

## How Lucent Power Systems Improved Innovation and Raised the Bottom Line

Jack McGourty, Lemuel Tarshis, and Robert Huljak

The Alliance Innovation Model, based on the practices of companies noted for innovation, has provided guidance since the mid-'90s to organizations striving to improve their new product development results. The current article documents the striking results achieved from the application of the Model by one company.

Larry Gastwirt  
Director

The Alliance sponsored a study of U.S. corporations renowned for their high rates of innovation in the early 1990s. Two of the current authors, Drs. Jack McGourty and Lem Tarshis, were the principal investigators. The study had two objectives: (1) to identify the factors that differentiate high innovators from lesser ones; and (2) to develop a model that would guide innovation efforts to improve business results. Results of the study were published in 1994.

In the sense used in the study, innovation was defined as the generation of new ideas leading to successful commercialization and utilization. The idea for the research was generated during discussions at Alliance meetings among a group of technology leaders representing Sponsor organizations, including Dr. John Mayo, then president of AT&T Bell Labs, and Dr. Ralph Wyndrum, also from AT&T. Both were major proponents of research that would result in an applied framework for organizational innovation.

Based upon detailed interviews of executives from specifically selected innovative companies, the investigators found that highly innovative companies:

- have a serious commitment to innovation;
- pursue it aggressively and strategically;
- develop and support specific policies and practices to create an innovative environment; and
- promote key and definable behaviors among employees, who are the ones ultimately responsible for innovation.

Subsequently, detailed quantitative survey-based studies were made of companies in

both the electronic and food industries to validate the postulated model. Using patents and revenue from new products as innovation measures, the postulated model was twice validated. The data clearly demonstrated that what appears to differentiate organizations, in terms of innovation, is their ability to sustain internal environments that promote key and definable behaviors that make up their cultures. Policies, practices, history, and strategy all are used -- knowingly or unknowingly -- to support the required behaviors.

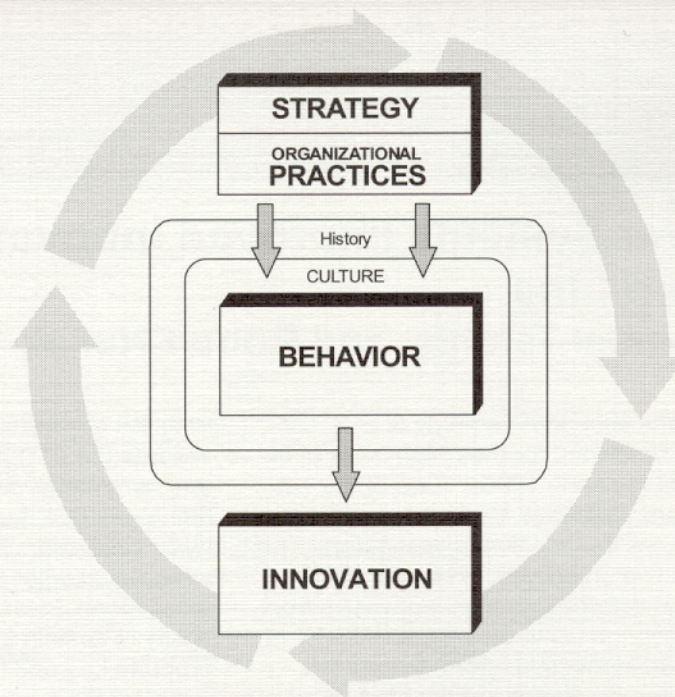
From these findings, the researchers developed the Alliance for Technology Management Innovation Model (Figure 1), which has been used by several organizations to guide innovation efforts. The most advanced use of the Model has been at the Power Systems division of Lucent Technologies. After five years (1995-2000), the results are remarkable increases in both patent productivity and revenue from new products, that contributed to a three-fold increase in total revenues for the business. This is how they did it.

