EDITORIAL — Innovation in China – Mark Dodgson and Lan Xue

FEATURE ARTICLES

Crafting organizational innovation processes – Kevin C. Desouza, Caroline Dombrowski, Yukika Awazu, Peter Baloh, Sridhar Papagar, Sanjeev Jha and Jeffrey Y. Kim

The innovation deficit in public services: the curious problem of too much efficiency and not enough waste and failure – Jason Potts

The content and role of formal contracts in high-tech alliances – Gjalt de Jong and Rosalinde JA Klein Woolthuis

Structural changes in mature Venture Capital industry: Evidence from Israel – Gil Avinnelech and Dafna Schwartz

Managing marketing externalities in innovative natural resources-based clusters – Christian Felzensztein and Eli Gimmon

Examining partner experience in cross-sector collaborative projects focused on the commercialization of R&D – Paul K. Couchman and Liz Fulop

CASE STUDIES

Nature and strategy of product innovations in SMEs: A case study based comparative perspective of Japan and India – MH Bala Subrahmanya

PROCEEDINGS OF INNOVATION LEADERSHIP GROUP FORUM ON INNOVATION AND SMES, BRISBANE, SEPTEMBER 2007 – convened by Terry Cutler and Mark Dodgson. Hunting the Snark: Some reflections on the UK experience of support for the small business sector – Alan Hughes

PROCEEDINGS OF INNOVATION LEADERSHIP FORUM ON INNOVATION AND PROCUREMENT POLICY, CANBERRA, OCTOBER 2007 – convened by Terry Cutler and Mark Dodgson. Using government procurement to help grow new science and technology companies: Lessons from the US small business innovation research (SBIR) programme – David Connell

BOOK REVIEWS

Crafting organizational innovation processes

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ABSTRACT
Innovation is a crucial component of business strategy, but the process of innovation may seem difficult to manage. To plan organizational initiatives around innovation or to bolster innovation requires a firm grasp of the innovation process. Few organizations have transparently defined such a process. Based on the findings of an exploratory study of over 30 US and European companies that have robust innovation processes, this paper breaks down the innovation process into discrete stages: idea generation and mobilization, screening and advocacy, experimentation, commercialization, and diffusion and implementation. For each stage, context, outputs and critical ingredients are discussed. There are several common tensions and concerns at each stage, which are enumerated; industry examples are also given. Finally, strategies for and indicators of organizational success around innovation are discussed for each stage. Successful organizations will use an outlined innovation process to create a common framework for discussion and initiatives around the innovation process, and to establish metrics and goals for each stage of the innovation process.

Keywords: innovation; innovation processes; competitive advantages; organizational capabilities

INTRODUCTION
Innovation is on the mind of most executives and is part of almost every company’s strategic plan (Lengnick-Hall, 1992; Govindarajan & Trimble, 2005; Kim & Mauborgne, 2005). The need to innovate, and to do so effectively and efficiently, is essential to one’s ability to endure and thrive in a fiercely competitive marketplace.
In today’s hyper-competitive marketplace, organizations that have robust processes for innovation will lead their industries. Newly emerging companies, such as Google and Amazon, have been successful at innovating at rates faster than their traditional counterparts. We can also find successful innovation programs at traditional organizations. These organizations adapt to changing market conditions and execute innovative strategies in a range of effective ways:

GE has been known for its traditionally strong and successful approaches to generating and managing good ideas. Through a well-executed transition between two charismatic leaders with very different managerial and leadership styles, GE managed to capture and nurture both the agility of small businesses and organizing power of the larger organization. The majority of GE’s inventions do not come from central R&D labs, but originate through acquisitions of other companies into a GE unit or as the result of alliances. One example of invention integration is Lunar, a Wisconsin-based company which GE Healthcare acquired for its work on portable bone density scanners. Working with GE gave Lunar greater access to markets, especially smaller international markets, as well as access to product couplings and market research throughout the company. GE Healthcare benefited by gaining the new technology, which has been adapted to test for percentage of body fat, thus widening the potential market considerably (Newman, 2006).

Whirlpool had been known for its focus on building high-quality product while utilizing a cost-cutting approach in innovation. In 2000, they created a new vision for customer-centered innovation: ‘a creative idea focused on a customer touch point that: Creates unique and compelling solutions valued by the customer; Creates real and sustainable competitive advantage; Creates extraordinary value for Whirlpool shareholders; Comes from everywhere and anyone’ (Cutler, 2003). These points emphasize a) stakeholders – especially customers and b) democratic innovation. Whirlpool focused on idea generation, advocacy for customer needs and marketing, organizational learning, mentors/sponsors, and alliances with other retailers as well as suppliers. Information technologies were used throughout the innovation process. Mentors/sponsors supported and assisted the people who innovated. Prior to rolling out the focus on innovation, new executive-level positions (such as the VP of leadership and competency creation) were created (Melymuka, 2004). Top management supported the innovation process every step of the way, from providing funding (20–35% of the annual budget was intended to be spent on innovation and innovation processes in 2001-3) to featuring slogans like ‘Thinking outside the box, inside the home’ in the annual report (Richard, 2002). Whirlpool’s culture can be described as an ‘innovation democracy’ (Melymuka, 2004) because anyone may participate. Top management’s unwavering support for the technology infrastructure, slogans promoting the innovative process, and seed funding for pilot projects contributed to the development of a highly collaborative and innovative culture, which enabled Whirlpool to outperform its competitors.

Procter and Gamble (P&G) treats the consumer as its boss; the company thinks and lives with consumers. P&G researchers have spent time with young mothers to research diapers and behaviors. They carefully followed young Chinese girls and examined their behavior and attitudes toward cold-water shampoos (Tеather, 2005). Through insights obtained from customers, P&G has successfully developed and commercialized innovations (such as diapers that stay wet for two minutes to aid potty training). In addition to their consumer focus, P&G now circulates problem stories throughout a network of technology entrepreneurs and suppliers (e.g. NineSigma, YourEncore [retired scientists and engineers], and Yet2.com [an
online marketplace for intellectual property exchange) (Huston & Sakkab, 2006). The problem stories are presented to these groups, and anyone with an answer can respond—and they usually do, quickly. Through this network, P&G wants to ‘connect and develop’ to supplement internal innovators.

These aforementioned traditional companies have found a recipe for successful innovation. Moreover, they have found a recipe for sustainable innovation programs rather than mere spurts of innovation. The question then becomes: what is their recipe?

Many organizations continue to fare poorly when it comes to development of sustainable innovation programs (Tushman & O’Reilly, 2002). One reason for this is poor understanding of the process of innovation (Christensen & Raynor, 2003). The process of innovation may seem complex and difficult to control or orchestrate. Many organizations continue to take a black box approach—only by chance or by happenstance might some ideas catch fire, and only those lucky ideas are investigated, developed, and commercialized. Innovation may seem disruptive to normal business operations because there are no standard procedures, rulebooks or guidelines. Consider the following quotes:

‘Innovation is a must to survive in our environment….All of my [executive] colleagues understand the need for innovation and are 100% supportive of employees who innovate….Yet, I cannot say that we have an organizational process for innovation….innovation happens, but I cannot outline the process to you because I do not think we have one.’ – CEO, Information Technology Organization

‘A process for innovation is missing in this organization….One reason why I have been harping on setting up a process, or at least a template, is the need to measure our efforts….we spend money on [R&D] workshops, brainstorming retreats, experimentation, and a million other things; some of these work and some don’t….I could not tell you where are the strengths and weaknesses of our innovation capacities….I can guess that we are very good at getting ideas from our employees, and not so good at the ways we commercialize the ideas….but these are my guesses….It is difficult to manage with guesswork.’ – VP of Research, Information Technology Organization

In too many organizations, innovation occurs by serendipity rather than by deliberate management. Without a process to understand, stimulate, and analyze innovation and an organization’s strengths and weaknesses around innovation, most companies rely upon serendipity. Waiting for inspiration to strike is not a sustainable method of securing competitive advantage (Von Oetinger, 2005).

Having a well-defined innovation process is important. However, we found following that simple rule difficult to implement. We posit that this difficulty is caused by the inherent and complex nature of innovation, which demands organizational robustness and flexibility. In this paper, we use the concept of robustness to designate organizations that are successful in repeated instances of innovation. We define ‘robust organizations’ as the ones with well defined innovation processes and clear-cut protocols for the evaluation and screening of ideas. Robust organizations use an established innovation process to create a common framework for the management of ideas, from their inception to commercialization. Moreover, they constantly seek to refine and optimize their innovation processes. On the contrary, ‘brittle organizations’ are defined as the ones without well-defined and vigorous innovation processes. In brittle organizations, innovation steps are laden with confusion and indecision. These organizations miss good innovation opportunities, and they are not able to swiftly recover from the mistakes and failures in their innovation efforts. As a result,
these brittle organizations are exposed to more risk. They may have spurts of innovation. They may even be good at one or more stages of innovation, but may fare poorly in other stages (e.g., commercialization).

This paper seeks to outline a framework of organizational innovation practice. Such a framework will help to introduce and manage timely organizational actions, and will make the voyage from idea generation to product commercialization both efficient and effective. We will use industry examples to illustrate organized and systematic approaches that managers can follow in each stage of innovation. Our aim is to explore how organizations with less effective innovation processes can improve their practices and become robust organizations. Moreover, by making this complex process transparent, managers are able to advance each of the stages by infusing them with knowledge-based activities. In light of that view, this paper focuses on the following questions: What are the stages of the innovation process? What are the various issues that organizations face as they move through the innovation process? What are the differences between organizations with successful and vigorous innovation processes and those without such innovation guidelines? And, what can managers do in order to make their innovation efforts successful?

