Focus: Innovation management

The secret of successful innovations

Decade after decade corporations have been looking for reproducible formulas that transform new ideas into marketable and profitable products. They analyze champions of innovation, benchmark, research, and test. And more often than not, what they finally come away with is that the rules for success used by other corporations and markets are not transferable. Yet nearly all innovative corporations live by three essential truths.
“Managers who forget how to dream and envision throw away the future of their companies.”

Peter F. Drucker, US economist
Money alone can’t buy happiness. And it won’t make you innovative, either. These were the rather sobering conclusions that Booz Allen Hamilton, an international consulting company, reached in 2005. Across the globe the sales numbers of 1,000 companies with the highest budgets for research and development (R&D) were compared. These efforts were for naught because it was not possible to draw a correlation between the trends for sales, earnings, or shareholder value and the size of the R&D budget.

Equally futile is the option to drastically reduced R&D activities, because companies that fail to create avenues for new products are traveling down a dead-end street. “Companies that produce have to be innovative to differentiate their products from the mass market. Innovations are often the only way to obtain suitable margins, especially in stagnating markets ruled by strong competition,” claims a current study by Bain & Company, a global management consulting company.

**Innovations are natural enemies of what exists**

Many companies are faced by this dilemma. Innovations are the natural enemy of what exists, what works, and ergo what should be continued for these very reasons. In large organizations, according to Rolf Berth, a German psychoanalyst and management consultant, every single person interested in change is opposed by five other people equally interested in maintaining the status quo. “Large companies tend to defend their success. Innovative ideas are usually put on the back burner,” says Reinhold Achatz, head of Corporate Research and Technologies of the Central Research group at Siemens. “The objectives of a business unit are frequently aligned with quick rates of return. This makes it difficult for new innovations, especially those of seemingly disruptive and radical nature, to be given the necessary time before they turn profitable,” confirms Klaus Streubel, CTO of Osram. “Large companies like Bosch that are not listed on the stock market do not need to hurry innovations to market.”

“Never change a winning team” – this soccer rule can apply to products as well. And occasionally – usually in low-tech fields – there is a Coca Cola, a Big Mac, or a Post-It Note, products that change only slightly over the years but continue their success story for decades. But even companies that profit from these proven workhorses innovate to enter new market segments.

Companies that rely for too long on proven products, especially in technology-driven sectors, disappear quickly from the marketplace. For example, as established by the industry associa-
tion Spectaris, more than 30 percent of sales in the German medical engineering sector is generated by products that were not on the market three years ago. For the overall German economy, the Center for European Economic Research (ZEW) in Mannheim determined that new products accounted for a good 16 percent of sales.

Innovation methods specific to the industrial sector

But how will companies be successful with new products when money and good ideas alone simply fail to pass muster? The answer lies in a system that may vary greatly from country to country, from sector to sector, and from company to company. Google proved this point by allocating 20 percent of the employees’ work hours for projects that had nothing to do with their actual jobs. It helped the company to stay in touch with real-life needs and to recognize new opportunities. The technology company 3M has set aside 15 percent of work time as well as a financing fund called “Genesis” to give its employees the means for developing innovations – again, proposals and follow-up are tied into a structured process.

However, in the food or automobile industry, classic market research appears to be successful. It does have its limits when the objective deals less with detecting needs and adapting product developments than with defining new products. Years ago, when General Motors developed a questionnaire designed to find out what the average customer wanted in a perfect car, the results looked very much like a – Toyota.

Lots of studies, lots of recipes for innovation

Because new products are so important for the success of a corporation, there are always studies underway trying to determine the secrets of innovative companies. In a study by McKinsey & Company, a corporate consulting company, three elementary characteristics were determined after examining how innovations were produced at 28 American and European corporations. Corporations that showed the best results recognized their project goals early on and defined them quite clearly. They favored a strong project culture and were in close contact with their customers for the duration of the project.

A study by the European Foundation of Quality Management (EFQM) reached a different conclusion that does not necessarily contradict the other results. The findings of the EFQM: The most important factor for successful innovations

Cooperation leads to success

Siemens’ ongoing interest has the company enter into new and highly promising cooperative agreements with universities, research institutes, and industrial partners to expand its innovation portfolio. “It has helped us to generate numerous solutions that sustainably support our business,” reports Dr. Dieter Wegener, CTO of Siemens Industry Solutions. The closest form of cooperation is the “Center of Knowledge Interchange” (CKI) with academic institutions worldwide. They are established directly on the campus of partner universities and headed by a Siemens manager. Responsible for a wide range of activities, this manager coordinates the cooperative efforts, identifies the most important cooperation partners, organizes workshops, and places students with the Siemens student programs. Currently, ten different CKIs are active, among these are the TU Munich, DTU Copenhagen, Tsinghua University, Beijing, MIT in Boston, and the University of California in Berkeley.

