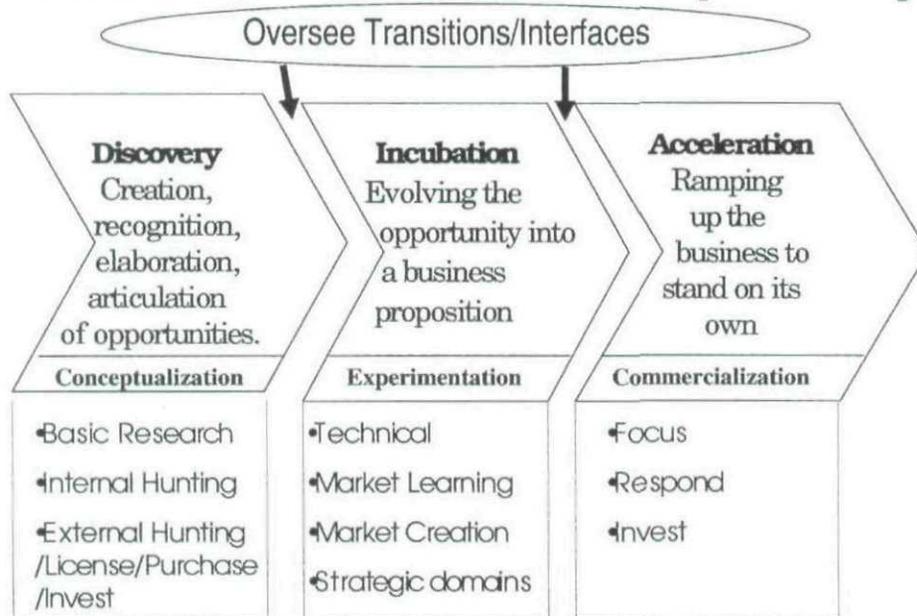


Figure 5.—A full radical innovation capability consists of three distinct capabilities, which not only need to be effectively managed, but the transitions and interfaces between these three capabilities need to be well connected into a seamless process.

3. *Radical Innovation systems differ according to organizational history and culture; there is no one "right" model for all companies.*

Most of our participating companies volunteered information regarding their organizational cultures: "We're a relationship-based culture." "We have a very controlling culture here." "We're all about innovation here" or even "We have not been oriented to step-out innovation here for a long time. Our culture does not allow it."

In nearly all cases, our interviewees talked about the need for culture change before radical innovation could begin to happen. But what we are beginning to see is that, in fact, it *is* happening, albeit in different ways depending on the firm's culture.

We have identified four "exemplars" from our data. By this we mean that four of our 12 companies exhibit very clear but different approaches to radical innovation, and we can match those approaches to what we observe about each company's culture.

■ *Competency and Readiness.*—The first approach is called the Competency and Readiness Model. This firm focuses on continuously deepening and strengthening its technical capabilities, its science base; it wins by sensing opportunities ahead of the curve as a result of that deep knowledge and then reacting quickly to solve those identified problems. The firm does not invest a lot of resources in developing and articulating a strategic intent for the future in terms of market domains or business platforms, although it does invest extensively in technology roadmapping, which drives its R&D hiring practices and investment strategies.

In addition, this firm is developing the exploratory marketing activity within R&D as described above, and uses that activity to sense opportunities in markets in which the firm currently does not operate. Market sensing is critical for a firm that depends on this approach.

■ *Strategy-Driven.*—The second model we observe is a Strategy-Driven Model. The CEO and CTO of this firm have defined five or six technology-market domains that are emerging as new business arenas, where there are currently few competitors, lots of advanced technology development activity, and a promising future market. The leadership of the company has a stated intention to dominate those spaces, and resources are dedicated to those programs from start to finish. Management is simultaneously discovering, incubating small, early opportunities, and building an acceleration activity in the designated receiving units for each program.

The acceleration activity is beginning to scope out acquisition candidates, hiring the appropriate general manager talent, building the value chain, and experimenting with

## A Radical Innovation Capability actually consists of three distinct capabilities.

various business models, even as the technology team is deep in the recesses of R&D struggling with high levels of technical uncertainty. One gets the impression that this firm will not take no for an answer on at least a subset of those programs, and is betting its future, to a large extent, on their success.

