Demystifying Innovation

By Eric L. Chen and Kathryn Kai-ling Ho

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I. A FRAMEWORK FOR ASSESSING INNOVATION

The importance of innovation has been described in a multitude of ways in recent years: Innovation has displaced quality as the standard for differentiation. Innovation is the only sustainable competitive advantage. Innovation is a necessity for continued existence. No matter how it is portrayed, innovation is understood by today’s vast business audience to be vital to any organization’s success.

Our research at the Cap Gemini Ernst & Young Center for Business Innovation (CBI) has shown that innovation is valued highly by the financial markets as well. Statistical analyses of industries, ranging from durable manufacturing to B2B e-commerce, place innovation at the top of the list of nonfinancial drivers of corporate market value.

But providing evidence of the value of innovation is no longer enough. If we know that the market is incorporating innovation into its valuation of companies, then it follows that we must also carefully examine how innovative we are. To understand this, companies should be asking two major questions: How do I recognize innovation in my organization? And, can I assess my organization’s innovativeness?

Over the course of our research, our unique perspective on the topic of innovation assessment has been utilized as the basis for several major projects, such as helping large corporations better identify and foster innovations and creating the judging criteria and assessment tool for Singapore’s National Innovation Award. As such, we strive to help organizations at large answer the stated key questions. In developing our framework for assessing innovation, we drew not only from our unique point of view on innovation but also from relevant pieces of others’ hard work. We have gained insights from a number of innovation indexes and awards, including the Strategos Institute’s Innovation Survey, the Council on Competitiveness’ Innovation Index, and the Drucker Award for Nonprofit Innovation, just to name a few.

This paper gives an overview of our approach by exploring the definition of innovation and the three main criteria with which innovation can be assessed. We will then introduce how this fits into the larger picture, beginning with the different types of innovation, such as products or processes. Next, we will bring both the criteria and the types together in a section on innovative organizations, including a case study of the National Library Board of Singapore. We will conclude by touching briefly on the importance of having an organizational culture of innovation, which is requisite for long-term success.
Properly defining and assessing innovation are the natural first steps to becoming a more innovative organization. The following pages, which draw upon the CBI’s extensive research and experience in this area, will explain how to take those steps.

Power of Innovation
We agree with assertions about the value of innovation because the evidence is not just anecdotal. In fact, the CBI has produced significant quantitative research results that reveal innovation to be one of the key factors of corporate value creation.

Specifically, innovation has consistently ranked among the most powerful drivers across different industries in the CBI’s Value Creation Index (VCI). The VCI was created by the CBI in order to define and weight the importance of nonfinancial value drivers (such as innovation, brand, management, social responsibility, etc.) as measured by their impact on a company’s market value. These value drivers are composed of quantitative data indicators; in the case of innovation, internal processes such as R&D spending and external output such as patents awarded and power of patents (measured by the number of references to a specific patent by other patents) are viable indicators. Statistical modeling has shown that the composite of these value drivers significantly explains market value, and the analysis of the industry-specific VCI models has directly linked innovation to corporate success. In addition, its high ranking among the different value drivers means that innovation is one of the best ways to differentiate oneself as superior to competitors in the eyes of the financial markets.

Definition of Innovation
Based on the evidence from the VCI, it follows that organizations, irrespective of industry group, will benefit by actively pursuing innovation. Those who really understand what comprises an innovation will be able to examine their organization’s activities with increased clarity. Organizations able to recognize projects that create, or have the potential to create, innovations will be better positioned to capitalize on their efforts.

This begs the question: What is an innovation? In many cases, managers believe that anything that is new or different is an innovation. But as we will see, this is not enough. Sometimes, managers trumpet a high-revenue offer as a fantastic innovation, but as we will show, there needs to be more. What we are getting at is that in order for something to qualify as a true innovation, it must meet three basic criteria in tandem: It must engage a creative process, it must be distinctive, and it must yield a measurable impact.

Assessment of Innovation
Once we identify a particular activity as meeting at least some portion of the criteria, how do we assess it along a spectrum? Assessment involves asking the appropriate types of questions—those that are designed not only to gain insight but also to yield responses that can be easily compared. Comparison can take place in a number of ways, with the two most obvious being comparison among competing entities and comparison over time. Most beneficial for drawing implications is some combination of the two.

Before proceeding, it is important to highlight that assessment is not the same as measurement. Rather,
companies that have cut R&D investment have often found that their range of products and services compare less well with competitors when the upturn comes and it is then more difficult to protect market share and value added.”

