BEST PRACTICE CASE STUDY -- CHAMPIONING INNOVATION AT CORNING

SUMMARY

Many dream of reinventing themselves as nimble technology companies. Corning has actually done it. – Wall Street Journal

For over a century, Corning Incorporated has been a company synonymous with technology-based innovation -- today, the spirit of innovation is stronger than ever. This management case study will look at the evolution of the current Innovation process practiced at Corning. The case will describe the approach used to successfully create, implement and grow a world-class, systematic new product Innovation process. It will also chronicle those who have championed innovation as a best practice for nearly two decades.

In 1984, then Vice Chairman Tom MacAvoy was asked to “fix” Corning’s approach to innovation; the technology cupboard was bare. To get James R. Houghton (Jamie), Corning’s Chairman & CEO (1983-1996; 2001-current) to bless this effort, MacAvoy stressed the significance of the Innovation process as the most important Quality program in the company. Learning how to innovate on a systematic basis over a long period of time, formerly a tacit matter, was now to be formally articulated so that it could be practiced across the company.

Today, the Innovation process is alive and well at Corning. In fact, it is clear that the company’s expertise in this area is going to play a significant role in positioning Corning for sustainable value and growth. As Corning’s current CTO Joe Miller states emphatically, “Innovation will lead the way.”

INTRODUCTION

Corning Incorporated, responsible for at least three life-changing product innovations – the light bulb envelope, TV tube, and optical waveguides – celebrated its 150th anniversary in 2001. Known for shedding old, mature businesses while establishing its leadership in innovative new product lines and process technologies, the company was awarded the National Medal of Technology for innovation in 1993. The drive to remain innovative and reinvent itself is at the crux of Corning’s identity and has been since Amory Houghton, Sr. (Jamie’s great-great grandfather) founded the company in the 1850’s as a small specialty glass manufacturer.

In the 1870’s, Houghton’s sons – Amory, Jr., and Charles -- established Corning’s tradition of scientific inquiry and emphasis on specialty glass products. They believed very strongly in creating unique products for mankind and in staying away from the mundane and the ordinary. They believed, therefore, in innovation and research and development. The next generation, Alanson and Arthur, institutionalized research by
bringing under management the company’s collective ingenuity. In 1908, they set up one of the earliest corporate research laboratories in the United States, one of four at the time.

Corning’s experience since then offers countless examples in which innovative activities aimed at one objective have borne fruit in many different arenas. Employees have responded to business challenges by finding new and innovative uses for specialty materials. The company’s best business successes have resulted from its ability to tailor specialty materials for particular applications. We will focus on one such example, EAGLE2000™, in some depth later in the case, one which used the Innovation process to great result.

Starting with a semi-formal 6+-stage process used in the 1960’s and early 70’s, Corning’s Innovation process has evolved through five iterations to its current manifestation as a centralized component of product development.

DIAGNOSIS: STAY OUT OF OUR HAIR AND FIX IT

As vice chairman with special responsibilities for technology from 1983 to 1986, Tom MacAvoy found himself the target of open resentment expressed by the operating divisions, which seemed to believe that they had been bearing the burdens of an insufficiently productive centralized technical establishment for far too long. Business leaders were given extremely challenging P&L targets to meet. They felt the high cost and inefficiencies of RD&E were a major stumbling block to meeting their numbers. “Stay out of our hair and fix it” was the message MacAvoy was hearing.

Organizational Challenge

Innovation at Corning, as in U.S. industry more broadly in the 1980’s, was a concept that had fallen out of public favor. This did not mean that Jamie Houghton would cut the R&D budget as a percent of sales; he reasserted his personal commitment to maintain R&D spending at 4-5% at that time. Although this was twice the national average and quite competitive for the glass industry, it was hardly in the ballpark for a “high-tech” company, where 6-8% was closer to the norm. Today, in 2002, R&D spending is at 11% of sales.

One universal method of “fixing” R&D in the 80’s was to decentralize either the institutions themselves or the control over their funding – or both. At Corning, key managers still believed it was imperative to keep specialty glass and materials research physically centralized, but financial decentralization was a major plank of the profitable growth plan. The centrally located part of the technical community accordingly shrank from a high of 1,400 people in the early 70’s to a rump force of 800 people, including central manufacturing and engineering. Today, R&D is a mixture of centralized and decentralized resource allocation. Corning works hard to excel at creating linkages between the technology and the business. In fact, this drive is so strong at Corning that it overrides the natural organizational barriers inherent between the two functions.
Change Objective

To get Jamie Houghton to bless this significant change effort, MacAvoy had to stress the connection to at least two of the chairman’s Vital Few – Performance, i.e. 10% operating margin (at the time the OM was at 2%); and Total Quality Management. To be sure, Houghton’s preoccupation with Quality was complete. MacAvoy recalls:

I’d worked out some very simple arithmetic. Let’s say we’re spending $150 million annually. We’re probably wasting about a third of it, we just don’t know what third it is. If Quality is only about improving manufacturing we can get 5% at most improvement in gross margin. The rest has to be about improving the way we innovate. Finally I convinced him that this had to be one of the Total Quality objectives.

The change management mission was clear, and MacAvoy summarized the objective this way: A good research laboratory staffed by good people, skilled at sensing technical trends early; building relationships with OEM (Original Equipment Manufacturer) customers in growing industries; excellent links between scientists and engineers and through sales and marketing groups to customers.

It was also clear that, to achieve MacAvoy’s vision, innovation would become a key driver for change – Corning’s #1 Quality process, its #1 Vital Few. Innovation would challenge the traditional ways of thinking – it would challenge the corporation and its businesses to think differently about what was possible. Innovation would convert ideas into opportunities and those opportunities into sustainable streams of earnings for Corning.