RESEARCH METHODOLOGY

We draw on several case studies gathered from the large-scale research project, Ideas for Innovation.1 We found that organizations with a defined and robust process for innovation normally fare better at developing sustainable innovation programs. Researching various innovation issues in an exploratory-type study allowed for a rich qualitative understanding of contemporary business practices.

We first reviewed relevant streams of existing research. From existing literature, relevant characteristics of successful innovation processes and issues surrounding them were derived. Exploratory multiple case study research design was chosen, as case studies are particularly useful for problems where the context of action is critical (Benbasat, Goldstein & Mead, 1987), and the research and theory are at formative stages or call for a revision of understanding (Lee, 1991). Using this approach, researchers can gain a rich understanding of the context of the research.

We chose multiple sources of evidence, as this facilitates a deeper understanding of the research phenomenon. Our sample of over 30 diverse American and European companies ranged from financial services to information technology, federal research and development laboratories, advertising agencies, non-profits, manufacturers, retailers, and pharmaceutical organizations. Data collection involved semi-structured interviews with senior executives from R&D, marketing, and product management areas. The interview data were complemented by analysis of corporate and annual reports, company presentations, and business press. Most interviews were conducted on-site. On average, six executives were interviewed per organization. The

1 This project examined innovation practices in over 30 organizations to identify critical drivers of successful innovation programs. The project resulted in over 800 pages of documentation describing the innovation programs in organizations such as Leo Burnett, General Electric, UBS, Motorola, 3M, Whirlpool, Microsoft, Hewlett Packard, Johnson & Johnson, and Air Products, among others. We examined innovation programs in the context of (1) how firms engaged with customers for innovation, (2) collaboration with business partners for innovation, (3) the development and management of innovative cultures, (4) the role of information and communication technologies in fostering innovation (e.g. the use of information technologies of sharing ideas), and (5) the development of metrics to link innovation efforts to business value measures.

In this section we are discussing the organization-sanctioned experimentation process. Ideas go through multiple forms of experimentation during their life-time. For example, an individual might experiment with ideas before even realizing that an idea is in front of them. These are local and personal experimentations. Similarly, teams may toss around ideas without support from the organization. In this section, we are looking at experimentation of ideas that are organizationally sanctioned and motivated.
interviews ranged from half-hour to over four hours, with the average being about ninety minutes. In follow-up sessions, findings and interpretations for each company were reviewed and validated with the help of key informants to improve the credibility of the research findings. Upon completion of the research project, the researchers presented their integrative findings to several of the organizations. The findings were received positively; both by organizations who originally participated in the research project and other organizations only had a chance to hear the final findings.

The innovation process

Most organizations encourage innovation and discuss the need for it, but do not specify a process of innovation (Dobni, 2006). The first sign of a successful innovation program in an organization is the presence of a defined innovation process. The very act of defining and creating a common language around innovation encourages those within an organization to value and critically consider innovation processes. Consider the following:

‘One of the most difficult things that we undertook was to articulate the process of innovation. We were coming up with new ideas, discoveries, and solutions to client problems, and even new business models for revenue generation. All of these were good. However, we asked the question, how good are we at coordinating resources for truly leveraging the value of these innovation?…Are we exploiting each of the ideas to the maximum? Are we crafting our ideas in the most efficient manner? Are the appropriate experts evaluating ideas?…The need for an organizational-wide process of innovation was clear.’ – VP of Global Markets, Consumer Products Organization

Based on our analysis, the following stages of the innovation process are the most common: generation and mobilization, advocacy and screening, experimentation, commercialization, and diffusion and implementation (see Figure 1).

The stages are interlinked in a cyclical manner. An organization may choose to execute each stage on its own, outsource it, or execute it in conjunction with external entities (e.g. customers or business partners). An idea, whether internally or externally generated, moves through a series of stages before it is adopted wholly into a company or a marketplace. The stages of the innovation process detail the major steps that an idea must go through to become fully implemented and accepted. Not all ideas complete all stages of the innovation process, but all ideas that lead to novel practices which are integrated into a company or products and services that are commercialized for the marketplace do pass through these stages.

We will now describe each stage. We outline the critical issues that organizations need to pay attention to when executing each stage, and the tensions that arise when doing so. Differences between organizations that have robust innovation processes and those that have brittle processes will also be articulated. Table 1 contains a summary of critical differences between organizations that have robust and brittle processes for innovation.
Crafting organizational innovation processes

### Table 1: Robust versus brittle organizations in the innovation process

<table>
<thead>
<tr>
<th>Innovation process</th>
<th>Robust organizations</th>
<th>Brittle organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idea generation</td>
<td>• Guidelines and processes exist to standardize stages of idea generation</td>
<td>• Employees are unsure what constitutes an idea</td>
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<td></td>
<td>• An ‘idea’ is defined</td>
<td>• Need and pressure are used in inappropriate situations</td>
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<td></td>
<td>• Multiple venues exist to identify ideas</td>
<td>• Idea sources are limited in range and scope</td>
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<td></td>
<td>• A conscious balance exists between the pressure of need and an environment of open</td>
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<td></td>
<td>playfulness</td>
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<td></td>
<td>• Procedures are defined to evaluate sources</td>
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<td></td>
<td>• A wide range of defined idea sources exists</td>
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<tr>
<td></td>
<td>• Are often subject to information overload or an absence of ideas</td>
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</tr>
<tr>
<td>Idea mobilization</td>
<td>• Idea sources are connected across departments, geography and authority ranks</td>
<td>• Idea generators are unclear about how to communicate ideas</td>
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<td></td>
<td>• Idea sources are focused on the most likely or useful areas for the organization</td>
<td>• The value of ideas is often not recognized</td>
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<tr>
<td></td>
<td>• Reward and recognition systems show value in both generation and mobilization of</td>
<td>• Sources and idea flow is unmanaged</td>
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<tr>
<td></td>
<td>ideas</td>
<td></td>
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<tr>
<td></td>
<td>• Accountability for recognizing and mobilizing ideas is specified</td>
<td>• Rewards are lacking for good idea generators or recognizers</td>
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<td></td>
<td>• Idea generators and those involved with mobilization interact with stakeholders</td>
<td>• Idea hoarding may be present, limiting mobilization</td>
</tr>
<tr>
<td>Advocacy</td>
<td>• Organizational and customer considerations are clear to advocates</td>
<td>• Methods and track record of recognizing and mobilizing ideas are not part of job</td>
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<td></td>
<td>• Possible ideas are broadly communicated</td>
<td>descriptions or evaluations</td>
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<td></td>
<td>• Numerous avenues to advocate for ideas and find supporters exist</td>
<td>• Idea generators may be isolated from key stakeholders</td>
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<td></td>
<td>• Dedicated advocate roles exist, and/or reward systems are standardized to reward</td>
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</tr>
<tr>
<td></td>
<td>advocates</td>
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<tr>
<td>Screening</td>
<td>• Standards for evaluation are articulated and communicated across the organization</td>
<td>• Evaluation process is unclear and subjective</td>
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<td></td>
<td>• A clear, conscious shift towards evaluative objectivity is made</td>
<td>• Egos play a large role in idea evaluation</td>
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<td></td>
<td>• Evaluation is as transparent as possible</td>
<td>• Secrecy surrounds the evaluation process</td>
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<td></td>
<td>• Long term and immediate consequences of ideas are built into the evaluation system</td>
<td>• Focus is on short term impact and revenues, or local context</td>
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<tr>
<td>Experimentation</td>
<td>• Resources are in place for experimentation</td>
<td>• A lack of resources or incentives exists</td>
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<td></td>
<td>• Process is defined and sanctioned</td>
<td>• Structure and definitions are nonexistent</td>
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<td></td>
<td>• Adoption of external ideas is valued</td>
<td>• Experimentation is on employees’ own time, without standard process</td>
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<td></td>
<td>• A variety of avenues exist to experiment, some of which involve external parties</td>
<td>• It is difficult to customize existing experimental processes to current need</td>
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<td></td>
<td>• Documentation of process contributes to the organization</td>
<td>• Documentation procedures do not exist</td>
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<td></td>
<td>• Technology is utilized and invested in</td>
<td>• Experimenters are isolated</td>
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<tr>
<td></td>
<td>• Process is transparent and communicative</td>
<td>• Failure, risk and resource expenditures are emphasized</td>
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<td></td>
<td>• Failure is part of the process, not an end point</td>
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<tr>
<td>Commercialization</td>
<td>• Public forums are utilized</td>
<td>• Isolated or internal processes exist</td>
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<td></td>
<td>• Consumers are involved</td>
<td>• Weak evaluation of market trends decreases likelihood of success</td>
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<td></td>
<td>• Distinctions are drawn between immediately useful and ideas needing</td>
<td>• One hit wonder syndrome exists</td>
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<tr>
<td></td>
<td>refinement or market changes</td>
<td>• Ideas are not evaluated against market demands or service scope</td>
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<tr>
<td></td>
<td>• Benefits are articulated and documented</td>
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<td></td>
<td>• Scope is considered</td>
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*Continued*
Generation and mobilization