■ *Execution-Driven.*—The third model is an Execution-Driven Model. This company has taken the approach of identifying growth platforms based on independent initiatives already underway throughout the company, combining those that make sense, and devoting money and senior management attention to ramping those up to be very large businesses that will ultimately impact a number of the current business units. In other words, these are not white space opportunities, but rather gray space, or multi-aligned opportunities.

Two features distinguish this model: (1) the early technical uncertainty is largely reduced by the time the businesses gain the attention of senior leadership, and (2) an enormous amount of senior leadership time is devoted to accelerating these businesses, which accounts for this model's label of "execution-driven." A triumvirate of corporate leaders, including the Chief Technology Officer, the Chief Strategy Officer and the Corporate Controller spend approximately two hours/month with each of these radical innovation business teams. When this system began, there were ten such RI programs identified, meaning that 60 man-hours/month of senior leadership time was invested in these RI initiatives.

The monthly two-hour sessions were not typical evaluation sessions but, rather, problem solving sessions, where the senior leadership worked with each team to overcome organizational and resource challenges they may have been facing and, in particular, to help them focus on clarifying their business strategy. We interviewed a number of these team leaders, and every one of them said, without hesitation, that these sessions were extremely useful. These were not the typical drills that many teams fear.

Finally, this company has managed to isolate the expenditures for each of these programs so that the Corporate

Controller can monitor the expenditure rate at which the team is operating. This is particularly important because these programs are not funded from the corporate pool, but rather through the business units. What is most interesting is that the Controller's concern is not that the RI teams overspend, but that they are under-spending their budget. This signals to senior leadership that money is being siphoned away from the RI investment to support short-term operating crises. If that is the case, the RI team must answer to the Controller.

■ *Rational.*—Finally, we observe one company whose approach we term the Rational Model. This label applies because the system is very well organized and the roles and responsibilities of each element in the system are well recognized. Central R&D is the place for radical innovations; in fact, if a project exhibits high uncertainty without showing enormous promise for the firm, it is transferred over to the appropriate divisional R&D organization. But most of Central R&D's projects are radical innovations that are tightly aligned with the firm's current businesses.

Alignment with the current businesses' future plans is managed through the business unit's senior leadership representation on the R&D oversight board. Together, they consider the future of the company through their evaluation and regular review of RI project opportunities and projects as they mature through development. Within R&D, however, there is an alternative infrastructure for unaligned, white space opportunities, as well as for seeking technologies from the outside that the firm may want to invest in. This "Venture Group's" decisions are not overseen by the senior BU leadership, but rather by the CTO.

Finally, this firm is incubating a new business within Central R&D all the way through to commercial launch. Thus, the firm has an appropriate spot for each type of radical innovation opportunity, depending on the type of organizational challenge it may face because of the potential lack of immediate fit within the company's current structure and planning horizon.

### **Moving Forward with the Research**

At the time of this writing, we were a little more than halfway through our three-year data collection period, and there is still a lot to learn and distill from the rich data that our participating companies have so willingly shared. As we move forward, we continue to seek input from companies as to the utility and validity of these approaches to embed radical innovation into companies. Following are a few of the working hypotheses that we continue to track and to think about within our own research team and subcommittee. While ours is not a study that allows for formal hypothesis testing, we expect that over the next year, as we continue to observe

these 12 companies evolve their radical innovation competencies, our confidence in some of these will strengthen and diminish in others. We invite readers to comment on any of these:

1. *Organizational structure for RI.*—There must be a dedicated group of people responsible for making radical innovation happen. Organizations cannot accomplish radical innovation solely on the basis of having an "innovative culture."

2. *A language for RI.*—Similarly, for successful initiation of an RI system, firms must develop and adopt a language for RI that is legitimized and different from the language used to describe conventional NPD projects.

