The DNA of Ideas

Systematically creating coincidental product evolution By Yoni Stern and Amnon Levav

IN 1928, ACCORDING TO LEGEND, a spore drifted into Alexander Fleming's lab in Paddington, London, landing on a culture dish and triggering a chain of events that eventually revolutionized the treatment of bacterial infections. The invention of penicillin was, in essence, a product of oversight and coincidence. But is there another moral to this tale? In addition to the understandable drive to find solutions to problems, it may be beneficial to look at what you have and search for the problems that it solves.

Suppose you want to come up with a new product idea. Where do you begin? The challenge is to create products that answer unmet needs, especially where a new product addresses a latent need of which even the market was unaware. Unfortunately, most new products tend to be of the former type, and, even worse, prone to competition. Why does this happen so often?

Most companies rely on three sources to develop new product ideas: 1) market knowledge and research, 2) surveying competitors, and 3) new technologies. The first two sources are important for a company's portfolio but are not conducive to product offerings that distinguish one company from the competition. The third can be, but only provided that the company has access to technologies that are not available to others.

There is, however, a fourth source for developing new ideas: using existing products as a basis for ideas. Based on internal company resources and expertise, this can serve as a strong differentiating factor between companies that know how to utilize it and those that do not.

Systematic inventive thinking (SIT), a novel approach to idea creation and innovation, is based on this source. The method has been used by hundreds of companies in more than 20 countries, including healthcare organizations such as Kodak Health Imaging, Ethicon Endo Surgery (Johnson & Johnson), Siemens, and Teva Pharmaceuticals, to help them "listen to the voice of their products."

At the heart of SIT is a crucial idea: Inventive solutions share common patterns. Inventors unknowingly follow patterns when generating new product ideas – patterns defined by observing thousands of products and their evolution. Surprisingly, a majority of new and inventive products can be categorized according to only five patterns.

One of these patterns is called, in SIT parlance, task unification, which occurs when one of a product's components (or some other object in the product's immediate vicinity) is given an additional task without losing its original one. A new medicine in testing for breast cancer takes advantage of the observation that tumor cells accumulate fatty acids much more than noncancerous cells do. The compound is made by chemically linking paclitaxel, a widely used anticancer agent, to DHA, a natural fatty acid present in breast milk. The design of this medicine can deliver more therapeutic agent to tumors and sustain therapeutic concentrations in tumor cells for longer periods of time than would be possible without the fatty acid. DHA, borrowed from the breast, is an essential component in the treatment of the cancer attacking that organ. True to the task unification pattern, the same factor that was formerly assisting the cancer to proliferate is now contributing to its destruction.

A second pattern is division. Here, the components of a system are divided and rearranged either in space or time. The basic structure of the immune system is one example. Lymphocytes are mainly of two types: B-cells and T-cells. When a T-cell comes into contact with an antigen, its receptor binds to the antigen, and it is stimulated to divide and produce three types of T-cells: helper T-cells, which stimulate the B-cells to produce antibodies; suppressor T-cells, which regulate the overall response; and killer T-cells, which kill the body's own cells that have been invaded by viruses or bacteria.

Links in The Chain

Rochester, N.Y.-based Vaccinex, a biotech engaged in the discovery and development of novel therapeutic antibodies, has developed a technology based on the division pattern. Forming the first stages in their antibody discovery process, immunoglobulin heavy-chain genes are separated from light-chain genes. They are then encapsulated in different vector particles and removed from the antibodies. Subsequently, host cells are infected with the recombinant vector particles, resulting in the host typically containing one heavy chain and one or more light chains. As the recombinant vector particles replicate, the chains are assembled into membrane antibody receptors. The antigen is then added to the culture and binds to the matching antibody receptors of a particular cell. The cell is selected, and the recombinant vector is extracted. This technology serves as an example of division, as it was made possible through the ability to separate heavy chains from light chains and rearrange them to produce new combinations.

Task unification and division are two of the five patterns that form the core of the SIT method. But in order to be able to proactively use the patterns to create future innovations rather than simply categorize historical ones, a systematic process has been developed to apply these patterns. The patterns become "thinking tools" to identify new ideas; they systematically create accidents.

This process is called function follows form, a term coined by cognitive psychologist Ronald Finke. Instead of innovating by identifying a "function" or need and then creating a product, one first manipulates the existing product and considers how the new form could be beneficial.

Using FFF, one develops products in the reverse order to the market research process. One begins with an existing concept or product – a list of the product's physical components and its environment. Then one of the five thinking tools is used to theoretically manipulate the product. These new "virtual products" in SIT-speak, are immediately assessed as to their value and feasibility. If the virtual product has market potential and falls within existing company and technological constraints, it undergoes needed minor adaptations and is considered worthy of follow-up. Market knowledge is used as a filter rather than the starting point; ideas generated are likely to be different from those of competitors.

A company that develops products to treat dermatological diseases such as acne might begin with a list of the current product's ingredients: benzoyl peroxide, alcohol, glycerin, etc., as well its immediate environment (e.g., the acne): sebum, Propionibacterium acnes, porphyrins, hair, and skin. It then applies a thinking tool – here, task unification – to ask: "How can each component perform the task of a different component?"

For example, we would ask how porphyrins could perform benzoyl peroxide's task. This virtual product would seem absurd at first, as these bacterially produced porphyrins perpetuate bacterial growth, whereas benzoyl peroxide kills them. However, we would recognize the immediate benefits of such a treatment were it possible – causing the acne to kill itself. Continuing with the FFF process, we check whether porphyrins can be manipulated to attack the bacteria that produce them. The R&D team recognizes that when porphyrins absorb certain wavelengths of light, free radicals are produced, which destroy the bacteria. The next stage involves looking for ways to incorporate this or a similar technology into formats available to the company. One can assume that were we to ask the market, its request would likely be for a stronger medication, or something that doesn't dry the skin. As Henry Ford said: "If I would have asked my customers what they want, they would have said a faster horse." Task unification can lead us in a direction of discovery rather than improvement – a new platform technology for a wide range of products.

By systematically creating "accidents" through controlled manipulation of the product's components, the SIT method, too, does not look to solve known problems, but concentrates on what could be done to the present form, with the company's present resources, in order to create a new one that makes business sense.

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