DTI research has also shown a positive correlation between R&D intensity (R&D as a percentage of sales) and sales growth, in which companies with above average-intensity have revenue growth six times as fast as companies with below-average intensity. While the argument that new ideas can come from anywhere and are unrelated to investment dollars is valid, those ideas need time and money to be developed. Remember, innovation involves investment in a creative process, not just new ideas. Thus, R&D investment, both as a raw number and as a percentage of sales, proves to be a meaningful quantitative measure of the creative process in terms of our definition of innovation.

But more often, the creative process is better measured with qualitative indicators—how well does your creative process work? Would the development of a new solution to a problem be better characterized as:

a) a rigid, previously applied process used only because it is the organizational standard?

b) a parallel process used in a new environment?

c) a flexible process incorporating the best combination of old and new ideas?

On a linear scale of the creative process, (c) is better than (b), which is better than (a). Some organizations view the mantra “not invented here” as taboo; these firms are stuck on creative process (a). But cultivating innovations by constantly repeating the same creative process can be very challenging and will likely yield diminishing returns. Others pride themselves on searching outside the organization for better ways of doing things and see “not invented here” as a good thing; these firms typically espouse creative process (b). One of the most popular methods of developing new ideas and opportunities demonstrated by some of today’s well-connected...
organizations is borrowing from others in their network, which is often more fruitful than always using the same internal standard process. But ultimately, we believe that those organizations that are open-minded enough to understand the best way of doing something can come from inside the firm, outside the firm, or a combination—organizations employing creative process (c)—will be the most successful.

In a positive example of employing the creative process, the National Institute of Education (NIE), an institute of the Nanyang Technological University in Singapore, was charged with devising a method to grow temperate plants in the warm lowland tropics. As academics, they initially proceeded with a literature search to analyze the landscape of research that had been done on the topic. Recent work in the area however, demonstrated only the methodology of temperate countries in extremely cold climates. The NIE scientists cited a case in Holland, in which the Dutch had warmed the soil within the greenhouse to promote warm air to rise so as to create a warm aerial zone for the lettuce to grow. The scientists from the NIE then inferred that the warmth of the soil had growth implications on the root physiology and, in turn, the plants’ development.¹⁵

In Singapore’s warm climate the opposite conditions exist, therefore scientists needed to develop a system that cooled the critical rootzone. Until recently, the process was to simulate the temperate condition by building a greenhouse where the environment is cooled to levels similar to those found in moderately cooler countries. This approach was extremely costly due to the amounts of energy consumed to cool the entire greenhouse environment.

The process that NIE undertook was to leverage existing aeroponics technology, a method of growing plants with roots suspended in the air within an enclosed trough with chilled nutrient solution fed to the roots in the form of a mist. The scientists were then able to modify only the rootzone environment to bring about the normal growth of certain temperate plants in the lowland tropics without the need to cool the entire environment of the greenhouse. By cooling only the rootzone, scientists were able to simulate the temperate vegetables’ indigenous environment even though the actual environment was in the mid-30s degrees Celsius (low 90s degrees Fahrenheit).

The NIE’s innovative success was due in large part to the creative process undertaken. The scientists involved were able to make the leap from the Dutch case and effectively reverse the elements of the process in its application to the Singapore climate. Without such a creative process, the NIE might still be searching for cost-effective ways to cool greenhouse temperatures.

**Distinctiveness**

Distinctiveness is an indication of rewriting the rules of the game. In other words, something that is distinctive is so different that it changes what both competitors and collaborators are doing, and often-times adds new parties that weren’t initially considered part of the game.

The key differentiation between the first and second criteria being put forward is that the creative process relates to how something comes into being, while distinctiveness refers to the nature of the discrete output. Simply put, is what I am dealing with new?

The granting of a patent is an excellent measure of distinctiveness. As defined by the United States Patent & Trademark Office, a product or process must be “new”, “useful”, and “nonobvious” to be granted a patent. These criteria serve as a good screen for distinctiveness, making the number of patents associated with a particular output a useful quantitative measure.

Just like the creative process, there are different levels of distinctiveness. How different is it? It is important to remind ourselves that an assessment of distinctiveness, and these notions of new and different, need to be contextually sensitive. In order to get a more specific feel we should ask questions such
as: How is this innovation distinctive from other ideas that have historically emerged? Is it the first of its kind in any form? Is it the first successful implementation? We should also ask questions that help us understand if the “rules of the game” really have been rewritten. For example, does your innovation make others react to what you say and offer? Are they forced to make changes based on your actions? Does this innovation change the basis of competition?