Even closer forms of cooperation for more innovations are Technology to Business Centers (TTB). A number of Siemens Divisions participate financially as well as professionally in independent young companies that are working closely with partner universities. For example, California start-up company Progressive Cooling has developed an extremely bright and efficient light source (see photo below) from LED lamps, which is based on a concept developed at the University of Cincinnati. The TTB in Shanghai is also involved in LEDs. In its Outside-In-Innovations strategy, TTB includes potential vendors who can be used for introducing technologies from third parties.
Siemens has two central tools in place for detecting trends and possible business models early on: “Picture of the Future” and “Innovation Benchmarking.” The “Picture of the Future,” a central tool for innovation management at Siemens, is used to get a clear idea about how to move successfully into the future. For one, road mapping is applied, that is, to update known technologies and product families for the future. This method estimates at what point in time certain technologies will be available as well as needed.

Known disadvantages: it is not possible to predict leaps in innovation or discontinuities. To be able to do just that, Siemens developed future scenarios for 10, 20, or 30 years from now in parallel to the “Picture of the Future.” These scenarios also include, for example, assumptions regarding social or political changes, developments in the world economy, demographics, or changes in climate. From these data, Siemens derives tasks that have to be resolved today to be successful tomorrow. The combination of these methods helps to identify areas with growth potential and broad effects as well as to detect future customer expectations and business possibilities. In the final analysis, the technology selected by Siemens hinges on two questions: How large is the market and what is the expected market growth? And what’s more, does Siemens have the necessary expertise or can it be obtained for the right price? “This trend diagnostic method has proven to be excellent,” says Dr. Albert Wick, CTO of the Industry Automation and Drive Technologies Divisions.

Innovation benchmarking, on the other hand, is a valuable basis for improving innovation management. Business Units are analyzed to determine whether or not they have the prerequisites for successful innovations. Based on a number of criteria, strengths, and weaknesses as compared to the competition are defined.

is good corporate governance and management, followed by corporate culture, market research, and, last but not least, the structure and organization of innovation processes.

Results after decades of research

The mountain of scientific and empirical research shows that there are no surefire formulas. Innovation researcher Holger Ernst, professor and chair for Technology and Innovation Management at the internationally renowned WHU Otto Beisheim School of Management near Koblenz and head of the “innovation success panel to improve innovation management by benchmarking” compared dozens of innovation studies over several decades. The bottom line is that although every market situation is different, there are a number of elements that have been of steady importance to the success of innovations for decades, across industrial sectors and continents.

1. Formal product development process

It has to include the entire process and be fully defined for all areas of the project. It is not just a question of getting volatile elements like creativity or inspiration back on track again, but rather on how to proceed in a structured manner from the very beginning.

As Holger Ernst knows, “the quality of planning prior to entering the development phase decides the success of the product.” As part of this process, Siemens uses, for example, the “Picture of the Future” method (see box above) for the early detection of trends and future technologies. Within its Strategic Management Innovation (SIM), Osram has gone as far as establishing a central special department for disruptive innovations – new products that usually meet with the greatest resistance in-house. At Bayer AG, innovation management includes a “Stage Gate” process: To minimize the risk for
development projects, gates (stopping points) are defined early on. When reaching one of these gates, the development is tested and – if required – even stopped. There is rarely a successful international company that does not use a formalized, although widely differing, model – be it Phase Gate (BASF), Integrated Innovation Management (Beiersdorf), or SIMPL (Procter & Gamble).

2. Continual commercial evaluation
Innovations as such are not valuable – they have to create value. At times, in their state of euphoria, participants in the process could lose this simple connection. The study “Next Generation NPD” by Droege & Comp., a consulting company, claims that 85 percent of all CEOs noted the lack of sufficient information about the intrinsic value of new products within the framework of innovation control. That’s why it is necessary to separate the wheat from the chaff at exactly defined points within the innovation process – similar to Bayer’s Stage Gate process. “The market is changing rapidly, due in part to new competitors from the IT field who want to get into our business. For this reason, we put a lot of energy into commercializing new software applications in our products, for example energy efficiency or building energy management – and we are going to step up these efforts in the future,” says Helmut Macht, CTO of Siemens Building Technologies.

The most important for Holger Ernst is the decision made at the end of the design phase for an innovation. Personnel and finances increase drastically for the subsequent development phase – meaning that resources should be focused on the most promising products. One of the most innovative chemical corporations in the world, 3M in the US, has made this reasoning its mantra. Three out of four designs for...
Moving toward a digital factory

When it comes to optimizing the production process, the Siemens Industry Automation Division is renowned as a trendsetter around the globe – from product development and planning to production planning and manufacturing. The product portfolio of the Division integrates both the real and digital worlds of products and production. This is highly beneficial for customers, as they particularly profit from a drastically shorter time to market.