Idea generation is the process whereby new ideas are created, whether through redefinition of concepts, changes in processes, creation of new components of service, or development of new services (Von Krogh, Ichijo, & Nonaka, 2000). Mobilization is where modifications to any existing products, processes, services, or frameworks of thought lead to the movement of ideas from one location (physical or logical) to another (Argote & Ingram, 2000). Ideas may originate internally (e.g. employees) or externally (e.g. customers, business partners, academia, government, and competitors) (Desouza & Awazu, 2005; Desouza, Awazu, & Jasimuddin, 2005). Not all ideas need to be generated (or created) from scratch; some ideas can be transported to a domain from allied or foreign domains. Consider the following quote:

‘Ideas for us can come from our employees and also our customers and even our business partners; we even occasionally read the academic journals…But an idea to a local department – let’s say the ABC group – can come from the XYZ group…mobilizing ideas that reside in one corner of the organization is important….Ideas that are good can have a multiplicity of uses.’ – VP of Global Strategy, Financial Services Organization

Generation of ideas

Ideas can be generated in playful, relaxed environments (Dougherty & Takacs, 2004) or in environments of need (e.g. as when a firm is in trouble and needs to change) (Mueller, McKinley, Mone, & Barker, 2001). People who don’t adapt well to new environments and who don’t integrate wholly into the organizational culture can lead to startling innovations by unsettling norms and assumptions (Sutton, 2002). On the other hand, creating an adaptive, warm, and constant learning environment where employee input is valued can also lead to innovation (Pettigrew, Massini, & Numagami, 2000). Ideas can seem instantly accessible or incredibly bizarre and risky, but generating ideas consistently seems to require extreme democratiza-
tion, wherein all employees’ input is valued, or an unsettling, learning-focused environment where ‘borrowing’ from other industries and other people is encouraged (Hargadon & Sutton, 2000).

One vital tension that occurs in the generation of ideas is in the balance between generating ideas through environments of playfulness versus environments of need. An environment of acceptance, playfulness and thinking that emphasizes unusual analogies can be found at some of the idea ‘factories’ like IDEO. In these environments, hierarchies are demolished regularly, and toys and mechanisms are commonly found in the environment to encourage free association. Lateral communication is encouraged and collaboration is expected. At the other end of the spectrum are environments of need. In these situations, problems are paramount and solutions are sought. Consider the following case: Proctor and Gamble’s ‘connect and develop’ strategy seeks solutions from the outside, and then develops them for internal use. Proctor and Gamble uses a network of small and medium-sized businesses, retired scientists, and seasoned advertising groups to find solutions to problems articulated within its organization (Huston & Sakkab, 2006). Customer needs are identified and then structured into ‘problems’ that are given to the network. Thus, in some instances, idea generation is outsourced to competent experts who supplement internal knowledge.

Balancing between the tensions of generating ideas via loose (playful) versus tightly controlled (problem-driven) mechanisms is critical. Robust organizations combine these two mechanisms, and will use them for the problems for which they would be most effective. Loose mechanisms work well for ideas that are emergent in nature and those that do not fit pre-defined problems or areas of investigation. Ideas that emerge from these environments are normally abstract, and may be broad and overarching. On the other hand, ideas that emerge as solutions to problems are narrower in scope and operational in nature. Not all sectors of the organization will respond to the two mechanisms in a similar fashion. For instance, engineering teams might arrive at ideas more easily with problem-driven solutions, whereas marketing teams will thrive in loose and playful environments. Customer-driven problems normally appear in the form of need-based statements, while working through un-chartered territories, such as the future strategic direction of a division or product, might be better handled through playful settings that are more tolerant of free-flowing ideas and unrestricted thinking.

**Mobilization of ideas**

Not all ideas need to be generated from scratch. The movement of ideas from a domain where they are well-known to another domain where they are fresh can inspire idea generation by revealing assumptions in practices, processes, or products. For instance, if the marketing department has been using a wiki to brainstorm and refine ideas, and that wiki is shown to the research and development unit of a large organization, the R&D unit may recognize the need for a similar process, and ideas may be generated to meet its newly discovered need. It is crucial to consider wiki as a potential way to increase and encourage idea generation.

The mobilization of ideas can also originate from traditional, entrenched places and move them to more nurturing environments. For example, the reason spin-offs are philosophically and physically separated from major firms is because the ideas which are at the roots of these new organizations were not likely to have been well-received in the original organization. Firms may purposely send ideas outside the firm to provide a more inviting and open environment, and/or to minimize risk (Chesbrough, 2003). If the idea fails and the spin-off goes under, the main business will be largely untouched. Large organizations are particularly likely to do this both to avoid disrupting day-to-day business and to reduce negative reactions or the image of failure.

Idea mobilization can be extremely difficult. There are two main reasons for this: idea hoarding and context specificity. Some people perceive
knowledge as power and feel that sharing ideas weakens their position; some organizational cultures encourage such notions. When people hoard ideas or act as unofficial gatekeepers of innovative ideas, the organization cannot benefit from the innovations. Competition can encourage this tendency. Sometimes, a unit clings to ideas even if it is not the best group to nurture or grow those ideas. In these instances, the individual or team may want the glory of developing the idea fully, even though the organization as a whole would benefit from idea transfer.

Another barrier arises because some ideas are context-specific and simply will not be useful or accepted in other environments. This does not invalidate or devalue the ideas themselves, nor does it imply that the unit that did not absorb the idea failed. Sometimes there is simply a lack of fit, either organizationally or within teams (Chua & Lam, 2005). For instance, brainstorming in front of a whiteboard may work spectacularly well with some departments. However, a group of chemists or electricians may find it more useful to share ideas or new approaches by using and manipulating physical objects like test tubes or circuit boards. Another common instance in which mobility of ideas becomes problematic due to context is the global movement of ideas. Ideas that are culturally-ingrained in one community might not make sense in a foreign area. For instance, the manner of handling customer service calls needs to differ depending on the specific cultural contexts of the customers. Incentive schemes to encourage customers to share ideas will also differ across geographical regions. Organizations thus must tread the fine line between trying to generalize and diffuse ideas across an organization and filtering ideas to suit the particular context.

The outputs of this stage are ideas that could alter business models, services or products, or could improve upon those models, services or products. This can be achieved by changing the thoughts, feelings, or reactions of people so that they perceive old problems in new ways or see other ideas in new contexts, applications or uses.

**Success indicators**

Organizations with robust innovation programs have clearly articulated guidelines and stages to help in the recognition and construction of ideas. We might begin at the level of a thought or hunch, a personal idea. The idea generator will then need to do some homework on the idea to gauge its potential. In doing so, the idea generator will go through an internal refinement process and will document the idea, if the idea is valuable. At this stage, the idea may be ready to be shared, but only in a limited fashion. The employee might use the idea in his or her daily work and also encourage team members to try out the idea and provide feedback. Through this process, the idea is refined and improved, or is deemed to have limited potential and discarded. If the idea moves forward, it might be considered for greater mobilization and organization-wide advocacy and screening processes, which we discuss next.

Having clear guidelines to demarcate what is an idea and what is not, and to demarcate the level of robustness and growth of an idea, helps avoid information overload. Robust organizations take a lot of care to identify domains of interest, problems of interest, and other zones of innovation. These are communicated to all internal and external stakeholders of the organization. Having these clearly defined helps focus the creative energies of all. In arriving at these zones of innovation, the robust organization not only considers its current position in the marketplace, customer needs, product and service enhancements, but also the future strategic direction of the organization. Moreover, they take the time to clearly specify which group within the organization should be primarily responsible for innovation in a given space. It is important to stress that only primary groups are identified, so as not to discourage others from attempting to innovate in a given space. The rationale behind identification of a primary group is to focus resources and avoid battles and in-fighting between groups.

Robust organizations guide sources. Rather than letting sources generate any ideas, at any
time, in any direction, robust organizations focus the activities of sources. One example of this is an organization identifying clear areas of interest or domains where innovation is particularly encouraged. For instance, Whirlpool seeks ideas from many sources, but often limits the area in which ideas are to be given. Suppliers are involved in idea generation through structured contests (Sheridan, Graman, Beck, & Harbert, 2001), for instance, while students have been sought to identify and target the needs of students, rather than of the general public (Dodson, 2002). Eli Lilly has adopted a similar strategy to tap into experts outside the company by bringing specific problems to virtual arenas. Eli Lilly founded InnoCentive, a wholly owned subsidiary, to take on the task of bringing outside researchers’ attention and energy to the drug development process through an incentive system. The process is similar to bounty hunting in the Old West: ‘Wanted’ posters describing a scientific problem and a reward are posted, and bounty hunters can then compete in an online project room to answer first and best. Confidentiality was the first hurdle InnoCentive tackled, but even scientists who have won large bounties argue that the process puts undue risk upon the scientist, particularly when research must be conducted to get to a particular target or answer (Breen, 2002). Many scientists are signing up for InnoCentive: in 2002, ‘7,000 scientists [had] registered at InnoCentive, and there [were] 2,400 project rooms in use, organized around 33 problems’ (Breen, 2002). As of 2006, more than 95,000 scientists have registered with InnoCentive (Kramer, 2006). Scientists from India, Russia and around the globe have signed up with InnoCentive (www.innocentive.com), and companies like Boeing, Proctor & Gamble, Dow Chemical and Nestlé all have paid the membership fee and now seek solutions using InnoCentive (Kramer, 2006). In this case, open innovation seems to be working for the organizations, the scientists, and the broker.