If we return to the NIE example of tropical aeroponics, several points demonstrate the distinctiveness of their offering. For example, this innovation has not only paved the way for the production of non-indigenous vegetables, but also considerably revamped the tactics for teaching plant physiology with respect to both content and methodology. This new model demonstrates the effects of various environmental factors such as rootzone environment. Since traditional plant physiology mainly deals with the shoot physiology, this innovation has opened up new paths and directions for the field.

So if we have a robust creative process that turns out a very distinct output, we are two-thirds of the way to an innovation.

Impact
The third piece of the puzzle is impact, the realization of value. This is where many have split into two distinct schools of thought. One school tends to view impact as the only consideration for an innovation. But without fulfilling the first two criteria, these cannot be considered true innovations. The other school of thought places much of the attention and focus on the distinctiveness of the innovation or the creative process undergone. Some believe that an innovation merits discussion merely because it is new and different, when really without any impact it is not an innovation at all. While it remains only one of the three criteria, impact is the element that truly differentiates the innovations from the mere inventions.

Of the three criteria, impact is probably the easiest to measure in terms of available quantitative measures. How does one measure the realization of value? One way is a follow-up measure on patents registered; namely, the power of patents—the number of times a patent is referenced by other patents. The more a particular patent is referenced, in all likelihood, the more of an impact its existence has generated. There are also a number of financial results that can be used as long as specific figures can confidently be attributed to a particular innovation. These include fees earned from licensing agreements, increased revenue, increased market share, and substantial cost savings.

As with the previous criteria, qualitative data also provides valuable information, particularly since the impact of an innovation is often social as well as economic. It is important in assessing impact to know what you are looking for and to remain consistent. For example:

- Are we only dealing with primary impact? Or are we attributing certain scores to those that reach beyond the scope of their primary customers and achieve secondary impact? (e.g. The primary impact of war is that it takes many lives, but we can see that war also leads to significant secondary impacts, such as inciting ideological and cultural shifts. Some feel strongly that secondary impacts should be given equal consideration when assessing impact.)

- Are we discussing measurable impact today or the future potential impact? (e.g., Boston’s Big Dig construction project: Today the Big Dig has yielded little impact to Bostonians other than the dreadful congestion and confusion around construction sites. But some believe that the completion of this project will undoubtedly have a huge impact on traffic flow, and in turn, life in Boston. Therefore, a split exists in how impact is being assessed.)
Perhaps it would be of value to visit some examples that do not meet the necessary criteria. Joseph Juran’s initial concepts of quality management and Japanese lean manufacturing were innovations in their times, but today, faster, better, and cheaper will not revolutionize your company. The world still realizes value from process improvements and increased efficiency, however, defined by our framework, activities that lead to incremental gains do not constitute innovations because they lack distinctiveness. Being distinctive—new and different—is what separates an innovation from a mere improvement.

As previously stated, impact is the attribute that is perhaps most important among the trio. When significant new value is realized from an invention, it becomes an innovation. Take, for example, the recent, highly publicized “Segway,” previously known to the public as “It” or “Ginger”—the smart motorized scooter invented by Dean Kamen. Undoubtedly, it is both very creative and distinctive. But at present, there has been little impact: “Segway” remains in the infant stages of commercialization and will only be available to the general public in about a year. Therefore, the product does not yet qualify as an innovation. But if over the next several years, “Segway” demonstrates market acceptance, leading to significant economic and social value, Kamen might be standing on a real innovation, literally.

But to switch gears, let us examine a historical example that does fulfill the trio. Until the 1950s the breaststroke was the only stroke that required a certain style in competition. The fact that the recovery of both arms and legs was done underwater, however, made the stroke rather slow. To try to solve this problem, in 1934, David Armbruster, a coach at the University of Iowa, uncovered a loophole in the breaststroke rules and experimented with a double overarm recovery out of the water. This granted the swimmer much more speed. Then in 1935, Jack Sieg, a young swimmer coached by Armbruster at the time, developed a style of swimming face down and kicking his legs together like a dolphin’s tail—

**Importance of the Trio**

While projects that do not meet all three criteria can still be of some value, they must incorporate the creative process, be distinctive, and yield a significant impact to be considered a true innovation.
an undulating motion from hips to the toes. Originally, the butterfly was only a novelty, as it was considered too tiring to swim for any distance. But soon proving to be considerably faster than the conventional breaststroke, this new style began dominating breaststroke races. Armbruster and Sieg later combined and coordinated these actions into the “butterfly” stroke that was later officially made a separate stroke in 1953.7

As this very simple example unfolds, we see that it does address the relevant innovation questions. Armbruster realized that the overarm recovery out of the water served as an interesting opportunity to address the issue of the protracted breaststroke. The “butterfly,” proving itself mutated enough from the original stroke to merit its own style in the books, warrants points in the distinctiveness criteria. The physical strain on the athlete and its slow uptake almost kept the “butterfly” from the ranks of innovation, but it was later widely embraced and is a fundamental segment of swimming today.

