

Innovation for Innovators

an occasional column exploring principles, models, and theories of innovation in business and management

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The Evolution of Innovation

In 1856, William Henry Perkin was an 18 year-old student at Britain's Royal College of Chemistry. He was working toward an antimalarial drug that was important to the British Empire as it expanded into Africa. But he stumbled onto a coal-tar derivative that was particularly effective at staining silk material into a rich shade of purple. At a time when dull, earthen colors had dominated clothing for two centuries, Perkin realized that a vibrant and stable purple dye was a very valuable product. He quit the university against the protests of his professors and established a factory for producing the dye. His father invested the family's entire fortune in the endeavor and his brother quit a job in the building trades to manage the new business. By 1857, Perkin's factory was producing "Tyrian Purple" for sale to commercial silk dyers and he was working on new dyes for wool and cotton [1].

The success of Tyrian Purple as a commercial venture led chemists across Europe to focus on this market in the hope of making their own fortunes. Over the next fifty years major companies like Bayer, Hoechst, BASF, and AGFA built their fortunes on the creation of new dyes. The sustained demand for dyes built new factories, created a demand for educated chemists, raised the importance of a university education, and provided employment for thousands of workers. The plot of this 19th century story is closely matches that of current Silicon Valley computer, software, and web services companies - the curiosity, hard work, and good luck of one person leads to the creation of one unique product, followed by the invigoration of an industry.

The creation of the aniline purple dye was an invention. The application of that dye as a commercial product was an innovation. Both invention and innovation are very old processes. The history of weaponry, machinery, and transportation are all filled with instances of invention and innovation that transformed individuals, companies, countries, and economies. But, as old as these practices are, the formal study of innovation is relatively new tracing its roots back to the works of Burns and Stalker in 1961 [2] and Rogers in 1962 [3]. In *The Management of Innovation*, Burns and Stalker clearly separated mechanistic from organic environments. In a mechanistic environment it is best to create standard processes, rules, and hierarchy to improve the efficiency of the organization. But organic environments require a different approach, one which recognizes the importance of unique skills and knowledge, as well as the means to stimulate these toward solving new problems and creating new products. Organic working environments require employees to use their own knowledge and judgment to solve a continually changing set of problems. In *Diffusion of Innovation*, Rogers investigated the means by which new ideas propagate through a society. He was most interested in the social factors that allowed ideas to prosper and identified five variables that determine the rate of adoption of a new idea or product: the attributes of the

innovation itself, the type of decision required to adopt an innovation, the communication channels through which the idea is carried, the nature of the social system into which the idea is introduced, and the extent of a specific change agent's promotional efforts. These ideas, published 45 years ago, were some of the first models of innovation.

It could also be argued that the ideas of Fredrick Winslow Taylor in 1911 [4] and Joseph Schumpeter in 1942 [5] were about innovation. Taylor may have invented new shapes and sizes of shovels to implement his ideas about labor productivity, but the real innovation was in recognizing that traditional methods of factory work were inefficient and could be improved if a scientific mind were allowed to enforce practices on the working hands of laborers. This idea so threatened the positions of laborers that Taylor found himself defending it in court and before Congress. The immediate affront to labor was much clearer to most people than the long-term economic benefits of efficiency, profitability, and lower costs. Schumpeter and David Wells [6] pointed out that inefficiencies in business cannot be sustained indefinitely. New ideas and new technology will transform a single practice or an entire industry to eliminate these inefficiencies. Schumpeter's "creative destruction" is the march of invention, innovation, and change across the face of society and business. Though it is painful to many people, it accrues to the good of the entire society. Individual interests cannot stop this march, but they can rush to get in front of it so that they are on the creative side of change, not just its destructive side.

Today we describe innovation as an activity or action that creates value from materials, processes, or ideas that are available to many people, but which have not been recognized or applied by others. But, like Perkin's discovery of purple dye, the success of an innovation will draw others seeking to capitalize on similar ideas or seeking to copy them outright. This value is a very transient thing that, unprotected, will flow from an inventor to a competitor without regard to claims of ownership. In fact, the entire system of patents, copyrights, and legal IP protection exists to allow inventors and innovators to prosper from their work. We recognize the value of innovation to society, the economy, and business and are eager to foster the personal and organizational investments that are required to make it happen. However, the time limits on these legal protections must also balance the good of the creator with the good of society. Legal systems allow a temporary monopoly as a means of encouraging and rewarding innovation, but prevent long-term control of an idea that can benefit an entire society.