Brittle organizations are more likely to seize good, immediately applicable ideas, but not to reward sources for particularly apt ideas, or ideas that complement the direction of the organization without being immediately applicable. Taking the long-term, business process view of idea generation allows robust organizations to highlight appropriate ideas. Brittle organizations have a difficult time with idea generation and mobilization due to lack of clear definitions about what constitutes an organizational idea. One crucial concern for idea generation is for employees to recognize when they have done something innovative. Sometimes, employees will be too modest or too unfamiliar with standard business processes to identify their own behavior as innovative. NPower Seattle deals with this concern through employee dialogue, where employees discuss recent problems and how they dealt with them. The listener, not the originator of the behavior, then reports to management about innovative processes and procedures. In this way, ideas are articulated and shared after basic screening.

Creating a long-lasting culture of openness is difficult, and not all people adapt well to that environment. Too much openness can lead to risky decisions and poor long-term management, while too little can lead to a staid and risk-averse culture. Similarly, striking the appropriate balance of need can be difficult. Overemphasizing need will cause some employees to leave for more stable jobs. Not emphasizing it enough will decrease urgency and idea generation across the board. Some companies choose to de-emphasize the time-consuming and sometimes unpredictable stage of generation in favor of collecting ideas generated by others. Robust organizations provide their employees with not only the necessary room for innovating, but also the necessary resources. Many organizations harp on the mantra of innovation, but few provide their employees with the necessary resources. Robust organizations, such as Air Products, will fund employee expenses to conferences that not only in the areas of expertise but also seemingly unrelated areas so as to provide the employee with resources to explore learn about auxiliary areas.
Moreover, several companies such as 3M provide their employees with time (15% of their work week) to explore and develop ideas that are not directly related to their work assignments.

Robust organizations find a balance between emphasizing play and emphasizing need. For instance, at IDEO all employees are encouraged to bring objects that inspire them and leave them lying around the office to stimulate thinking. This is in part because IDEO’s specialty is coming up with radical, big solutions, and thinking through analogies and having objects to pick up and manipulate sometimes encourages that process. On the other hand, many companies have to focus on both need and play in different situations. When a new client must be wooed, sometimes the driving force of need (to increase revenue or to earn a commission, for example) is much more suitable. Like organizations, individuals react differently to playfulness and the pressures of need. Robust organizations have assessed and balanced the two for the best results.

Robust organizations also explore ideas from a wide array of sources, both internal and external. For instance, Whirlpool underwent a major transformation when barriers to communication were eliminated and a website, the Innovation Pipeline (or I-Pipe), was constructed to facilitate the contribution of ideas from all employees, regardless of their places in the organizational hierarchy (Melymuka, 2004). Furthermore, Whirlpool has initiated competitions and communication channels with suppliers to improve its products (Sheridan, Graman, Beck, & Herbert, 2001; Atkinson, 2003). Whirlpool also seeks ideas from business partners like Lowe’s and Best Buy (Dodson, 2002).

Brittle organizations have more limited ranges of sources and are less likely to be open to ideas. This is partly because they are less capable than robust organizations of evaluating sources. Robust organizations encourage boundary-spanning activities; they have individuals or entities (e.g. departments) tasked to examine domains outside their primary areas of interest for new ideas and sources. Determining the credibility and applicability of sources requires deep understanding of the market and of source context and expertise. Further, evaluating sources demands that an organization continuously update its evaluations of services – a source may become outdated or surpassed by a new, better idea generator. For instance, if a single employee with deep expertise in a single department constitutes a source of ideas, that employee may be able to gain a wider understanding of the organization or the market by being promoted, thus becoming an even better source of ideas.

Robust organizations know how to connect sources of ideas. Sources of ideas are distributed across the organization. Physically, sources may be located in different countries or geographic regions. Logically, sources may span various functional units of the organization (e.g. teams and departments) (Desouza, 2006). Unless sources are organized and connected in a meaningful and optimal manner, the mobility of ideas will be limited. Connectivity among sources can be arranged via physical arrangements (e.g. the design of office spaces to facilitate more interaction among employees) and also technological solutions (e.g. the use of intranets or other communication technologies). Unless sources are connected in an explicit manner through standardized idea generation processes, two problems will occur. The first is that ideas will not find communication channels. An idea generator might not know who is the best person to whom an idea can be sent; as a result, ideas may be sent to incorrect destinations, where their value might not be appreciated. Second, ideas might get lost in the regular traffic of other communications. Information should pass through the least number of hops between nodes, so as to get the messages to their destinations efficiently. Similarly, the more time ideas take to reach a destination, the less current the ideas will be and the less attention they will receive. Organizations must choose the appropriate connectivity solutions to enable the most effective and efficient mobilization of ideas and sources.
tion of ideas. For example, the use of communication technologies may be productive for sharing ideas in highly structured domains and for solutions to well-defined problems. However, these technologies might fare poorly if ideas are in the early stage of development or are for problems that are currently unknown or poorly specified; a face-to-face discussion might work best in that case.

The next aspect of robustness is to hold some people, teams or units responsible for idea generation. Some level of accountability must exist for idea generation, even if those ideas are unsuccessful. Someone must be in charge, and evaluation and promotion systems must recognize this crucial role. However, controlling the sources of ideas too tightly can limit innovation. Brittle organizations sometimes have very isolated research groups that no longer engage with the stakeholders of the organization. In those instances, the core innovation group becomes accountable to stakeholders whose needs they do not understand enough to satisfy. Furthermore, particularly in small groups, very isolated research or idea generation groups may fall into ‘group-think’ and become considerably less innovative than more heterogeneous, engaged researchers. In these instances, both the impact and quality of ideas decreases. Robust organizations balance accountability, time and space to innovate, and engagement with stakeholders.

**Advocacy and screening**

Advocacy and screening is the process of identifying the potential benefits and problems present at a particular time. Advocacy and screening encompasses evaluation of potential opportunities for ideas within a particular organization’s context. The process of advocating for and screening ideas reveals another tension in the innovation process. Once ideas have been generated, they need to be evaluated, because not all ideas will be worth the effort of implementation. However, new ideas may be risky and might undercut the status quo, so the natural inertia against new ideas must be counteracted with advocacy; otherwise, ideas risk rejection in favor of the known. Thus the processes of screening and advocacy must take place simultaneously.

The joint processes of advocacy and screening allow ideas to undergo a period of refinement during this stage of the innovation process. By discussing an idea and hearing arguments for and against it, the idea itself becomes streamlined. Excess is removed and new notions may be added. This stage is crucial to the adoption of new practices and development of new products. Even a great idea must be pitched to upper management, and that advocacy calls upon very different skills than those utilized in idea generation. Advocates often play a role in helping innovators make their ideas and their benefits more explicit and communicable.

Idea generators do not always have the skills necessary to effectively advocate for their ideas (Heng, Trauth, & Fischer, 1999). Whirlpool again provides a great example. A structured training program with an emphasis on business strategy and analysis produces Innovation Mentors, who aid those with ideas in the process of advocacy to management (Cutler, 2003). These mentors do not manage idea generators, but facilitate, encourage and support them. Innovation Mentors also lead brainstorming sessions and evaluate ideas based on market environment and manufacturing concerns. This support network is balanced by a formalized review process that evaluates and grades each idea based on its potential to meet customer needs and its fit with the company (Warner, 2001).

Screening helps to discard ideas with low probabilities of success or high costs of implementation (whether those be social, structural or financial). The identification and refinement of ideas with high probabilities of success is the major, desirable output of this stage of the innovation process. To increase the likelihood of success, both advocates and screeners must be present in an organization and have the collaborative skills to interact productively.
In older companies, established hierarchies can make advocates hard to find and screeners overly negative about new, risky ideas (this concern can be counteracted with careful changes to culture and enhanced collaboration (Kodama, 2002)). In newer, younger companies with an emphasis on teamwork and collaboration, screening and cost-benefit analysis may be incomplete or lacking, which can lead to the demise of the business. Striking the right balance is difficult and different for every organization.

Success indicators

‘One of the things I have struggled with is evaluations on my ideas. Some of my ideas light up fires around here, while others are squashed...When I ask why was a given idea not pursued, I get wishy-washy responses...We clearly lack standards in how we evaluate ideas...Needless to say, I grow skeptical when they [the executives] ask for ideas and then do not provide feedback as to why an idea was not pursued.’ – Software Engineer, Information Technology Organization

‘Evaluating ideas used to be a highly subjective process. Often, ideas were evaluated differently depending on who came up with them...Evaluation also depended on who was reviewing the idea...The analogy I would draw is how disciplines review scientific research...On any given day, any idea might make it or might get rejected...Over the last six months we have put in place a systematic, transparent, open, and feedback-laden process to review and screen ideas. Any employee that turns in an idea via our Intranet can track the idea, see who is reviewing it, see the comments, ask questions and interact with the reviewing managers, and get constructive feedback...Both the number of submissions and the quality of ideas have increased since we implemented the standardized review system.’ – VP of Research, Pharmaceutical and Bioengineering Firm

One of the major distinctions of a company with robust innovation processes is the existence of clear-cut protocols for the evaluation and screening of ideas. Usually this involves two stages, one at the organizational level and the other at the customer level. Checking the fit between a new idea and the mission and values of an organization as well as the organization’s current capabilities and resources helps weed out ideas with less potential. In the second stage, screening focuses the energies of employees on ideas that have demonstrable commercial value. Thus, the first stage identifies possible ideas, while the second clarifies which ideas are most likely to succeed. This is a highly pragmatic approach.