### Background

Until recently, Lucent Power Systems was the world's leading producer of power supplies/systems for the worldwide telecommunications, data networking, and computer industries. While the company has been growing faster than the marketplace for the past three years, it has actually become number three based upon revenue. Competitors have grown more quickly through acquisitions, while Lucent Power Systems has been limited to organic growth. On December 29, 2000, the Lucent Power Systems business was sold to Tyco International for a reported \$2.5B. Key ingredients of the sale were



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**Figure 1. The Alliance Innovation Model**  
(McGourty & Tarshis 1994, 1996, 2000)

In an era of increasing competition and rapid change, skill at innovation is a major factor in attaining and keeping a competitive edge. The **Innovation Model**, illustrated above, serves as a guide to an innovation improvement program.

The model is drawn from the experience of companies renowned for generating large numbers of new ideas leading to commercially successful innovations. An extensive survey of 14 *best-of-breed* corporations widely recognized as leaders in innovation, along with substantial additional research, identified the factors responsible for these companies' success and produced a model for innovation.

The model depicts the inter-relationship of five primary components affecting innovation.

It focuses on **key individual behaviors** that translate into innovation-related activities. Previous emphases in the literature on personality traits, which are not readily observable and are difficult to measure, have been replaced by these behaviors, which can be measured and provide a much clearer map for organizational change. A corporation's **culture** plays a powerful role as social influence within the organization. It informs people

explicitly and implicitly of what is or is not important and expected. It helps to define norms and behavioral patterns. Innovative behavior by individuals is a function of the extent to which that type of behavior is expected, valued and supported by the organization.

The present-day operations of an organization are greatly influenced by past events and **history**. Such past events include actions or behaviors by founders and other key leaders and the evolution of the organization's core values and behavioral norms. A company's history can have a significant influence on contemporary culture and must be considered when attempting to assess and improve an organization's ability to innovate.

**Strategic direction and organizational practices** are controllable influences that play a major role in determining an organization's culture. Exemplary organizations systematically translate a clear and aggressive strategy into specific organizational practices that encourage innovation and exploitation.

By understanding and managing each of these interconnected elements, a corporation can create an environment that fosters innovation and can ultimately join the ranks of those who are already *best-of-breed* innovators.



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A company can raise its level of innovation by fostering specific individual behaviors in its employees. This research identified four distinct behavior patterns – and the specific individual behaviors listed below – that are common to all leaders in innovation.

### Inquisitiveness

- Search purposefully for useful new ideas and technologies.
- Challenge each other's ideas in a constructive way.
- Search for and incorporate diverse points of view.
- Seek information from expert sources outside the organization.
- Continuously experiment with new ways of doing things.

### Collaboration

- Facilitate and encourage informal relationships across the company.
- Encourage constructive conflict while deliberating over new ideas.
- Downplay status differences and encourage input from junior associates.
- Collaborate with associates outside their own functional area.
- Collaborate with people outside the company.

### Advocating New Ideas

- Encourage and support the ideas of fellow associates.
- Challenge the status quo.
- Pursue ideas despite risks.
- Champion new ideas by promoting them.
- Use failure as a way to develop new ideas.

### Goal-Directedness

- Work toward specific technological goals and objectives.
- Guide work with both technological and business goals in mind.
- Screen ideas in relation to established technologies and business objectives.
- Create action plans and timetables to ensure technology/business goals are met.
- Actively monitor progress to ensure that technology goals are achieved.

**Figure 2.**  
**Innovative Behaviors**

Power Systems' \$1.6B revenue, profitability, strategic customer base, global development and manufacturing facilities, strong management team, and the reputation of being the industry's innovation leader.

Even though Lucent (AT&T at the time) Power Systems won the prestigious 1992 Deming Prize, Japan's award/recognition for total quality, its revenue remained virtually flat through 1995. During this same period, the industry enjoyed double-digit growth. In addition, only 20% of Power Systems revenue came from new products and more than 80% of the first shipped new products were being returned by customers as defective. As a result, morale was low and senior management was making most of the decisions in reaction to customer/market concerns and problems.

Furthermore, an earlier (1988-1990) move of personnel from the Bell Laboratories in New Jersey to Power Systems headquarters in Texas had seriously damaged morale. The totally different cultures -- that of the laboratory environment and that of the production facility -- had not mixed well.

Viewing the situation at Power Systems in 1995, the

outstanding reputation of Bell Labs (many employees still carry the Bell Labs logo on employee badges) was attracting the best people, and the receipt of the Deming Prize had added to company pride. However, the drive to win the Prize had exacted a harsh toll, creating a cumbersome bureaucracy in that everything was highly "metricized" and overly focused on paperwork rather than on growth.

