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# Achieving Radical Innovation

**Gary S. Lynn**

Our March Conference dealt with achieving radical innovation. It was our most successful ever, with nearly 100 attending and giving high marks to the speakers. For those who couldn't make it, and for those who did, this Newsletter features contributions from the keynote speaker and other Alliance researchers working in this important area.

Larry Gastwirt
Director

Innovation is the lifeblood of companies large and small. Innovation allows a company to grow and improve, to compress cycle time, to speed distribution, to reduce manufacturing defects, to improve product quality, and to increase customer satisfaction. Radical innovation is particularly important because it can lead to new families of products or create entirely new industries.

### The Radical Innovation Process

The process of radical innovation differs substantially from the conventional innovation process. The conventional innovation process is analysis-based. It centers on market research: listening to the voice of the customer. Radical innovation works within a very different framework based more on experimentation, or learning by doing.

Radical Innovation is a lengthy, expensive, risky process, marked by setbacks and unpleasant surprises. Management is faced with the challenge of delivering evolving technology to an ill-defined market. As a result, radical innovation is far more risky than conventional, incremental innovation.

History is replete with examples of failed radically new products. Federal Express, for example, lost $190 million on Zap Mail. Polaroid wrote off $68 million in inventory for "Polarvision" instant movies. Xerox invented the PC in 1973, but failed to successfully commercialize it. The question begs to be asked: How can companies develop radically new products and services more successfully?

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**A "New" New Product Development Paradigm**

Over the past 25 years, the conventional new product development paradigm has come to be viewed as a staged or multi-phase process. Although the specific names used to describe each phase may vary, fundamentally an innovation passes through five basic steps: Idea Generation, Screening and Evaluation, Development, Testing, and Commercial Launch.

In Idea Generation, people formulate various possible concepts that offer potential. In Screening and Evaluation, the ideas generated are checked against development costs, market potential, and company strengths and strategies. In Development, the company tries to deliver on the selected ideas. In Testing, the prototype is checked for technical and market compliance. Finally, in Commercial Launch, substantial resources are marshaled to plan and implement full-scale introduction.

Radical innovations proceed much differently. They are not well behaved, nor do they follow a sequential linear process. Successful companies develop radical innovations by probing potential markets with early versions of the products, learning from the probes, and probing again. In effect, they run a series of market experiments—introducing prototypes into a variety of market segments. The product is not the culmination of the development process but rather one of the initial steps. And the first step in the development process is in and of itself less important than the learning and the subsequent, better-informed steps that follow. The approach at work in radical innovation might best be described as probing and learning.

The first step in the probe and learn process is to experiment—to introduce an early version of the product to a plausible initial market. For example, GE introduced a breast scanner into the CT marketplace in the mid-1970's at a time when the market seemed to be moving toward whole-body scanners. The breast scanner was half the size of a whole-body scanner, posed less rigorous technical challenges, and cost less to develop. Ted Pashler, one of GE's development engineers, explains the logic behind the innovation strategy in the context of probing and learning for GE's CT.

"Whether or not the breast machine would be a success would be a minor point. We were committed to the fan beam [GE's new scanning technology] and knew it [the market for CT] would develop. We needed a 'technology vehicle' to enable us to proceed and develop a system. We could learn what the limitations were even if the final application would turn out to be different. At no time did we look at the torso [whole-body] market because of the long scan times. To do a torso, you needed scan times in the 10 to 12 second range [which exceeded what GE believed to be technically feasible in such an early phase of the development process."

The breast scanner, however, ailed in market trials. Images were poor and the scanner could not differentiate between healthy breast tissue and a tumor. But by then, GE was applying what it had learned to newer versions of its CT scanner. GE's CT breast scanner, though a miserable failure in the marketplace, demonstrated the feasibility of the new technological approach (i.e., the so-called "fan-beam" system) that GE believed would lead to a significant improvement in scanning speed and greatly enhanced image resolution. GE's next probe was a fan-beam based whole-body scanner, which again was a market failure. However, GE learned from this probe that the market was ready for a faster, higher resolution system. When GE initially announced its intention to market a whole body scanner, it was flooded with orders. (In a sense, the product announcement was itself a probe.) GE had projected five orders, but received 65 (at roughly $500,000 per or-

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der)! Unfortunately, GE learned that most of the radiologists who had placed the orders also wanted a machine that could scan heads as well as the torso. Because of this and because of unanticipated technical difficulties, most of the orders received when the product was announced were canceled.

Probing and learning is an iterative process. Firms enter an initial market with an early version of the product, learn from the experience, modify the product and marketing approaches based on what they learned, and try again. Development of a technological innovation becomes a process of successive approximation, probing and learning again and again, each time striving to take a step closer to a winning combination of product and market. Thus, when GE learned that its first whole-body scanner—which followed the unsuccessful breast scanner—was also badly flawed, it reacted with an extensive problem solving period to overcome the deficiencies. But even the improved version of the body scanner, which GE introduced in 1976, proved to be a disappointment in the marketplace. Rather than leapfrogging the competition, the product was merely equivalent, in terms of image quality, to the CT scanners already on the market.

Meanwhile, competitors were announcing a new generation of CT scanners with better image quality than GE, and at a comparable price. At the same time, the market for CT scanners collapsed, due to a change in federal regulations regarding health care cost reimbursements. The market problems with GE's full body system triggered yet another iteration in the development process, which finally led to a substantially improved scanner system. This in turn led to a new product, introduced in 1978, that was so successful and so clearly superior to the competition's product that, despite the contracting market, GE's market share soared from 20% to over 60%.

The story of the development of GE's CT stands in contrast to the conventional linear new product development paradigm, applicable to conventional innovation. Bobby Bowen, a key figure in the development of GE's CT and now Vice President and General Manager of Technology, GE Medical Systems, states:

"Several cases have been written about the history of CT, but they don't describe anything that I recognize. They tend to project what ought to have been rather than was. There is a tendency to assume that a lot more occurred by planning than what actually occurred . . . In fact, one thing tended to follow from the next. There were a lot of curves on the road that we hadn't anticipated. We took things as they came. A lot of people think of product development as involving a lot of planning, but I think the key is learning and an organization's ability to learn."

The pattern we see in GE's development of CT is similar to the process other companies used when developing a radical innovation. Examples include Corning's development of optical fibers, Motorola's cellular telephones, and Searle's (now Monsanto's) NutraSweet.

The probe and learn process can be an effective new product development strategy, but probing with immature versions of the product only makes sense if it serves as a vehicle for learning about the technology, and whether and how it can be scaled-up, about the market, and which applications and market segments are most receptive to the various product features, and about the influence of exogenous factors, such as changes in government regulations and the need for regulatory approvals. Probing is a waste of resources unless it is accompanied by learning.

Several logical questions emerge: How do new product development teams learn? What tactics can management use to promote learning? How can management be reassured that the knowledge the company has invested so much to acquire is used, and used as profitably as possible? These topics will be addressed in a future SATM Newsletter.

**Reference**

G. Lynn, J. Monroe, and A. Paulson, "Marketing and Discontinuous Innovation: The Probe and Learn Process," *California Management Review,* 38/3 (Spring 1996), p. 26.

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