Once the value of innovation was both recognized and protected, it became desirable to analyze the practice and attempt to formalize it for repeatability. Establishing a business on a single innovation is a great entrepreneurial venture. But sustaining an ongoing business through random and haphazard innovation is much too risky. I suggest that our understanding of innovation has also evolved so that it can be practiced in a disciplined, organized, and directed manner, or one can continue to pursue it in a random and haphazard way (Figure 1).

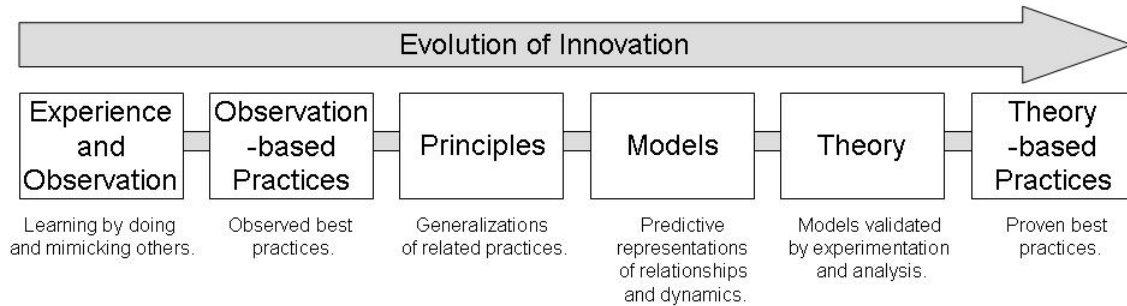


Figure 1. Innovation has evolved from individual experiences and observations to practices based on theories.

In its native form innovation begins with *observation and experience*. Someone notices something valuable and repeats the activity to repeat the benefits. This may come from a new technology, a new process, or a unique application of something that has been around for years.

These observations lead to *practices* that appear to capture the value noticed in observation. The practice-stage of innovation focuses on selecting and fine-tuning specific practices to improve results. However, practices are very limited and not immediately extensible to other businesses, activities, or products. Therefore, practices are soon extended into principles.

Principles are rules that seem to generalize the important aspects of specific practices. The foundational literature of management, the works of Henri Fayol [7] and Chester Barnard [8], focused on extracting general principles from their years of experiences, observations, and practices. They hoped to provide a foundation upon which big businesses could be built and thrive, without reliance on the intuition and experience of a single outstanding leader.

Where principles derive from historical information, *models* attempt to structure this knowledge so that it can be extrapolated to future applications. Models attempt to describe both facts and the relationships between them to create a dynamic representation that can identify what the past and present mean to the future. Most models do not claim to be exact representations of a real system, but rather capture useful information and make predictions better than a less structured view of that information.

Innovation *theories* attempt to get at an absolute truth about a system. They separate legend, intuition, precedent, and varied practices from objective truths that can be counted upon to deliver exact results. Theories are based on experimentation and analysis. Because of their exactness, the breadth of theories may be limited by what can actually be proven. But theories also serve as a solid foundation upon which new ideas and experiments can be built.

Finally, *theory-based practices* close the loop. These replace limited observations with limited theories in describing the most appropriate practices. Theory-based practice is the

core foundation of science. But in management, the entire spectrum of innovation from Figure 1 is at work daily across the world economy.

Historically, practicing businesses have worked from observation, experience, practices, and principles, while models and theories have been the realm to academics, researchers, and consultants. Combining these two communities allows practitioners to move from observation-based practices to theory-based practices. Since this progression of understanding takes time, it assumes that the derived theories remain applicable to the environment from which the data was collected. In a fast changing field, it may be impossible to create theories at a pace that remains current with the environment in which it will be applied. In some fields, change is so rapid that practices based in observation are better than those based on theory because of the currency of observations and the age of the information upon which a theory is built.