More time was spent in filling out forms and putting together charts and reports than in analyzing and proactively correcting problems or identifying and exploiting opportunities. Ironically, in going after the prize, the business had lost sight of what the prize actually was intended to generate—to improve business results.

Several problems that existed at least through 1995 in the areas of strategy, practices and behaviors were identified. The most important were:

- Business goals were confused. Management, which had been focused on quality with little emphasis on revenue growth, had inadequately spread the word that growth was now the new strategy.
- There was little, if any, advocacy for new ideas. Most decisions were being made at the top of



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the organization, and no real empowerment existed. As a result, people would not take risks due to a fear -- real or perceived -- of being punished.

- Collaboration across functions was virtually non-existent. There was a major emphasis on individual technical activities. Leadership was confusing its goal direction by not prioritizing work, which created extensive multi-tasking and turmoil for the organization. There was a long list of desired product developments and the list kept changing constantly. People were working on everything, and not concentrating on what was important or critical.

As a result of these factors, employees said, the division had not been innovative and its stagnant business was clearly reflecting that.

New management, coming in mid-1995, was aware of the Alliance Innovation Model and wanted to use it to make some changes. As part of their efforts, management sponsored an initial benchmarking of the organization in 1995 against the *best-of-breed* sample, using the Innovation Model.

**Basic Principles of the Innovation Model** (Figure 1) Before illustrating its application to the Power Systems business, let us review the primary tenets of the Innovation Model:

- Organic growth is highly dependent on innovation, the process of expeditiously introducing high quality new products at targeted costs.
- Sustained innovation, in turn, depends on key individual employee behaviors that translate into innovation-related results. Specifically, the Model identifies four distinct behavioral dimensions (Inquisitive, Collaborative, Advocative, and Goal-directed), common to all leaders in innovation. (see Figure 2)
- An organization's history, strategy, policies and practices directly influence these behaviors. By identifying and describing these elements, the Model makes the process of innovation finite and quantitative.
- All of the elements just mentioned are interrelated and part of a system that determines innovative output. Each element can have a positive or negative impact on the others. Through understanding and monitoring these elements, an organization can create an environment that fosters innovation and ultimately attain growth objectives.

## How Power Systems Applied the Model 1995-1997

In 1995, management launched an effort to improve and increase product innovation -- output from product development -- in order to achieve total revenue growth. The new General Manager laid out new business objectives:

- Refocus on business growth
- Achieve a higher rate of throughput, getting from concept to market more quickly
- Reduce product development cycle time
- Accomplish the above without adding a lot of staff
- Create an enthusiastic “pull” rather than “push” environment throughout their stage-gate Product Realization Process (PRP), to encourage innovation.

During the two years that followed, using the Innovation Model as a guide for defining appropriate efforts, business management made it clearly known that the main goal of the business was growth. Additionally, they started to streamline the PRP and make it more user-friendly.

Contrary to an initial hypothesis that the product development process caused the company's limited success with new product introductions, the process itself was independently assessed as being excellent, *on paper*. What was wrong was that the process was not being properly employed. Instead, it was being used in a manner similar to how Total Quality Management (TQM) has been practiced -- emphasizing form over function.

In the bureaucratic environment that prevailed, employees were using PRP more as a *rule* than a *tool*, dotting all the i's, crossing all the t's and doing everything the written guidelines stated, failing to recognize that the goal was *commercialization* rather than *process execution*. They had developed risk-aversion (non-advocative) and self-protecting behaviors. They were generating papers instead of ideas and completing forms instead of developing products. To illustrate, one product manager displayed a stack of papers as high as a conference table! These were the actual papers that had to be signed off on, even though the project was a small and simple one.