Another screening consideration present in robust organizations is the need to assess both the idea’s relevance to the current operational needs and its potential long-term impact. This helps organizations avoid being blindsided by issues of the future because they become aware of how many immediate, ideas of the present they support, and can evaluate if long-term benefits or consequences are likely to accrue. Of course, this balancing act requires paying attention to immediate costs and benefits, as well as long term investment and return on that investment. Companies such as MAK Technologies have internal R&D funds to promote ideas that support or refine operational concerns, while they prefer to work with customers for ideas with longer-term impact. In this way, MAK Technologies uses market concerns and needs to guide long-term feedback, but implements operational changes quickly. Brittle organizations are less likely to balance appropriately between immediate and longer-term ideas. Often, brittle organizations become trapped in a cycle of working on problems of the present, then falling behind. Robust organizations also know how to advocate and screen for ideas and risks that have varying degrees of impact, locally or globally. Some ideas may be highly context-specific and local in their impacts. Robust organizations have dedicated teams in place that examine the potential of ideas.
and then advocate and screen for them. These teams are comprised of representatives from the various functional areas of the organization, as well as the various geographic sectors. The team represents the wide array of activities and capabilities of the organization. Brittle organizations, on the other hand, are more likely to view ideas in the confines of local contexts, thereby not understanding risks and potentials fully.

In robust organizations, employees also have numerous avenues through which to advocate for and get feedback on their ideas. For example, at Aptima Inc. employees have weekly company-wide brown bag lunches where they can present ideas during the early stages of development to receive feedback. More structured processes are in place to review ideas at a later stage of development. These organizations recognize that advocating for ideas is a risky and time-consuming process. If dedicated advocate roles do not exist (as is the case in most organizations), then employees must advocate on their own time, with little encouragement and with the formalized screening process against them. In the case of radical innovations, advocacy needs to be particularly determined and skillful, because opposition is likely to be raised against the general notion of change, no matter how good or useful the change might be. In brittle organizations, the reward system is skewed towards successful idea generators, who receive credit and recognition for idea generation. Robust organizations recognize the difficulties and the risky nature of idea advocacy, and provide rewards to those who advocate for ideas in addition to rewards and recognition for idea generators.

Robust organizations also understand the challenge of evaluating truly innovative ideas. The challenge can be put forth as follows – if an idea is truly innovative and involves a radical departure from the current state of affairs, chances are high that there might not enough qualified individuals within the organization who can evaluate it. Moreover, if highly innovative ideas are evaluated by the same screening procedures as incremental ideas, many of the radical ideas will be discarded. It is much easier to calculate the Return-on-Investment (ROI) for an idea that the organization has experience with and understands. This is because there is an established history in the given domain and the presence of well-understood governance processes to manage the idea. However, in unchartered spaces, screening for ideas requires a higher degree of tolerance for risk, uncertainty, and incompleteness. Robust organizations understand this issue and appreciate the complexity of advocating and screening for radically innovative ideas. It is common for robust organizations to employ the assistance of external entities (e.g. professors and researchers at universities, venture capitalist, etc) to help in the advocacy and screening for these ideas. Robust organizations have a network of trusted external sources that they can bring into the innovation process at this early stage without risking loss of intellectual property or suffering other negative outcomes. Brittle organizations, on the other hand, do not clearly understand the differences in evaluation criteria when screening for different kinds of ideas. Moreover, they are less likely to involve external entities in this stage of the process as they fear loss of intellectual property.

Finally, robust organizations take great care in building transparent evaluation and screening protocols. Openness reduces confusion about how ideas are evaluated, resulting in a participatory process. The protocols are made known in advance to all employees. Moreover, employees are solicited to serve as reviewers of ideas, advocates for ideas, and even to help peers in the crafting of ideas. This is a stark contrast to brittle organizations, who often promote secretive and selective evaluation protocols. In these organizations, ideas are promoted and advocated for based on the egos of the ideas creators, the preferential treatments provided by managers, and other nuances. Brittle organizations thus frequently create black-box innovation processes that discourage the submission of ideas and reduce belief in the merits of screening and advocacy processes.
**Experimentation**

Once an idea has passed through the screening process, experimentation and prototype-building begins. Even if the idea generator(s) or an advocate has created a prototype as part of an earlier stage of innovation, the idea’s applicability to a specific problem, context or production chain must be tested. Experimentation does not test an idea’s objective merits, but the suitability for a particular organization at a particular time. Ideas that are generated, advocated for, screened, and even found desirable might be ahead of their time or beyond the present capacity of the company. At either the screening stage or the experimentation stage, ideas may be set aside into an idea bank or idea library for development at a later time.

For instance, when the notion of redesigning the look and feel of bank interiors was raised at Washington Mutual, it was deemed worthy of experimentation. Washington Mutual then designed and implemented a new design in a few branches. That new style, named Occasio, was based on the open, friendly feel of many retail stores, and moved bank tellers from behind tall counters and into the same space as customers. Only once response to the new design was favorable did Washington Mutual then decide to revamp older structures and to apply the Occasio design in new branches.

Experimentation is an iterative process of development, and at each stage an idea may be re-evaluated by advocates and screeners alike. Because of this, experimentation may be continuous or may occur in fits and starts, depending on the presence or absence of advocates, screeners, and resources. Tested ideas are evaluated for suitability within a particular context and either are set aside or enter the diffusion and implementation stages. Experimentation results in data, prototypes, or feasibility studies that top management can use to evaluate an idea or innovation. Possible ideas are identified. The major outputs of this stage are libraries of ideas for the future and the identification of suitable ideas for commercialization. Another output is work-in-progress prototypes. Evaluating work-in-progress artifacts can point to new ideas that might trigger newer cycles through the innovation process.

Critically, resources must be present to experiment, and those in charge of the process must be given time to do so and time to reflect on the experiments so that refinements and evaluation are ongoing. This need not be an internal process, and in cases of product development and consumer response testing, it may be outsourced (Kambil, Eselius, & Monteiro, 2000). For business model, strategy, or service changes, however, this process must be internal. Experimentation can be resource-consuming, especially if an idea is found unsuitable or too expensive. Further, experimentation is an unstructured process that is difficult to make routine or familiar, since context is key.

**Success indicators**

Robust organizations tend to encourage experimentation, while brittle organizations emphasize the risk of failure and lack reward systems and structures that would encourage experimentation. The variety of ways in which robust organizations make it possible for employees to experiment with ideas in itself encourages experimentation. For instance, employees may be encouraged to write articles and attend conferences and trade shows to present ideas. Employees may also be encouraged to work with academic partners in formal arrangements to build and test ideas. In general, robust organizations seek external constituents and their opinions, feedback and input for experimentation purposes. They thrive on taking in and understanding a multiplicity of interpretations. Robust organizations will also forge external partnerships to undertake risky and complex experimentations. For example, an organization might collaborate with a business partner or even a customer (e.g., a lead user) or even a research lab at an academic institution to experiment with a new product enhancement or service provision. Brittle organizations, on the other hand, do not know how to experiment with
external entities. Much of this can be attributed to the fact that they have little experience sharing ideas with external entities or working on early-stage product development activities with outsiders. As such they perceive these activities as high-risk and dangerous, leading to an insular attitude on experimentation. The downside being that they very often have to assume all the losses with experimentation, leading to a negative connotation to the concept of experimentation, which in turn, negatively affects the innovation process.

For robust organizations, the process of experimentation itself is valuable and rewarding; even if the experimentation does not result in any products, organizational culture becomes further accepting of innovation processes. Brittle organizations lack these protocols and discourage what they perceive as risky, potentially-failed efforts at experimentation. Robust organizations do not view experiments lacking in results as failures, but as a learning activity. Learning throughout the experimentation phase is encouraged and sought after. After each run or trial, employees document their findings and connect them to original expectations and also to previous runs of the experiment. The output (i.e. the finished product or service), while important, is not the only measure of the value of experimentation exercises. One of the features of experimentation programs in robust organizations is the sharing of data and other artifacts that result from experiments. Robust organizations are more willing to share data between innovators so that mistakes are not repeated and a collaborative atmosphere to experimentation is developed. Moreover, sharing of data allows for hidden or latent connections in the data to be discovered through exploration of large data sets that have been collected over time and by multiple innovators. Today, especially in industries such as pharmaceuticals, biotechnology, and even financial markets, the sharing of data and the construction of large-scale data sets for experimentation is critical. Robust organizations have the capabilities and processes to foster the process of large-scale data collection and integration from experimentation. Brittle organizations, on the other hand, seldom have an organizational-view of experimentation. Each innovator is left to his/her own devices to experiment and hence are limited in their foresight and ability to solve complex problems.

Robust organizations identify ways to creatively use technology in the experimentation process. An example of this is the evolution of Goodyear’s tire design and testing process. In the past, new tire designs at Goodyear were tested by subjecting the tires to road tests that included hours of driving around a track. This was slow and expensive and had an adverse impact on the environment. Due to the number of parameters involved, building a computational model to automate this testing process was perceived to be very difficult and challenging. In spite of this, Goodyear went ahead and developed computational models for testing tires virtually. The result was a faster, cheaper, and environmentally friendly process that used computer software to get the job done. Moreover, engineers at Goodyear were able to perform more tests and experiment more. Consequently, this led to the development of new products (Levinson, 2006).