As you may have guessed from the butterfly example, degrees of innovation must be measured on a sliding scale rather than a discrete one. In Figure 2, we have provided such a scale for managers to use in assessing their own innovations both quantitatively and qualitatively in tandem. Using the spectrum, companies can gain a better insight for the “look” of their innovations, which come in all shapes and sizes (for example, Figure 2: Model A). A manager can infer that the further out on a particular axis a score is, the more of a nonlinear advancement it is. But this is where it becomes much more imperative to know what your objectives are, because it is not always necessary to be at the extremes in order to create significant value, given the costs entailed.

III. TYPES OF INNOVATION
Conventionally, innovations are most commonly associated with new offerings (products and services). Desks, cars, telephones, and video rentals are all fantastic product and service innovations. But while offerings are certainly the most tangible type of innovation, they are far from being the only type. In fact, innovations can be clearly categorized into four groups—offering, process, strategy, and structure.
When thinking about an innovative offering, it is important to keep in mind that innovation is not synonymous with technology. In today’s times of rapid change and advancement, there is a tendency to rely too much on technology to yield the majority of innovations. Oftentimes we see advances in technology and quickly label them innovations. The advent of home delivery was a compelling innovation that required, at the time, no technological innovation. We must remember that “low-tech” innovations derived out of human imagination can be just as powerful as their high-tech counterparts.

Process innovation is another area where many businesses can yield great value. This is not to be confused with a process improvement, which we’ve already discussed as simply tweaking the creative process and manifesting an impact, but lacking distinctiveness. A process innovation must also yield something that is new and different, making a nonlinear jump forward. The butterfly stroke is a good example.

Structural innovations change the forms and configurations of an organization. For example, the worker empowerment movement in the early 1990s that elicited a transformation from hierarchical to flat management was a structural innovation. Novel combinations of companies through mergers and acquisitions can be great structural innovations. Such combinations, however, are also incredibly difficult to achieve smoothly as evidenced by recent research revealing that most fail to achieve their goals. As a result, a popular method these days of finding new value without radically changing the organization is by forging new partnerships and alliances, thus blurring the boundaries of the traditional organization. This is less extreme than mergers or acquisitions, but may lead to a similar innovation of your corporate structure.

Strategic innovations deal with visionary business models. These can either be business models developed from scratch, such as the creation of eBay, or a significant shift by a current organization, such as the transformation of Nokia in the 1980s when the one-time rubber boot maker decided to focus exclusively on mobile phones. Because strategic innovations require both a successful vision of the future and the realization of that vision, they are often the most challenging to achieve.

IV. INNOVATIVE ORGANIZATIONS

To this point, we have created a framework that has assisted us in defining and assessing a specific innovation. However, these same tenets can also be expanded to the entire organization. The ideal innovative organization would excel at innovation across all types—offering, process, strategy, and structure—with strengths in all criteria—the creative process, distinctiveness, and impact. While it is true there are innovative organizations that are not highly successful across all four types of innovation, it is important that all organizations at least be cognizant of their efforts in each. The following case study on the National Library Board of Singapore will show how all these pieces come together in a particularly innovative organization.

A Case Study of Innovation: The National Library Board of Singapore

Beginning in 1992, the Singapore National Library Board (NLB) was not only tasked with revamping the library system in order to boost efficiency, but to also create a vision in which the library could act as a catalyst in creating a cultural shift in Singapore. This case study examines the different paths they took to accomplish their mission. In each of the following examples of different types of innovation, there is evidence of the creative process, distinctiveness, and impact.

Offering

The NLB leadership understood the library was much more than a room full of books. That said, they devised services, special facilities, and collections as the platform for fresh insights, self-discovery, and engaging interactions to make the library the catalyst for innovative learning experiences. They created distinct offerings such as libraries in...
shopping malls (library@orchard), which were much more visible to the everyday citizen. They even created library services that were available through short messaging services (SMS) on a cell phone in order to streamline processes and make services even more readily available. And the impact of these actions has been substantial. In 2001 alone, the NLB made 25,034,444 loans in a country where the population is only slightly more than four million people. Their membership has risen more than 12 percent since 1998, with a similar 12 percent increase in annual visitors.*

**Process**

Queues at the NLB were always long, but it was stated several years ago that if a system were not set in place immediately, queues today could be upwards of four hours long. They understood that as imperative as it was to come up with new insights for inciting a societal cultural change, they had to undergo an internal restructuring first. The process they adopted was two-pronged—developing a coordinated national collection process while streamlining many of their backend processes. Working with industry partners, the NLB deployed the use of Radio Frequency Identification Technology for the world’s first Electronic Library Management System, which was later awarded a patent for being a revolutionary system for library automation. The impact of removing book stamping and fine collecting at the counters has saved more than $50 million per year in staff wages. The NLB has also implemented several other process innovations such as sophisticated integration of their back-end HR and finance systems that have since eliminated more than 40,000 forms and save more than $6 million in man-hours each year.