Between 1995 and 1997, the division began to experience some positive results as patent rates, revenue from new products and total revenue all increased. The organization attributed these results to having stated the new growth objective and to newly structured product development teams utilizing a streamlined



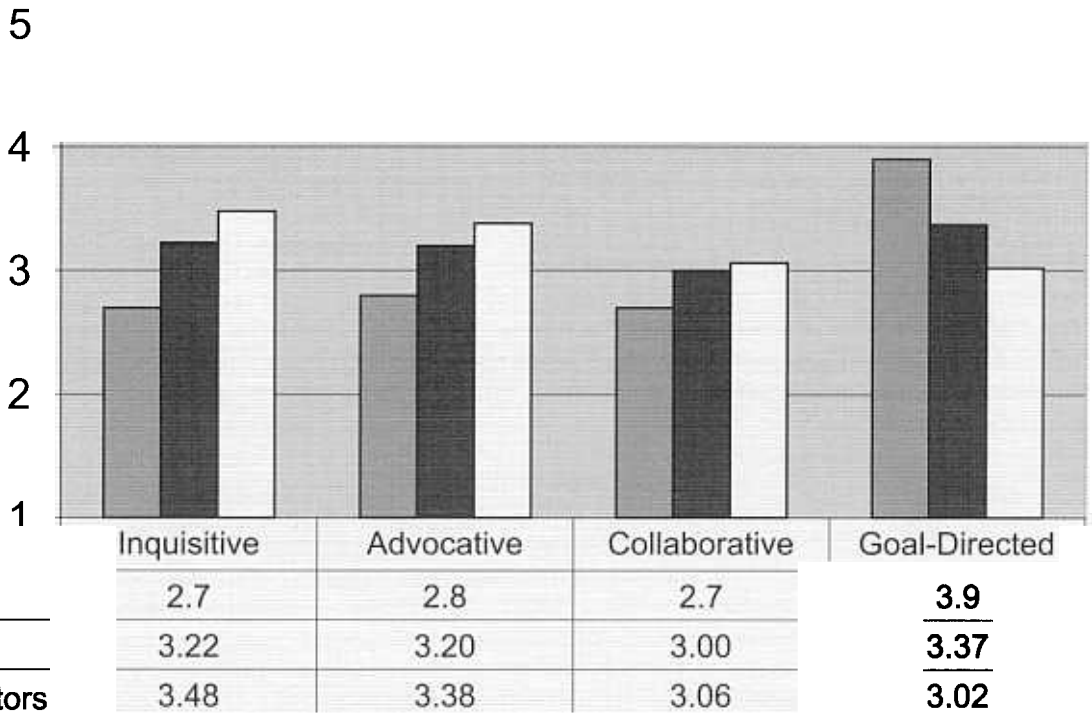
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product realization process.

Despite its stated growth objective, however, the organization was not yet really committed to growth and was not following through on recommended actions defined by the Innovation Model. This was shown by a second assessment in 1997 using the Innovation Model, as discussed below. Management seemed especially tentative about tackling some of the fundamental advanced behavioral aspects as prescribed by the Model. Virtually all of the innovation efforts languished, with only the PRP streamlining taking permanent hold.

Model, backed by a strong commitment from senior management, to improve innovation. He became the advocate for innovation activities and has championed the program since then.

The new effort began with a reassessment of the environment using the Innovation Model survey, which indicated that the Power Systems' culture had improved somewhat since 1995, along with the business results. In addition, the company was having limited success with empowerment, as evidenced by a greater number of issues being resolved by the product development teams. However, the culture, as measured by the inno-



**Figure 3.**  
**Power Systems Behavioral Trends**

1997 - 2000

In 1997, the third author of this article, Bob Huljak, joined the Power Systems division as Chief Technology Officer (CTO). He realized that, like most companies, Power Systems would require shorter and continuously improving product development cycles to achieve aggressive growth targets in a rapidly changing and highly competitive marketplace.

He was familiar with the Innovation Model and was also aware of the company's limited success in using it to date. He believed it would be productive for the company to initiate new efforts to employ the Innovation

assessment, still was not satisfactory and much more had to be accomplished in terms of bot-

tom line results.

The new CTO looked again at the model. To develop a particular behavioral environment or culture, the model suggests looking at gaps in management practices and focusing on those that are likely to have the most impact on innovation. The gaps can be defined by benchmarking with *best-of-breed* data (the results of the earlier research) as well as by innovative thinking based on insight gained from prior experience. Both techniques were used at Power Systems to describe new practices



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intended to develop desired behaviors.