Another example of a company where technology played a major role in enabling experimentation and thus helping innovation is JEA, a Florida-based public utility. JEA produces electricity using natural gas and oil. It implemented a neural-net-based solution to determine the optimal production of electricity by calculating the optimal amount of fuel required, based on the current oil and natural gas prices. The computer-based model also incorporated the government guidelines for prescribed emissions limits. The result was reduced operating costs with increased savings on oil and natural gas costs, and increased compliance with government emissions guidelines. Although the computer-based solution cost was significant ($800,000), the cost was recovered within eight weeks. Moreover, JEA is also planning to experiment with the system within its water business (Levinson, 2006).
The process, through which a prototype is constructed, tested, evaluated, refined, and improved upon, needs to be clear and known. Only a handful of organizations have sanctioned experimentation processes. Experimentation is most often conducted in a haphazard way by various individuals, teams, or organizational units, resulting in poor development of products and services. An apt analogy would be every scientist deciding to invent his or her own research processes and metrics. The growth of science would be stifled, as it would be difficult to evaluate, build upon, and even commercialize knowledge. The process of experimentation allows for the sharing of data, prototypes, ideas, and also past knowledge. Experimentation with ideas needs to be rigorous and in a manner that makes the ideas open to inspection (i.e. anyone who wants to know the process by which an idea has been developed should be able to examine the process). The experimentation process should be defined, yet not constraining. Not all experiments will be able to follow the outlined process exactly, and there might be developments in the environment that might warrant modifications to the process. Particularly in this stage, agility is crucial. Brittle organizations may have an experimentation process that is outdated, difficult to customize, and even cumbersome.

Finally, the experimentation process is viewed both as a necessity and as an asset in robust organizations. Experimentation allows the organization to not only test and build upon ideas, but also to renew existing products and services. In addition, experimentation engages the workforce in learning and training programs wherein new ideas can be creatively integrated into work processes. Consider the following comment:

‘For us, experimentation is fundamental. Even [when] our experimentation process comes up with no commercial outputs, we learn. Learning has to be part of the experimentation process and we value all learning efforts… During experimentation with new ideas we may learn that our thinking, the entire framework, on a problem has been incorrect. This may have been the reason why we did not succeed in a given set of trials… The emergence of a new framework might be significant in and of itself, especially if it helps us address the hundred other problems that the experiment had never intended to solve… Experimentation is a skill, a core capability, and a strategic differentiator for us. We pride ourselves on being able to experiment in a more rigorous, skillful, and agile manner.’ – VP of Sales and Marketing, Consumer Products Organization

Commercialization
While experimentation focuses upon the possibility of executing an idea, commercialization focuses upon the potential impact of an idea. Once ideas are developed within a context, the next step is to make them appealing to the intended audience. This involves choosing methods to package the ideas, whether for internal or external audiences. Commercializing involves clarifying how and when ideas can be used by people other than the group that developed them, and using data or prototypes from the experimentation process to demonstrate tangible or visible benefits. Commercialization takes possible ideas and creates internal or external market value, creating parameters within which value can be expressed or shared in a coherent fashion. External audiences may need to be introduced to products or services, either as entirely new products or as improved versions of existing outputs.

There are many mechanisms for commercialization. Some organizations encourage employees to write papers and attend conferences, thereby experimenting in a public forum while gaining insight from audience responses. This is a variation on the marketing focus group, wherein a small group of consumers is brought in to test reactions to a product or service. Commercialization weeds out the ideas that need refinement in order to win an audience, from the possible ideas that can be immediately and persuasively present-
Part of the work of commercialization is to establish the specifications of an idea. The promises and potentials of the earlier stages of innovation must be discarded so that the actual benefits of the new innovation can be perceived and communicated. Documentation, both of the commercialization process and of the demonstrable and communicable aspects of the innovation, becomes crucial. The very act of documenting an innovation’s benefits establishes a base for communicating value.

Much of the time, commercialization involves refining scope. For instance, when introducing a new wiki, understanding who is most likely to benefit from the wiki, who will be using it, how often it will be maintained and the scope of ideas intended to be explored will greatly affect later adoption and use. Commercialization allows organizations to identify stakeholders and their needs (or desires) and sometimes to redefine those stakeholders, including or excluding groups with conflicting or complementary needs. Aside from identifying target markets or users, commercialization also ensures that only the right parts of an idea are made public, usually with plans to continue to release ideas. For example, when introducing a new service, sometimes it behooves an organization to announce the most appealing component of the service first, to draw people in and pique their interest, and then to explain the details only when the consumer has been engaged and demonstrated interest.

The output of a commercialized idea is a defined product or service (or a combination of the two). Crucially, a business plan must be developed for how the idea is to be diffused and implemented, which constitute the next steps in the innovation process.

Commercialization is the stage where the focus of innovation shifts from development to persuasion. After the experimentation stage, the idea’s possibility has been demonstrated; commercialization requires creating or revealing the idea’s merits in the current consumer or user context. If an organization lacks contextual knowledge or cannot shift gears from engineering ideas to determining market feasibility, outsourcing this stage or selling the realized invention may be the best route.

With process or business innovations, however, outsourcing is almost impossible. In these instances, a keen understanding of organizational culture must back up any changes. Some organizations bring in consultants or lay off large numbers of employees and bring in fresh blood as a way of circumventing this stage of internal commercialization of business processes. Other companies, like HP Labs, initiate a dialogue and involve employees from the beginning of the commercialization process, asking them what they want and engaging them in the business process of internal commercialization (Albert & Picq, 2004).

**Success indicators**

The challenge here is for organizations to commercialize ideas in the best ways. To this end, they need to understand the costs and benefits of various types of commercialization. This gives robust organizations an edge because they often have already involved the customer in the innovation process. Robust organizations are also more likely to be able to package their new ideas within existing products and services without disrupting current customers, services or offerings. The most robust organizations can balance the bundling of products and services, to continuously increase the value of their offerings with low-cost implementation of new innovations. Robust organizations also tend to underplay successful innovations because they are hungry for the next breakthrough. Brittle organizations tend to get caught up in a single success and try to ride their own waves, often resulting in one-hit wonders.

Robust organizations understand the difference between idea (knowledge) creation and idea (knowledge) commercialization (Desouza & Awazu, 2006). The stages that have been discussed up to now are those that represent the cre-
The stages of commercialization, diffusion and implementation are quite different — they represent the full realization and demonstrated value of ideas. In order to invent, organizations must be able to go through the knowledge creation cycle multiple times and, ideally, obtain new knowledge with each cycle. The second phase of knowledge management is the commercialization of knowledge. This is where organizations wish to transform inventions into innovations. An invention is considered an innovation only when it has been commercialized (Dahlin & Behrens, 2005). Invention and innovation feed into each other. Inventions can be the result of needs or demands that existing innovations fail to satisfy. On the other hand, innovations are dependent upon the existence of new ideas that lead to new products, services or processes.

However, these two processes require different governance structures and approaches. The process of idea creation blossoms in fluid and safe spaces. In such spaces, creativity is encouraged, not managed; individuals are provided a safe haven for experimentation without being punished for failed attempts to innovate. In the case of idea commercialization, the main task is to commercialize the ideas that are generated (i.e. the inventions) so that they create value for the organization. Innovations can be internal or external to the organization. For example, a group may invent a best practice, such as a knowledge process, and then seek to commercialize it in the organization by promoting its acceptance and adoption. Similarly, an R&D lab may develop a product enhancement. Interestingly, many of the ‘rules’ for successfully transforming inventions into innovations are similar, regardless of internal or external focus. This is because both cases involve transferring inventions from their ‘original spaces’ to ‘foreign spaces.’ Successful knowledge commercialization occurs when an organization has a systematic process (Brown & Duguid, 2001). An essential aspect of such a systematic process is the centralization of the commercialization process in the organization. Just as recruiting in different divisions of an organization is handled by the human resources unit of the organization, commercialization of inventions produced by different units of an organization should be handled by a centralized organizational unit. In academic research institutions, such a function is served often by a separate unit involved in technology transfer that seeks commercialization of inventions. These units share a symbiotic relationship that reflects the constant interaction of the idea creation and idea commercialization processes. Success derives from using different principles to manage the knowledge creation and knowledge commercialization units, and recognizing the differences between decentralized and centralized control regimens.

Robust organizations understand these differences. Brittle organizations may try to centralize and control idea creation, and leave the process of idea commercialization loose and uncoordinated, thereby wasting resources. Consider the following quote:

“We finally learnt a simple thing – researchers and idea creators do not appreciate the nuances of marketing and commercialization. Even better, our business development folks do not understand the intricacies of research and the fuss that goes along with design, robustness of solutions, etc. In the past, we tried to get the researchers involved in the commercialization aspects of the business and the BD [business development] folks in the labs. The goal was to build better knowledge transfer flows and all the other niceties that go along with cross-functional teams. The end result was pain and more pain. Now, we keep these two distinct, yet integrated. Distinctness plays out by allowing researchers to be researchers and for the BD folks to be happy with revenue generations. BD folks provide need analyses and idea requests to our R&D groups who have incentives to address these commercial problems. The researchers work to come up
with the solutions in direct cooperation with the customers, most often the engineering teams of the customers. Then, the BD folks at both ends, ours and the customers, go through a structured process to work on the financial, legal, and other operational details of the agreements... Before, we tried to centralize and tightly control the entire innovation life-cycle. Today, we have structured and optimized the commercialization aspects and preserved the serendipity associated with a decentralized and chaotic, yet manageable, idea development aspects.’ – CEO, Research & Development Organization.

Finally, robust organizations experiment frequently with minimal cost because they know how to learn from their failures as effectively as they learn from their successes. Every failure of commercialization is thoroughly scrutinized; lessons are learned and then fed back into the various stages of the innovation process to increase the chances of future success. Robust organizations have built clear and robust linkages between experimentation and commercialization efforts. If a product or service, or an internal process, is commercialized, the robust organization will have individuals who were part of the experimentation process collect feedback from the customers. Feedback is scrutinized to evaluate both the process (how the ideas moved through the various stages of the innovation cycle) and the outputs (the tangible products and services). Feedback then influences future activities in each stage of the innovation process.