**Structure**

Sir Isaac Newton said, “If I can see farther than other men, it is because I stand on the shoulders of giants.” The NLB has been able to capture that very essence. Being in a small nation like Singapore, they understood they needed to assume a creative process that allowed for adaptability and evolution. They began to grow and leverage various local and international partnerships and collaborators such as the Congress of Southeast Asian Librarians (CON-SAL), the Russian State Library, and the Singapore Management University. This has enabled them to create a more diverse and robust offering to their members. Because the libraries’ collection now traverses the boundaries of the nation, the NLB took the next step to develop the eLibrary Hub to serve as a one-stop, all-inclusive digital library accessible from anywhere with Internet access. This transformation has had a significant impact on society. Through the network of borderless libraries, Singaporeans have access to information from a greater multitude of resources always close at hand.

**Strategy**

The NLB has been deliberate in its strategic creation of symbiotic linkages between the work, home and community. Their intention has always been more than creating a place to check out books. Instead the mission has been to create a lifestyle product that is fully ingrained into society. Through the creative process of co-locating in the community, they have been able to create “Lifestyle” libraries with an image that depicts a character of both convenience and fun while maintaining learning at the core. And even though this is a long-term mission for the NLB, signs of success have already begun to manifest: Half of all Singaporeans are members. Even more impressive is that the Lifestyle library is the country’s third most popular destination after school/office and home.

**A Culture of Innovation**

Now that we have explained the criteria for defining innovation and how they can be used to assess both specific innovations and organizational innovation, where do we go from here? These concepts along with the matrix we’ve offered in which to recognize and understand the components that build to organizational innovativeness will not guarantee innovation. There are other significant variables which serve as the “glue” that holds the pieces together,
most importantly organizational culture and leadership. Although this topic is tangential from the scope of our primary objectives, we believe that it is prudent that you consider these factors in concert with the innovation assessment framework, for it cannot be successfully utilized over time without an organizational culture of innovation.

Innovation does not occur in a vacuum. Despite the fact that many managers know that innovation is important, it is all too easy to put it aside in favor of day-to-day operational activities. The solution is to make innovation a part of those everyday activities. Organizational leadership must continuously assess projects across the four types of innovation on whether they involve the creative process, produce distinctive results, and make an impact, and cultivate those that have the potential to be meaningful innovations.

Striving to be innovative often pushes an organization to operate on the edge of chaos, which makes many leaders uncomfortable. As a result, larger organizations often struggle to maintain and promote an entrepreneurial culture with the goal of innovation in mind. The dynamics of leadership and culture will play a significant role in how innovations are carried out. Given the density of material available on the topic, we will just pose a few questions for you to consider: How does a leader manage the inherent struggle between providing a long leash on employees to incite innovative thinking and the need for increased streamlined efficiency? What is the corporate attitude toward risks, mistakes, and failures? Are we proactively seeking out ideas at all levels within the organization?

Being innovative should not be such an impossible quest, and it isn’t as long as it is woven in as an integral part of the organizational culture and leadership vision. An eye for innovation cannot be just at the top ranks of the organization, nor can it only be at the bottom. In order to incite a successful culture of innovation, it is important that everyone associated with the organization—employees and outside partners alike—understand and apply a meaningful, consistent framework for assessing innovation in their work.

Footnotes:
1 For more information on the Value Creation Index, see http://www.cbi.cgey.com/research/current-work/value-creation-index.html.
2 This statement is derived from the CBI's definition of innovation: Innovation is the realization of value from a new solution to a problem, rewriting the rules of the game.
5 Details on NIE's aeroponic technology found at www.nie.edu.sg and Singapore Innovation Award's Winner Media Release.
8 For instance, see David Hussey, “Merger and acquisition: more often wrong than right?” Strategic Direction, Volume 17 number 3, 2001.
9 Details on The Singapore National Library Board found at www.nlb.gov.sg and Singapore Innovation Award's Winner Media Release.
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