3. *Senior leadership and radical innovation.*—There is a dearth of senior leadership that is oriented toward the long-term future health of the firm. Compensation systems for senior leadership focus on consistency and growth of quarterly earnings, which tends to focus the CEO on short-term performance metrics. It takes courage and conviction for the senior leadership to spend dollars on long-term, high-risk ventures such as RI initiatives, in the hopes of growing their business 5–10 years in the future. Firms with low turnover at senior levels may have a better chance for success with RI than those that experience leadership "churn."

4. *Market analysts' impact on radical innovation.*—Few analysts express the view that companies need to invest significant funds for the long-term growth of the business. Until analysts and investors develop sufficient sophistication, the burden for deciding and justifying investment in radical innovation will rest with the leadership and board of directors of that company, thus making their success highly dependent on those champions.

5. *RI system initiation.*—A radical innovation system need not always be initiated from the top of the company. Mid-level management can successfully initiate the development of an RI system if the group explicitly works toward sensitizing senior management about the importance of RI to the company's renewal or growth.

6. *RI system evolution.*—As it evolves, an RI system moves from a focus on culture change and education to one of competency development and project advancement.

7. *Pressure on RI objectives.*—As an RI system evolves, the temptation is to migrate away from the original objective of developing longer-term but higher-risk big hits. Instead, pressure to perform mounts, causing many systems to retrench to aligned shorter-term projects in order to "show results."

8. *RI system leadership.*—RI system leaders must be highly complex thinkers to deal with:

- Simultaneously managing their group, managing others competing for the same resources (e.g., Strategic Business Unit leaders), and managing senior leadership's expectations; and

- Simultaneously managing for the future and balancing the practical needs of the present.

9. *RI skills*.—Large established companies lack new business/new market creation talent that is necessary to make radical innovation happen. New formal roles are required in large firms to legitimize these skills.

10. *RI processes and tools*.—Appropriate processes and tools are entrepreneurial rather than managerial; that is, they have a strong orientation to uncertainty, experimentation and opportunism. Stage-gate processes can be used as a pacing and review mechanism, but evaluation criteria must be very different.

11. *RI processes*.—Organizations that include explicit/formal and separate advising, coaching and mentoring activities as part of their RI systems will have higher throughput through their RI systems than those that do not provide such coaching.

12. *Rewards and metrics for RI*.—Rewards for radical innovation teams need not be different from conventional rewards in large companies—but metrics for assessing success must be dramatically different.

## Conclusions

At this stage of the study, it is not possible to predict which approaches are more effective at building management systems that nurture and commercialize a steady stream of radical innovations. However, several insights can be considered in developing or refining approaches to radical innovation.

First, companies are paying attention to radical innovation. They are experimenting with a number of organizational structures in an attempt to ensure that RI is constantly nurtured. Every one of the organizational structures we are observing is connected to the mainstream operation in some way and leverages its resources, networks and knowledge banks. Thus the concept of "skunkworks" organizations, while critically important to large companies at some time in their histories, is not the order of the day. Firms are working toward building these radical innovation capabilities as part of their organizational fabric.

Second, we are seeing that there is not necessarily one right way. We have identified four exemplar approaches that can be described because the companies' cultures are so clear and distinct. But our learning has been that companies that are operationally oriented, or those that are sense-and-respond-oriented, or those that are

**The initial excitement over radical innovation is observed to be waning in several of the participating companies.**

highly planning-oriented, can all engage in RI—they just tend to approach it differently from one another.

Approaches taken to date seem to favor adoption of RI management systems and practices that align with their company cultures. Radical and incremental innovation seem to be coexisting in the same organization, essentially as an ambidextrous company. The question remains, however, that if these companies are trying to do radical innovation within their current culture, how radical will it ultimately be? It will be interesting to observe their effectiveness as we continue our study.

Third, we have observed in several of the participating companies that the initial excitement is waning for RI units. Is this the beginning of their dissolution, or is RI becoming business as usual? We do not know if this is the start of a downturn in their support or if this is a sign of ultimate success, whereby RI is being institutionalized throughout their normal reporting systems and ultimately becoming incorporated into one holistic (more highly evolved) management system.

Finally, our research to date has turned up more questions than it answers. As we continue to observe these initiatives in our partner companies over the next 1½ years, we will doubtless gain increased insight into the hypotheses that we have highlighted above. ☺

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