**Diffusion and implementation**

Diffusion and implementation are two sides of the same coin; diffusion is the process of generating buy-in and acceptance for a new innovation, while implementation is the process of setting up the structures, maintenance and resources to allow the innovation to develop and be utilized or produced. Most organizations recognize the critical nature of this stage. Consider the following comment:

‘We come up with great ideas. Sometimes we even can commercialize them with ease. But getting people to accept them and then change their behaviors to actually utilize the innovations in the optimal manner is difficult. Difficult is putting it modestly. Most of our effort goes into ensuring that we can change the mindsets of customers.’ – VP of Global Markets, Consumer Products Organization

Three potentially useful strategies for diffusion of ideas are 1): targeting key actors to align the company for knowledge management by involving all levels of the organization and building internal alliances with various stakeholders; 2) building on existing initiatives and actively fostering knowledge networks to generate momentum by linking decentralized initiatives and emphasizing the company mission; and 3) communicating a purposeful message that aids the cultural and mental transition by focusing on realistic objectives (Raub & Von Wittich, 2004). Executives are not always the agents of innovation diffusion – anyone can take on that role. Diffusion happens at all levels, whether department-wide, company-wide, or partner or network-wide; or regionally, nationally or globally (Waarts & Van Everdingen, 2005).

One way of formalizing and systematizing this process is to use ‘knowledge brokers,’ key figures who bring new ideas to the table either within an organization or as representatives of a partner company or outside organization (Hargadon & Sutton, 2000; Hargadon & Brown, 2005; Sawhney, Prandelli, & Verona, 2003; Smyth & Longbottom, 2005; Cillo, 2005). Knowledge brokers differ from idea advocates in that knowledge brokers know the specific context and application into which an idea, product or service can be inserted. Knowledge brokers present nearly finished, i.e. mostly refined ideas, for the purpose of rapid implementation. Knowledge brokers are often viewed as consultants who try to solve specific problems, but a growing literature suggests that within large companies, knowledge brokers can
fulfill a crucial advocacy role for internal ideas as well, particularly because they can mobilize ideas into other areas of an organization and illuminate potential benefits. As previously discussed in the mobilization stage, transfer of ideas into new contexts sometimes results in idea generation for that particular context; at other times, idea transfer does not result in re-use after experimentation, but rather in wholesale adoption, followed by minor tweaking. During alliances, brokers can increase collegiality between parties and garner buy-in for new ideas that initially appear strange (Hagel & Brown, 2005).

At Hewlett-Packard (HP) Laboratories, in order to diffuse a new internal focus on innovation throughout the company, top management started by asking questions. Employees gave feedback on HP’s status as a world-class research and laboratory organization and suggested ways to evaluate the organization. In this instance, diffusion could then be matched to employee priorities and expectations for evaluation. Dialogue with management continued when employees were asked how their particular positions would allow them to contribute to making HP one of the best research institutions in the world (Albert, 2006). Thus, HP Laboratories involved all employees in a discussion of standards and desired goals. Individual meetings then assisted the translation of goals from the organizational level to the individual level. Diffusion of the idea of organizational improvement was the first step, while subsequent individual employee dialogues allowed for the implementation of specific individual goals and metrics.

One approach is to actively engage members of an organization in the stages of idea creation and idea commercialization. For example, IBM conducts innovation jams (InnovationJam – Introduction, n.d.) which are open to all its employees, clients, business partners, and even employees’ families. By involving these stakeholders and giving them a sense of ownership, IBM also ensures that the innovations that are developed are diffused effectively within and outside IBM.

For product or service innovations, the final stage of the innovation process requires marketing to consumers. This is a specialized subset of innovation diffusion. The use of customer data and careful attention to customer desires and perceptions assists this part of the process. For instance, after September 11, 2001, KLM Airlines reinvented its image, emphasizing customer service and friendliness in order to market itself as an airline that knows customers and their preferences. KLM’s strategy for marketing was to emphasize knowledge of frequent fliers and make their trips more comfortable and friendly, thus improving the airline’s image with the people who were most likely to discuss and convey impressions of airlines. To do this, KLM had to dramatically improve its Customer Knowledge Management (CKM) systems, so that every interaction with a KLM representative was tracked and recorded, and so that the representative knew the flier’s preferences and could offer the best customer service (Viaene & Cumps, 2005). Customer Knowledge Management may lead to the generation of new ideas as well, but during this stage of the innovation process, CKM allows an organization to assess market openings and identify marketing strategies. The literature contains some strategies for using CKM for both marketing and generation of ideas (Gibbert, Leibold, & Probst, 2002; Smith & McKeen, 2005). This reveals that the innovation process can be cyclic if customer knowledge sparks new ideas.

Acceptance of an innovation and demonstrated use or application of the innovation should be accomplished by the end of this stage. Tweaking of the innovation may occur throughout, and brief returns to experimentation phases may occur, particularly if experimentation was outsourced initially. However, by the end of this stage an innovation has been accepted and implemented, and older, duplicative processes are eventually eliminated.

An advertising campaign or successful sales is the most desirable output of marketing. The key critical ingredient for success is knowledge of customers, as well as the capacity to make use of
that knowledge. Finally, an organization must execute implementation of an innovation into a service or product. As the final stage of the innovation process, marketing lends itself to evaluation of innovations as business success, sales or stock growth. However, successful marketing implies that all stages of the innovation process have been completed.

The diffusion process requires an open culture and/or strong advocacy throughout the organization. The benefits of the innovation must be readily apparent, and detractors must be convinced or removed from the community. Resources and unlearning are the two critical factors required in implementation. Resources, whether in the form of time, money, equipment or materials, must be available for the new process, product, service or strategy to be implemented. Unlearning and deprogramming require eliminating behavioral or mechanical processes that duplicate the new strategy or process. For example, if a new enterprise portal is introduced in a company, the older software must be removed from computers, and information must be transferred into the new portal. In addition, employees must unlearn old habits of finding knowledge and learn to use the new portal.

**Success indicators**

Either great caution must be exercised to diffuse ideas, or the organizational culture must be accepting of failures or missteps. Because more people have exposure to the innovation at this stage, feedback mechanisms can provide invaluable data but may give employees a false sense of control. The innovation must be perceived by employees as inevitable and beneficial for diffusion and acceptance to occur, which will then minimize the costs of implementation. An open culture may be difficult to create. HP’s strategy, discussed previously, was to involve all employees in setting priorities and goals for the organization as well as individually.

Robust organizations know how to enable change. If a change in culture is desired, the organization needs not only new archetypes for business, but the kind of gossip that will spread infectious. Stories that emphasize the core of a business (whether that be scientists, social change or light bulbs), while simultaneously emphasizing that change and new ideas fit within the profit margins, are keys to making organizations change. Who tells the stories, and how the stories are told, changes the rate and type of change. Higgins and McAllaster suggest that stories and tangible cultural artifacts are the ways to effect cultural organizational change through easily understood, significant symbols (Higgins & McAllaster, 2002). Storytelling isn’t the first step towards organizational change. First, the strategic plan, objectives, resources and hiring need to be aligned with new organizational goals (Higgins & McAllaster, 2002).

The story of 3M and Post-it® notes provides one example here. The employee who invented Post-it® notes, Arthur Fry, originally developed the sticky notes for use in his church hymnal. Market research showed no interest in this product, but Fry distributed them to secretaries until they were hooked. Eventually, Fry’s innovation was developed into a new product line. In this example, diffusion was not standardized nor organizationally supported, but the process of demonstrating market value and persistence with a novel idea, despite organizational inertia, is clearly demonstrated. This story emphasizes that in 3M, buy-in and diffusion of ideas happens when innovators believe in their ideas and advocate for them. Higgins and McAllaster break this story into the values supported by 3M: perseverance; openness to ideas; advocacy for one’s own ideas; rewarding of success; and the use of stories to promote corporate values (Higgins & McAllaster, 2002). The values identified in Fry’s 3M story illustrate a clear value placed on unconventional innovation and long-term belief in innovation. Obviously, 3M has thousands of inventions. Any single story could have been told to demonstrate the successful innovation processes at 3M. This particular story, however, high-
lights and encourages a specific culture of innovation and values. Upper management at any organization would do well to consider which stories are told in their offices and how that will expedite or impede innovation diffusion. Robust organizations do this on a regular basis.

Another example of the use of stories to effect organizational change comes from Yokogawa Electric Corporation and its use of the bullet train metaphor. When a new corporate strategy was needed for the electricity corporation, its CEO used the metaphor of the new, high speed bullet trains to emphasize that a quantum leap in strategy would require new technology, new modes of thinking, and new ways of laying the groundwork. Just as a bullet train requires straight, wide tracks, a different kind of engine than a traditional train, and a new design, corporate strategy change requires that the groundwork, engine and design of the company change together.

Higgins and McAllaster emphasize that Yokogawa succeeds with this metaphor because a new ‘richness’ is added that ‘transcends the words themselves’ (Higgins & McAllaster, 2002). The image and the story told about the image provide a clear map of organizational values and the need for dramatic change. This story helps to generate buy-in and ease diffusion of innovations by creating a framework in which employees and stakeholders can understand the need for and actuality of change. Diffusion of ideas requires just such visionary calls to arms so that traditional, stable, familiar processes can be upset and uprooted. Robust organizations utilize such tools.

This internal diffusion of ideas differs dramatically from the need to market ideas to consumers. The art of marketing has been described in various literatures, and little consensus has emerged on how to properly market. The marketing of ideas also constitutes progress through the innovation process, but this final stage of executing ideas into a marketplace requires understanding the target consumer and launching another, different effort towards a further level of buy-in and innovation diffusion.

