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# **PERVASIVE INNOVATION: TAKING INNOVATION THROUGHOUT THE ORGANIZATION**

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## **Abstract**

One of the fundamental tenets of management is that human capital can provide an essential competitive advantage for a business. Pervasive innovation (PI) is a process that blends strategy, structure, process, and culture to elevate product development to new heights and can provide a critical advantage. PI also encompasses new paradigms, practices, methods, and applications that support an environment of creativity and innovation that cuts across organization boundaries, both internal and external boundaries.

Pervasive innovation guides the team through the ideation stage to implementation by leveraging the greater collective knowledge of the entire organization. This collaborative approach ensures that the organization is solving the right customer problems by providing the right solutions. Innovation on a collaborative scale has a need to be repeatable, teachable, deployable, manageable, and reliable [1]. Can the management of innovation that includes the four elements of strategy, structure, process, and culture lead to a pervasiveness that provides long-term benefits and impact innovations?

## **Introduction**

Innovation is the growth engine for companies wishing to succeed in the global marketplace. To have sustainable competitive advantage, the organization needs to differentiate themselves from the competition and create value. The goal of modern leaders should be to have innovation permeate the organization, in other words, pervasive innovation [2].

To gain market share and react to the rapidly changing market, many companies turn to innovation to provide an edge in the marketplace. Often times, the actual implementation of innovation is limited and only bridges across a few disciplines. Cross functional engineering teams use data sharing systems to wring out the last bit of efficiency in each innovation cycle. To have true pervasive innovation, all of the members of the organization need to eat, sleep, and breathe innovation. Innovation should be ubiquitous; not something you do but part of who you are.

## **Concurrent Engineering Is Not Enough**

In 1986, the phrase ‘concurrent engineering’ was used in a Defense Advanced Research Projects Agency (DARPA) report. The term defined the systematic method of simultaneously designing a product as well as the downstream production and auxiliary processes [3]. Popularized in the 1990's, concurrent engineering (CE) was used for part design and integrated manufacturing with heavy reliance on automating data and process management and decision making. More recently it has included the lean enterprise and quality methodology [4-8].

CE was developed out of the need to address the “throw it over the wall” syndrome. A design engineering department would finish the design, throw it over the wall to manufacturing, and go on to the next design project. This structure has been referred to a collection of “silos” because of the vertical integration or concentration of people with similar skills and knowledge, but separated by their functions.

The idea emerged that to develop products effectively, a repeatable process and a localized organizational structure of cross functional teams became the critical elements. Now we have cross-functional teams, for instance teams composed of electrical, mechanical, materials, software, and manufacturing engineers, that work on a project from start to finish and go on to the next project. These teams still constitute silos; teams that communicate better and share information but remain isolated from other teams working within the organization. In this situation, learning is not shared between the product teams. An even greater problem is that the product development teams are detached from the sales, marketing, and business teams that are in tune with the needs of the customer.

At the most basic level, innovation is about people implementing new ideas to create value [9]. New ideas can originate from many sources but most agree creativity is a necessary element. Collaborative working relationships are a key enabling element to enhance both creativity and innovation [10]. Some of the CE literature discusses collaboration and calls attention to its importance as part of the seven critical elements [11], while integrating it with innovation is limited or left out of the conversation.

Roberto Santaro, in his discussion of concurrent innovation, states that best in class corporations perceive they are reaching a limit of human capital because they are bound to traditional, organizational structures [12]. Additionally, strategic, cultural, and process limitations contribute to the barrier.

## **Strategy**

It has been commonly accepted in leadership literature that management is doing things right and leaderships is doing the right things. You need both and one is not better than the other [13]. Consider the situation where there is great management, but no leadership. Great products can result that no one wants. The corollary is a mediocre product that disappoints a large potential market and an opportunity is missed.

Customers buy products and services to solve problems. The goal of leadership is to make sure the organization is solving the right problems [14]. Further, leadership reinforces the innovation agenda for the firm, ensures that alignment exists, and delivers seamless execution [15].

Although innovation can be sparked by a single individual, in a blog entitled Innovation Hacker, Gary Hamel points out that CEOs and corporate HR leaders “don’t know how to turn on the innovation genes” in their people and have not taken the steps to train employees to do it themselves across the organization [16]. This may create a situation of only a few “gurus” being tasked with innovation. Because tangible results are difficult to relate to traditional measurements such as return on investment, the value of innovation, especially across a broad population, leads to several issues including: limited view of who should develop innovation skills and a limited view of how innovation fits in the overall company strategy [17]. In 2008, IBM openly discussed their collaborative innovation strategy that is pervasive across the company, across organizational structures, and that goes outside the corporate. In an internal survey, IBM found that innovative ideas emanate from a variety of sources (employees, business partners, customers, consultants, competitors, associations/trade shows/conference boards, sales/service units, internal R&D, and academia) and from collaboration with these sources [18].