### Focus on Behavior: Two Examples – Goal Directedness and Collaboration

**Goal Directed.** To improve its innovation and bottom line, management decided that they would need to change its excessive focus on total quality management programs (initiated earlier by the quest for the Deming Prize) to one of dynamic growth. About the same time, in 1997, the organization had another change in top management, a new general manager, Bruce Brock. He called for strong, dramatic and clearly defined growth with a vision, executed by a business team committed to new product development.

The business team began working on the front-end process, better defining, from a business perspective, what products needed to be developed. They focused on prioritization, deciding what it was their organization really should work on and in what order of priority. Priorities were made clear to employees and efforts were made not to change them too frequently.

The Product Realization Process was further simplified, utilizing a small number of gates with clearly defined expectations as checkpoints between empowered teams and management. These gates ensured congruence between customer's and management's defined needs and product development activities.

To further develop the desired behaviors for innovation, senior management issued a formal statement of operating principles for product development. This philosophy was explained to product development teams as the way management expected the process to function. It consisted of eight operating guidelines aimed at reducing dependency on measurements, management involvement except where needed, and process. The general philosophy included:

- Treat a product development project as if it were your own business
- Think about a project from the customer's perspective, the real essence of TQM that had somehow been lost
- Focus on overall project success, not individual functional metrics
- Manage risk to an acceptable level. This recognizes that high innovators, who are advocates of new ideas, constantly challenge the status quo and pursue ideas despite risk
- Use PRP as a *tool*, not a rigid set of absolute requirements or rules. Skip non-applicable tasks, but add any that are needed. Do not do anything in a prescribed order if it does not make sense

- Product development teams should manage the project to meet gate expectations and team members should ensure completion of functional tasks
- Complete activities between gates without management intervention, as long as hard-to-resolve issues are brought to its attention in a timely manner.
- Urge the continuing collaboration between engineering and manufacturing, from project start to completion.

These principles were given to everyone in the division. They also became part of the orientation package for new employees outlining to all the culture that Power Systems was striving to achieve.

The division renewed its focus on its definition of innovation growing more products internally, getting them to market at target costs more quickly and with higher quality. The commitment by senior management had now been made at last.

**Collaboration.** One of the major efforts between 1997 and 2000 was to effect true empowerment to product development teams. This was accomplished by strengthening the membership of the groups, making sure that each team consisted of committed representatives from all appropriate functions responsible for product development. Between gates, the periodic checkpoints for reviewing progress with senior management, each team was responsible for carrying out development without management intervention – unless it was required and requested.

Project managers, empowered to use the Product Realization Process as appropriate and to reduce the amount of management involvement, led the teams. More decisions, therefore, were being made at a lower organizational level. However, it was determined that greater functional skills were needed by some of the members of the teams.

For 18 months, management reorganized into functional units, including a discrete project management group. The idea was that employees who needed greater expertise would be more likely to obtain it in a functional organization.

When it was discovered, for example, that many project managers were not expert enough in leading teams or taking the required responsibility, the organization started appropriate training. The skill gaps relative to the desired competency levels were identified to determine training/development needs for individual