Universal system for all data

In the beginning, new products are nothing more than mere ideas in the minds of engineers and marketing experts. But once they are put down on paper or in the computer, they take shape. To become real, they need to be produced. The cycle from idea to market introduction includes many individual steps. Currently, they are based on closed standalone systems.

For an optimal process run, all data have to be systematically integrated across the entire value-added chain in a universal system. Siemens realized early on the need for integrating industrial software. With the “Totally Integrated Automation” solution, the company created a worldwide leading concept in automation technology on the basis of these products that are for one individually competitive, but also offer customers significant additional use when integrated.

Homogenous information structures

Siemens traveled a similar road in the product life-cycle management (PLM) area with the “Teamcenter” solution. This platform combines product data generated during the development with information from many other parts of the company – even up to data from vendors. This interaction guarantees homogenous information structures that are the prerequisites for a digital factory.

new products don’t clear the internal hurdle. Not because they would have been so awful, it is just that other products are even better.

3. Customer orientation

Customers are not just the recipient of innovations but quite often the actual trigger. Keeping this in mind, innovative corporations work closely together with their customers. “Creative entrepreneurs have to know what is technically possible; they also have to know what customers want, how the global value-added chain can be optimized, and how solutions can be brought to market,” says Reinhold Achatz, the head of Siemens Research.

A study on service innovations at Oestrich-Winkel, a European business school, shows that managers consider customer proposals the most important source for ideas. A questionnaire by the European Intelligence Unit confirms these findings. Accordingly, 41 percent of companies worldwide consider their customers as the originators of their best ideas, followed by those from heads of business units (35 percent) and in-house R&D departments (33 percent). An excellent example for close cooperation between customers and developers are the innovations for liquid crystal production at Merck in Darmstadt. Cell phone and TV producers decide on the ideal characteristics for their next screen – and Merck goes ahead and locates the right liquid crystal mixture. Another corporation, Procter & Gamble, is going as far as planning to create half of its new products in response to customer proposals. Most notably, in the invested assets sector, vendors in their role as worldwide specialized problem solvers in development partnerships are increasingly adding to the creation of innovations.

Customer feedback as a standard tool

To understand customer needs and as a method for determining market changes, questionnaires are required that are based on clear evaluation criteria, allow for comparison among competitors, and also target improvements. Siemens
Worlds grow together

Product development, production, and production automation have been separate worlds so far in terms of data processing. This will change in the coming years thanks to an extensive integration approach from Siemens. Using the “integration platform” solution, product data will be digitally and seamlessly used for the planning, simulation, and control of production processes. The result: increased performance of the individual products and a considerably improved working environment.

Currently Siemens, together with important customers in their respective industries, is developing consistent concepts and is ensuring their practicability in order to accelerate time-to-market by up to 50 percent. Siemens’ own experience as an industrial company plays an important role in this process, as challenges equal those of the customers when it comes to increasing productivity, flexibility, and efficiency.

 sends out these types of questionnaires on a regular basis as “Lead Customer Feedback.”

However, innovation researcher Hugo Wernst warns against catering too much to individual customer needs: “When the focus settles too much on just a few customers, niche products may be developed that reduce the success of new products.” He also recommends looking at market requirements as such. “If Henry Ford would have listened only to the wishes of his customers, he would have upgraded horse-drawn buggies instead,” warns Stefan Thomke, professor at the Harvard Business School.

But even if a corporation does everything right, successful innovation cannot be guaranteed. The bumpy road of a product, highly praised today, is well illustrated by the example of the hybrid engine. It was developed and brought to market by Audi, one of the most innovative car manufacturers. In 1994, the Audi 80 duo was the first hybrid production car worldwide. Unfortunately it did not sell. It may have been priced too high, or the time was not right for the drive concept, or perhaps it was some of both. Anyhow, the car was taken out of production in 1997.

Yet that very year, the Toyota Prius came on the market, using a similar technology. It was Toyota who managed the breakthrough. Today, approximately 400,000 vehicles are sold per year, primarily in the US, followed by Europe and Japan. And that in the face of massive resistance from the manufacturer’s own people. For a time, as Holger Ernst tells it, the developer at Toyota was joined by just one other fan – the Chairman of the Board.
Innovations that Siemens Industry predicts for its fields of business until 2020

**Industry Automation**

It will be crucial for producing companies to bring goods to market faster and to produce more flexibly to meet individual needs and fast-changing markets. Siemens integrates product and production engineering – from the first idea to the complete product. With industry automation and industry software, the entire value chain of producing companies is optimized – enabling customers in both factory and process automation to reduce their time-to-market by up to 50 percent.