The sheer number of popular books on innovation indicates that most practices and models are based on observations rather than theories. A search of the Amazon.com database identifies 12,560 available titles on “innovation”. When the search is narrowed to business titles published in the last 20 years, the list shrinks to 2,371. Figure 2 shows how these titles are distributed over each year, clearly indicating a rapid increase in 1997 – the year that Clayton Christensen’s *Innovator’s Dilemma* appeared [9].

Innovation Books Published Annually

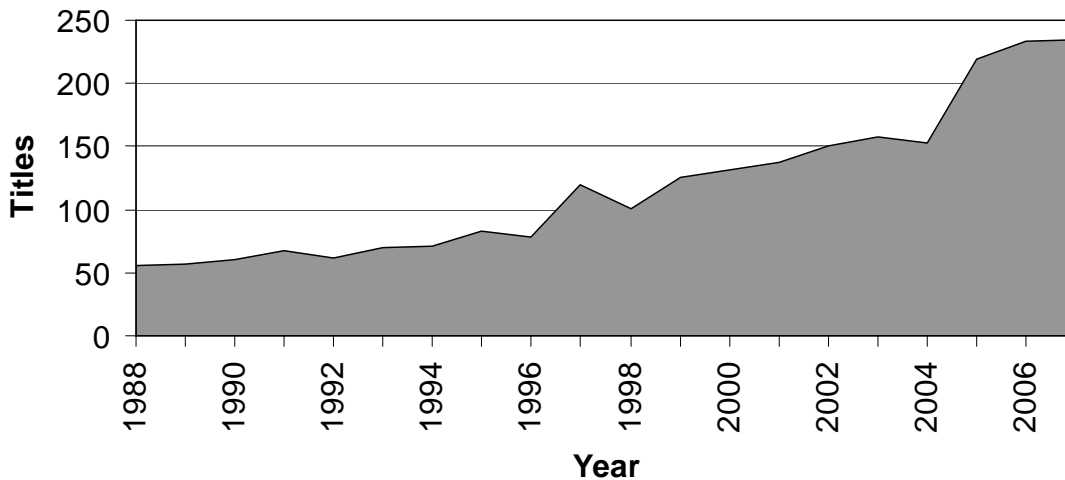


Figure 2. Annual book titles on the topic of innovation has risen from 56 titles in 1988 to 235 titles in 2007, resulting in a cumulative twenty year library of 2,371 titles.

Source: Amazon.com

Buderi’s account of 19th century Bayer identifies one of the company founders as a chemist. The company showed its persistence in creating new products using every means possible. It initially tried to create new products on the manufacturing floor as an integrated part of the production process. When this failed, they experimented with hiring

chemists and allowing them to remain at their universities to interact with other faculty members, seeking to isolate their chemists from the distractions of production problems. This did not yield results within one year, so the company pulled the chemists back to the factories and assigned them to specific production lines. However, Carl Duisberg, one of the young chemists, settled into a research lab and spent the next two years inventing three new colors for the company. Bayer's persistence in trying new methods along with the arrival of a talented researcher led to new products, higher profits, and a much larger research organization centered around Duisberg, who later became a member of the company's board of directors.

Regarding invention, innovation, change, and renewal, Charles Kettering told the United States Chamber of Commerce in 1929, "I am not pleading with you to make changes. I am telling you you have got to make them – not because I say so, but because old Father Time will take care of you if you don't change. Advancing waves of other people's progress sweep over the unchanging man and wash him out. Consequently, you need to organize a department of systematic change-making." [1]

Alfred North Whitehead famously said that, "The greatest invention of the nineteenth century was the invention of the method of invention." [10] What has been the greatest invention of the twentieth century and how are we using it in the twenty-first century? Could it be the invention of the methods of innovation? What do we really understand about innovation? That will be the primary focus of this column. We will explore current principles, models, and theories of innovation and make some attempt to understand how best to use them.

Sidebar textbox:

Innovation:

- the introduction of something new (Merriam-Webster Online)
- an idea, practice, or object that is perceived as new by an individual or other unit of adoption [3]
- an activity or action that creates value from materials, processes, or ideas that are available to many people, but which have not been recognized or explored by others

Model:

- to abstract from reality a description of a dynamic system [11]
- a representation of an actual system [12]

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