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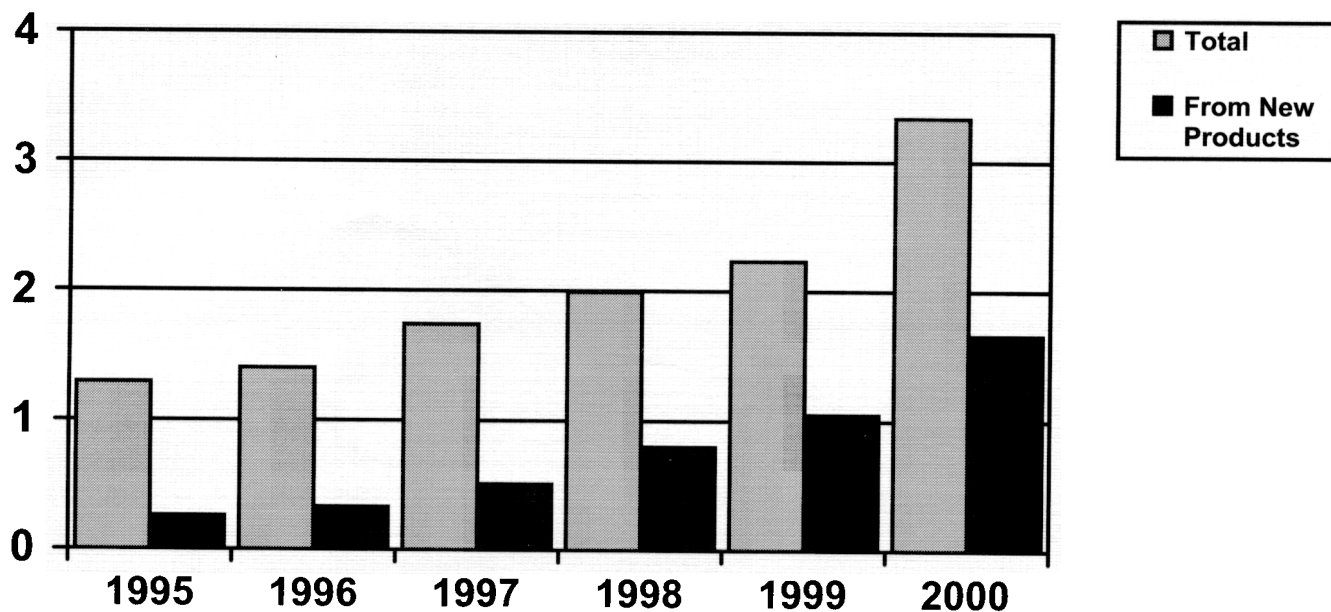


Figure 4.  
Normalized Revenues

project managers.

A recommended self-evaluation model said, in effect "Here's what the business needs from a project manager and here's where you are today." If an employee found himself weak in team leadership, for example, it would be his responsibility to define the needed education, and management's responsibility to provide it. The company, which has a tremendous capability for training people, introduced and improved programs to help develop the required expertise.

## Results

By the end of 1999 and through 2000, the Power Systems division reported spectacular results from its efforts to improve innovation and business results. A third review, in early 2000, of organizational behaviors and practices, using the Innovation Model survey, showed that, over a five-year period, they had made strong progress in approaching the behavioral levels of the highest innovators of the initial Alliance study (Figure 3). Power Systems had made remarkable progress in all four behavioral dimensions defined by the Alliance Innovation Model. They had gained in the areas of inquisitiveness, advocacy for new ideas and collaboration. They had also seen a decline in goal-directedness, a positive sign that they had become less rigid and less dependent on forms.

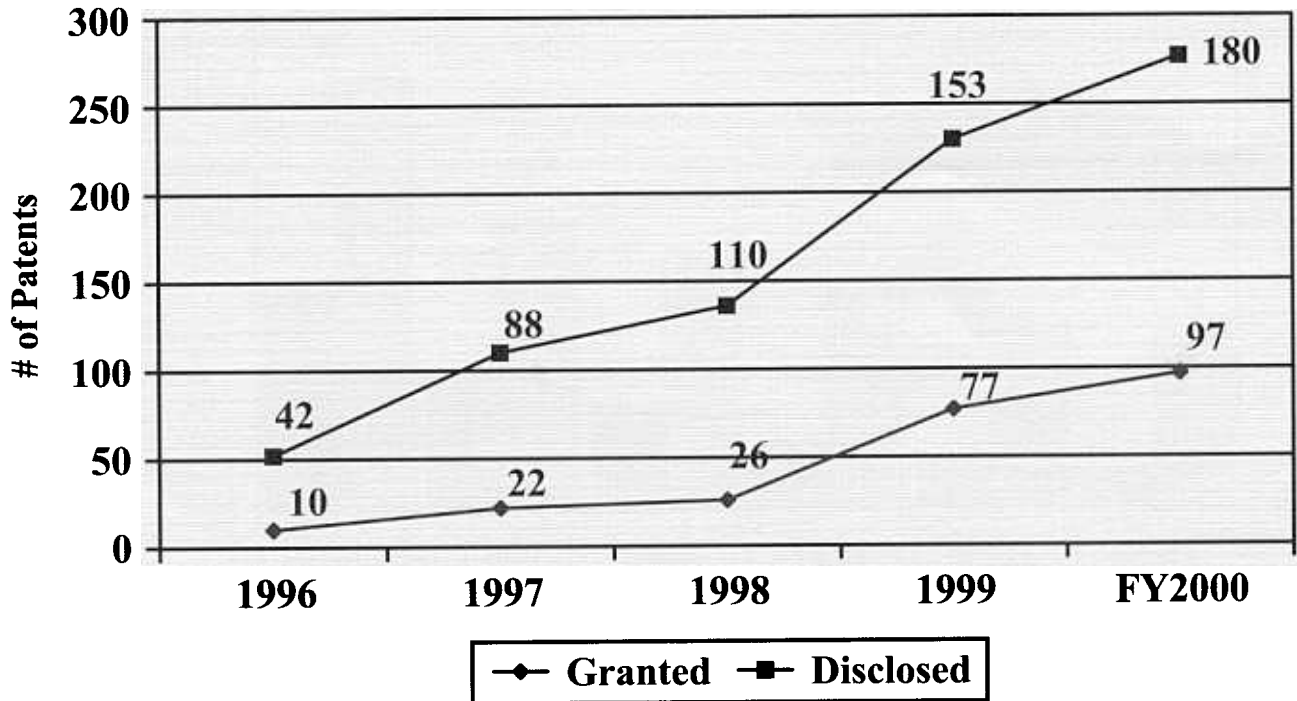
These measurable changes in behaviors, which are prescribed by the Innovation Model as indicators of an