Some criteria are common problems with mass appeal to drive sufficient sales volume. The goal of management is to provide right solutions. Solutions that are timely cost effective, high quality, and high reliability.

## **Structure**

The optimum structure for pervasive innovation connects research, marketing, business, and engineering. The innovation process needs to be structured to address four key abilities: differentiability, desirability, viability, and feasibility.

1. Technology and invention provide the new, unique, and different elements required to differentiate your offering from the competition
2. Proper marketing ensures that solution resonates with the customer: meets a need/solves a problem
3. The business case states why this makes sense for the organization
4. Engineering provides how the solution will be done (spec, schedule, cost)

The inventive process creates intellectual property that provides the customer with a differentiated product or service. Proper marketing ensures that the offering is desirable to the customer. Proper input from the business team ensures the business viability. Engineering delivers the technical feasibility.

## **Process**

A concurrent innovation process always has the customer or end user in mind. The process starts with an eye to the future. The organization needs to be aware of trends that are beginning to form that have potential to create future value. No one has foreknowledge but people can develop foresight. With a vision of the future emerging technologies can be sought out. The goal being that one of the technologies can disrupt the market and provide a competitive advantage through lower cost or a differentiated offering.

A technology funnel is helpful to gather multiple inputs from research, sales teams, customer input, and competitors. These inputs are processed and weighed against customer needs to ensure the product or service offering has sufficient desirability.

A technology roadmap is constructed to gauge the maturity of the technology and the anticipated availability. The technology roadmap feeds the product roadmap, this step ensures the business viability of the product, assigns priority, timing and resources. This ensures that the development team can produce the product with fewer rework cycles because of changing requirements. The expectation should be that this is the best possible product definition at the start but there may need to be course corrections.

## Innovation Culture

To stubbornly finish a project because of a large sunk cost is foolish. The culture needs to change so that cancelling a project or making significant change in direction is not a failure. Making mistakes and sometimes failing is part of the learning process. As the organization matures, these “learnings” will be less frequent and less severe because more effort is expended up front. A \$1,000 design change can multiply into \$10,000 by the time the product is in production [19]. By the same token, revisions early on in the product definition phase can pay large dividends in design, development and in the marketplace.

The right environment is crucial to fostering innovation. A place where employees feel free to express their ideas without ridicule is key. Freedom to dream and spend time on pet projects can be very helpful. Google has a policy of “20% Time”. Employees are encouraged to work on projects of their own choosing for 20% of their time. Marissa Mayer, Google vice president of search products and user experience estimated that in 2009 half of all new Google products got their start in 20 percent time [20]. This is an effective means to leverage knowledge across the entire organization by putting people together who are passionate about an idea.

A Harris Interactive surveyed over 300 Fortune 1000 executives to get their perspective on enterprise innovation. The survey showed that while 95% of the participants say innovation is critical to future growth, less than half actually have a system, tools, or processes for fostering enterprise innovation. At least a third of those surveyed see the lack of such tools and processes as barriers to innovation at their company [21].

Some innovation skills employees should develop are market scanning for trends and nascent technologies, scenario development, structured problem solving, proper brainstorming techniques, brain-writing, and Pugh matrix analysis for idea evaluation. IBM looks to consolidating communications with expectations of discovering more opportunities for innovation across the corporation. New Web based tools help lay the foundation for the change in communication, thereby changing the culture as well. New collaborative connections use the digital infrastructure to work anywhere, anytime, on any device. The digital focus ushers in a culture where innovators express themselves more fully and find like-minded communities with which to work [18].

## Conclusions

Successful companies fail to innovate for several reasons. One is that organizations will try to create a

blockbuster innovation immediately after instituting an innovation strategy versus building on the successes of smaller more manageable and possibly failed innovations. Secondly, companies let their guard down after a victory. The huge success of the Motorola RAZR was followed by several flops from which Motorola is just starting to recover from a decade later. [22] Thirdly, managers should pay closer attention to the key abilities: differentiability, desirability, viability, and feasibility.

When a product lacks differentiability there is no market buzz; it's the “same old same old”. If desirability is missing, there is a great idea but no market pull to create demand and drive sales. Without proper business analysis the product's viability can be jeopardized. Unless engineering does its job the product may not be technically feasible. When companies fail to have the structure and systems in place ensure execution, the idea never makes it to market. Finally, when people are not considered the innovation process can lack passion and people in the organization burn out and leave taking away precious intellectual capital.

Consumers buy good products. Great products are loved. [23] When consumers love a product or service they can't help but tell people in their network thus repeating the cycle leading to mass adoption. Strive to involve all elements of pervasive innovation (strategy, structure, process, and culture) and do this collaboratively across an organization may help a firm create the next breakthrough product and a pipeline for future products.

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Key Words: Innovation, Concurrent, Patent, Creativity, Invention, Design, Product Development, Competitive Advantage, Collaboration.