**Mobility**

The key requirements will be sustainability, multimodality, and efficiency during operation and will be met by innovative products. In turn, this will lead to products such as a zero-emissions train, a train concept where no emissions are created, from producing energy to operating the train. The Vectron generation of locomotives, which already exists, points the way forward: it can be applied nationally and across borders for passenger and freight trains. The different performance classes and voltage systems enable flexible configurations, and country-specific automatic train control systems are easily replaced or supplemented. There will also be completely new fields of activities, for example, in electromobility.

**Drive Technologies**

In industrial facilities, highly-efficient electrical drive technology such as compressor stations for oil and gas, or electrically powered vehicles, are used to replace comparably less efficient combustion engines. Intelligent status monitoring of the entire drive train would increase the productivity and reliability of production systems, and machines. Customers are being encouraged to install energy-efficient motors in production (see image).
Industry Solutions

In the area of environmental technology developments and solutions will emerge that help reduce environmental damage. These could involve reducing or converting CO₂, or preparing and desalinating water in an energy-efficient way.

Siemens’ saltwater desalination is based on separating electrically charged sodium and chloride ions of the salt. In the picture to the left, a water sample is taken from the pilot installation for ocean water desalination for a taste and odor test.

Building Technologies

In the future communication will be entirely IT and IP based. This sector will see net zero-energy buildings. In decentralized Smart Grids, smart buildings will effectively coordinate energy supply and storage. The Green Building Monitor will not only visualize current energy consumption, it will also provide information for the useful incorporation of abstract data. In addition, building information models (BIM) will arrive on the scene; that is, integrated building models ranging from planning to operation.

Osram

Soon enough, there will be special energy-saving lamps, modules, and lights (LED, OLED) as well as new designs, including the integration of light into the construction material. Another step is light-management systems that are as easy to operate, as the Internet, and will be integrated into building management systems. Other interesting developments involve off-grid lighting systems. Additionally, there are high-performance laser and LED projectors like the pocket projector by 3M that can be connected to notebooks, cell phones, or cameras.
Open Innovation (OI) – this term describes how to generate approaches, competencies, expertise, developments, or suggestions from experts, customers, or suppliers outside the corporation. It includes top universities and research institutes from all over the world as well as customers, think tanks, other industrial sectors, start-ups, venture capital companies, employees, and even competitors. “For companies with a global base that possess a great deal of in-house knowledge, Open Innovation is a wonderful opportunity. Researchers from different departments are able to bundle their knowledge and leverage synergies,” said Frank Piller, professor for Technology and Innovation Management at RWTH Aachen. Huschke Dietmann, CTO of Siemens Mobility wholeheartedly agrees: “We are applying diverse Open Innovation approaches to utilize ideas from outside established networks. They will gain in importance.” For the systematic use of OI, Siemens has established an OI department for internal and external activities. Siemens won second place for its knowledge management and OI activities associated with the study “The European Most Admired Knowledge Enterprises (MAKE)” by the market research company Teleos. For OI, Siemens relies essentially on four methods: Internet-based network developments, competitions regarding ideas with and for customers, moderated Internet discussions, and personal roundtable discussions.

Expert networks
Online networks proved to be especially successful. In this case, e-brokers are included when dealing with especially challenging research. They get external problem solvers to contact Siemens: Siemens publishes research questions and explains the problems involved on the Web pages of e-brokers, for example NineSigma, vet2come, or Innocentive, and offers a reward for the best solution. And that solution could come from a large IT company in India or from a student in Korea, a professor in the US, or a hobbyist in Germany. To date Siemens has managed to solve about half of its problems – one of them was for an especially fast and efficient mail automation.

Employee network
TechnoWeb is based on the same principle. It is a closed Internet forum for registered Siemens employees. Every employee can offer his or her solution to problems or answer questions ranging from complicated technical issues to operating difficulties with Microsoft Word. This also makes TechnoWeb a tool for networking researchers from different departments within the company.

Innovation jams
Innovation jams are Web-based, usually company internal, moderated discussions with hundreds or even thousands of participants. In 2009 Siemens asked how future information and communication technologies like cloud computing could change business, and in return received hundreds of valuable responses.

Ideas competitions and roundtable discussions
When Siemens holds ideas competitions, it calls on the creativity of its customers by having them participate in finding new product ideas, usually via online platforms. Different from expert networks, the emphasis in this type of crowd sourcing is not on technologically mature solutions, but rather on innovative stimuli. In 2009 Osram held an ideas competition for low-cost and simple lighting solutions, and received over 600 mostly marketable solutions. Moreover, researchers at Siemens meet at least once a year with important partners in the market, and these include colleagues from Philips, a Siemens competitor.