increase in innovation, were echoed in a dramatic increase in bottom-line results by the end of 2000:

- Total revenue grew 300%. (Figure 4)
- Revenues from new products more than doubled, from 22% to the 50% level (Figure 4). Management believed that 50% of revenue from new products is optimal for their organically-growing business.
- The number of new products introduced went from fewer than 80 in 1995 to almost 200 in 2000.
- The percent of new products being returned early in product life declined from over 80% in 1995 to well under 20% in 2000. Power Systems is now realizing the quality level for new products shipped that had long been the goal.
- Over the five-year period, the division experienced a 900% increase in patent disclosures and a 450% increase in patents granted. (see Figure 5)
- All this has been accomplished with a small increase in personnel, less than 6%/year in the development area. This increase in employees also included the staffing of new European and Asian design centers, which had not existed in 1995.



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**Figure 5.**  
Patent Activity

COO of a highly successful retail corporation with over 200 locations.

## Conclusions

The results of the Power Systems innovation project proves that management cannot simply put goals on paper and expect to achieve them. Nor can it take just one kind of action -- such as increasing employee rewards for patent filings -- and expect that it, alone, will accomplish the objectives.

Innovation is based on an inter-related system of organizational practices and behaviors. Power Systems has demonstrated that management can effect a change in culture and can see positive results in as little as two years by following a systems approach, such as that embodied in the Alliance Innovation Model. A business can accomplish innovation if it encourages a particular culture, and the way to develop a prescribed culture is through the practices put in place. The key to success is a commitment by senior management. The first effort at improving innovation at Power Systems, did not have the commitment and did not achieve the desired results. When the current management became a champion of the effort, however, it succeeded.

## Authors

Jack McGourty, Associate Dean for Engineering at Columbia University, has worked with over 100 companies to measure and improve innovation rates in their organizations. Formerly, Dr. McGourty served as President and

Lem Tarshis has successfully managed international product businesses from consumer to high-technology enterprises. He managed numerous, commercially successful, new product innovations, including fiber optic cable TV distribution, the smoke alarm, and the plastic flat iron. Dr. Tarshis, who received his Ph.D. from Stanford University, is a Director for the Stevens Alliance for Technology Management.

Bob Huljak is currently consulting for the power industry. Mr. Huljak was the Lucent Power Systems Chief Technology Officer. As the CTO, he provided the technical leadership for the entire R&D organization. Prior to joining Lucent Power Systems, Mr. Huljak worked for IBM from 1970 to 1993 holding various technical and managerial positions.

Comments on Newsletter?  
Contact Dr. Jack McGourty  
jm723@columbia.edu