During the diffusion and implementation process, robust organizations are likely to turn back to the social networks developed during earlier phases of innovation. For instance, during earlier stages of the innovation process, companies may involve business partners, academia, customers and suppliers. Within each of those groups, robust organizations have strong social networks that can help to diffuse new ideas throughout other organizations. If customers share ideas with friends and family, for instance, marketing campaigns may be greatly enhanced. Some companies, such as Personiva, are built around this idea. Personiva lets consumers create personalized advertisements so they can star in their own commercials. The personalized ads can then be emailed to friends and family. Organizations like Hewlett-Packard and Levi’s have already chosen to work with Personiva to harness the marketing power of social networks.

Robust organizations are also likely to have already established customer segmentation policies that helped drive the earlier screening and prototyping stages. Strong relationships with lead users and key customer segments are present in robust organizations, and are leveraged during the marketing process. For example, lead users may be beta testers who spread the word about successful products; at the same time, the company benefits from the patches, behaviors, and repairs of lead users. Google Labs releases early versions of products in the prototyping and experimentation phases, and then allows lead users to promote successful innovations simply by discussing them with friends, co-workers and family.

Robust organizations use technologies to enable the diffusion and implementation process. There is a growing interest in the concept of edge technologies, which help organizations connect with customers and drive innovations in the organization, for the purposes of implementing and diffusing innovations (Mui, 2006). For example, General Motors (GM) sends a monthly report to its customers via OnStar, which allows
GM to monitor the performance, status, and locations of vehicles using sensors on the vehicles and cellular connections. The monthly reports contain information such as the condition of vehicles, possible problems, and reminders of maintenance checks. The report is generated based on the analysis of more than 1,000 problem records. Traditionally, GM interacted with customers only before purchase, via mass advertisement, and at purchase. Now GM maintains the relationship with customers even after purchase by being helpful to consumers.

Edge technologies have brought tremendous benefits to GM. First, they have improved GM’s customer relationships. The OnStar system has received 15,000 emergency service calls, 23,000 roadside-assistance calls, 29,000 diagnostic calls, and 380,000 direction requests. Second, the real-time observations of vehicles in various conditions provide knowledge to GM for improving vehicle designs. Third, the technologies provide GM with new income sources. For example, GMAC Insurance offers different services for customers based on car mileage. Customers who have lower-mileage vehicles can qualify for lower premiums.

Edge technologies promise benefits to an organization; however, there are drawbacks, too. First, they may increase the problem of information overload. Nowadays, organizations have more data than they can analyze. Appropriately analyzing data and applying it to the right situations is important for the successful implementation of edge technologies.

Amazon.com has a successful platform that records all transactions and product-evaluation histories of active customers. Amazon analyzes the data and improves customer’s shopping experiences through sophisticated data mining technologies. As a result, Amazon maintains a record of high customer satisfaction. Hartford Financial Services also has a platform that records all telephone calls between customers and service representatives. Details of conversations, such as talk time, hold time, outcome, and snapshots, are recorded and are available for learning exercises by service representatives and supervisors.

Implementing edge technologies requires big changes in an organization. CIOs must design information systems architecture that can appreciate emergent knowledge. The change must occur at the organizational level, not at an application or a departmental or functional level. Implementing edge technologies at an application level can lead to disasters, such as inconsistent data and incompatibility of different systems. To use IT as an edge technology, CIOs must be aware of the following five trends. First, organizations must connect themselves with their external entities, such as customers, business partners, competitors, and suppliers. Second, the connectivity must be established not only by infrastructure, such as networks, but also by software, such as Web services. Third, to reach customers, pervasive devices such as PDAs, mobile technologies, cameras, handsets, and electronic wallets are important. Fourth, data mining capabilities need to be further developed in terms of storage expenses and intelligence analysis. Fifth, deriving knowledge from the collected data is important, since such knowledge, which includes customer identity, location, preference, health, and evaluations of the quality of service, was previously unavailable in decision making. However, this knowledge needs to be treated carefully, since issues of privacy and security are involved.

Finally, the implementation and diffusion process is an opportunity for robust organizations to identify the next set of needs for customers. Unsuccessful diffusion informs an organization of true user needs, often delivered in the form of complaints and angry customer voices. Successful diffusion may elicit wistful comments (particularly from lead users) that hint at unsatisfied needs, and thus at potential customer needs that the company can strive to satisfy. Thus, feeding customer input back into the organization facilitates and stimulates the innovation process to begin again. This is particularly true when the organiza-
tion looks for larger trends in the marketplace (for example by looking across products that satisfy a particular need) and uses that knowledge to refine its innovation processes.

CONCLUSION
The innovation process can be cyclic. All ideas must go through the entire innovation process, but any single organization may not participate in all of the stages. Identifying competencies (and deficiencies) in the innovation process can help organizations improve their overall success with innovation. For instance, if outputs tied to a specific stage of the innovation process are weak, an organization has an area upon which to focus or to consider outsourcing.

The innovation process outlined in this paper can provide a guideline for structuring internal analyses and dialogues around innovation (see Table 1). Organizations need a common language around which to discuss and analyze innovation. Establishing goals for specific stages of the innovation process will be more effective than simply urging employees to innovate. Rather than relying upon serendipity, organizations can structure initiatives around the innovation process for maximum benefit. Furthermore, companies can advance each of the stages, for example by infusing them with activities that will leverage knowledge assets or by introducing contemporary IT support, for even better performance. The pace and scale of innovation and organizational changes pose a huge amount of challenges. Managers need to be aware of these challenges and take a set of systematic approaches.

First, managers must constantly pay attention to the operational details of innovation projects. Because market conditions shift swiftly, managers always have to know how well their projects are doing. Rapid technological advances do not make their jobs any easier. In order to ease the burden of constant changes and monitoring, managers need to establish a learning-focused environment. In this environment, individual employees are empowered to explore and generate new ideas. To make this approach work, managers need to balance between loose and tightly controlled idea generation. Far too many organizations neglect to combine these two mechanisms. For successful idea generation, managers need to take the following steps:

• Recognize employees when they have done something innovative.
• Encourage individual employees to identify both mechanisms of idea generation and apply any one of these two as they see suitable.
• Ask employees to explore and evaluate ideas from a wide array of sources.
• Support employees’ efforts to organize, connect, and focus ideas in a meaningful manner.
• Designate people, teams, or units to be responsible for the activities mentioned above.

Second, managers need to be clear about how the ideas are evaluated and selected. One distinctive feature of robust organizations is the existence of clear-cut protocols for the evaluation and screening of ideas. These protocols help managers keep their attention on the processes of robust innovation. And, their continuous attention is required to assess any new idea’s relevance to the current operational needs and its potential long-term impact.

Managers are the ones that actively recognize the difficulties and the risky nature of idea advocacy, and provide rewards to those who advocate for ideas in addition to rewards and recognition for idea generators. For every new idea, it is necessary that managers ask the following questions:

• What do we know about immediate costs and benefits, as well as long-term investment and return on that investment?
• Do we know the difficulties and the risky nature of idea advocacy?
• Do we have dedicated resources (e.g. teams) in place that examine the potential of ideas and then advocate and screen for them?
• Are there transparent avenues through which employees can advocate for and get feedback on their ideas?
• What might be the consequences of idea advocacy?
• Do we provide rewards to those who advocate for ideas in addition to rewards and recognition for idea generators?

Third, managers must be quick to respond to external constituents and provide their opinions for experimentation purposes. Such prompt and open approach makes innovative experimentation particularly effective and relevant. Questions managers must ask are:
• What is our process by which a prototype is constructed, tested, evaluated, refined, and improved upon?
• Is that process clear and well known to the employees?
• What are the costs and benefits of various types of experimentation and commercialization?
• What do we learn from our failures?
• How is the technology used to capture and share tacit knowledge gained from experimentation and commercialization?

Last, managers must pay careful and continuous attention to customer desires and perceptions. Stories and tangible cultural artifacts bring organizational changes in an easily understood manner. They not only provide a clear map of changes, but also establish strong relationships with key customer segments. Creative use of technology is also important. For example, data mining and pervasive computing infrastructure play a critical role in connecting organizations with their customers and business partners. This connection will channel customer input back into the organization and stimulate the innovation process all over again.

The framework described in this paper is to help managers identify what they need to focus on and commit their resources to at any given time in the innovation process. The framework informs managers about the areas of focus, factors to give close attention, and the directions they need to choose. Establishing an organizational process for innovation is a worthwhile effort. The innovation process of the organization is the backbone against which innovative efforts can take shape; it is the context around which ideas are mobilized from thought to action. An organizational process for innovation displays commitment and direction for all stakeholders towards innovation. In many cases, just having a sanctioned and organization-wide framework for innovating may be a strategic competitive differentiator.

Both practitioners and academics recognize that sustained, non-disruptive innovation is crucial for success in industry. Having a sound innovation process is critical to achieving sustained innovation. As one interviewee put it:
‘If I have to go into an organization and measure the innovation competency or capability [of the organization], the first thing that I would do is see if the organization has a process for innovation. Do employees know their role in this process? Does the organization have metrics around this process? Does the organization have methods for improving the process on a continuous basis? Without a defined process, there can be no management of innovation as you do not know what you are managing [and] as you have not defined or even articulated the process. You may get lucky on occasion… the absence of a process will even prevent the organization from exploiting the lucky breakthroughs.’ – CEO, Information Technology Organization

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