ASSESSMENT

Except for a few key projects protected by top management and a few new products that had come in from the periphery, most other aspects of the RD&E program had fallen into a state of neglect. New product development was insufficient to sustain profitability, declines in new process development had allowed core businesses and acquisitions to become unprofitable, and the manufacturing sciences had deteriorated. There were, to be sure, pockets of promising technology here and there, but they were not strategically integrated even in the desired market-based businesses, end-use and systems-based products.

Corning’s defensive moves of the 1970’s and early 1980’s – to reduce research funding (down 20% in real dollar terms over the decade) in favor of development and to confine new investments primarily to low-risk product and process extensions and renewals – had set up a cycle of diminishing returns. Corning’s traditional practice of sponsoring exploration and “reach” projects across the board, as well as keeping up a certain level of risk-taking, had had the important side benefit of replenishing the company’s “technology till.” By the mid-80’s that till was in need of revitalizing – the cupboard was bare.
Further, much of the rest of the company was paying no attention to innovation at all, while low morale in the R&D organization itself was undermining the effectiveness of its projects. Innovations that did occur were based on extreme measures. Efforts to innovate were succeeding by acts of heroism or by fighting the rest of the company.

**APPROACH**

With Houghton’s blessing, MacAvoy placed innovation under the umbrella of Total Quality and, with that, was on his way.

The company’s innovation process previously had been defined only within the research, product development, and engineering communities, and now the company would work to make this minimalist, yet formal, process the central integrating mechanism across the broader community.

A major part of MacAvoy’s effort consisted of a systematic appraisal of Corning’s many past innovation successes and failures – its best practices and lessons learned -- from which he and his team aimed to develop an explicit, formalized description of Corning’s way of innovating – an Innovation Process.

**INTERVENTION: KEY ELEMENTS**

*Innovation is possible in every aspect of our work together.* – Tom MacAvoy

As the first step toward significant change, MacAvoy set up the innovation task force as a quality improvement team to find out why the rest of the company was dissatisfied with RD&E. Members of the team – including recognized Corning innovators -- invested months of their time, most of it over early morning breakfast meetings, which became commonly known as the Breakfast of Champions. So as not to ignore outside perspectives, the team retained an outside consultant as part of the program.

The first decision was to focus on Corning’s past history of successful innovation as an untapped resource, one that could be crucial to rebuilding morale. They also believed that the understanding of innovation implicit in the company’s shared memory needed to be made more visible. MacAvoy proposed a slogan for this effort taken from a well-known saying of Corning veteran Eddie Leibig: *We never dance as well as we know how.*

The group studied hundreds of Corning innovations, mining them for their larger meaning. Many of their generalizations matched those that were coming out in broader studies of innovation across the country: that high-caliber people who were willing to take risks and had good communication and team building skills were key.
Another factor stood out: Corning’s ability to very quickly concentrate maximum strength on a project of major importance, referred to internally as *flexible critical mass*. This method enabled Corning to tackle outsized opportunities. In addition, innovation at Corning had never been the sole province of scientists or even technical people. Corning had been good at identifying and developing innovative leaders with the right qualities throughout the company’s history, but this kind of leadership had gone by the board in the face of countervailing pressures to specialize, downsize or reduce the asset base, and shifts in balance between the short-term and the long-term. Finally, based on a review of current literature on innovation, the task force identified a five-stage Stage-Gate™ model that could be adapted for Corning’s case.

The Innovation Process, although depicted in a linear fashion for teaching purposes, is anything but linear. An iterative process by definition, innovation is one of the most fluid, yet socially complex of business processes. Innovation transcends the entire organization -- it is a way of enabling people to learn together; it provides a framework for a common language. Further, the graphic shown depicts the concurrency of three functional disciplines – typically organized as cross-functional teams for innovation activity.

Jim Riesbeck, Director of Corporate Marketing, acting as the marketing member of the *Breakfast of Champions*, cautioned against doing what many companies were doing at the time, which was to define the process of new product development in such minute detail that it reduced innovation to filling in endless checklists and inhibited creativity instead of enhancing it. The task force adopted a skeletal overview of the essence of a process, grounded in Corning’s own unique experience, to be used as an integrative framework. “We are going to make this a marketing document…We are really going to use this thing!” exclaimed Riesbeck.
As a second step toward significant change, MacAvoy orchestrated a two-and-a-half day innovation conference for more than 200 senior Corning leaders, intended to focus attention on innovation and re-introduce the Innovation process. Moreover, he reminded those in attendance that the conference’s subject matter was in fact nothing less than the company’s defining activity:

_In all cases, technology is involved and is at the heart of what we do. We lead primarily by technical innovation. Translating technology into new products and processes, into new ways to help our customers, into new sources of profit and growth – that’s what we’re all about as a company._

The task force had not limited its deliberations to celebrating Corning’s past achievements. It had also identified the key ways in which Corning had fallen short of innovating effectively. MacAvoy portrayed innovation as one of the top quality problems the company had. He firmly implanted the notion that improving the innovation process by 10% a year could cut costs in half. Doubling that rate would be equivalent to doubling the RD&E spending level. It came down to restoring several simple elements: an environment and culture of energy and enthusiasm, entrepreneurial behavior at all levels, the right people in the right places, sound business and technical strategies, improved processes for nurturing ideas, and organizational mechanisms that could support the organization’s drive for results.

**Turning Point**

The conference was a real turning point. The conceptual marriage of TQM and innovation was far more than simple rhetoric. While it would be another seven years before quality programs and innovation would work together on the same track, at least they began running on parallel tracks. A full decade would pass before the change in attitude inaugurated at the innovation conference would be reflected in significantly increased RD&E budgets, but a new generation of innovators with the necessary integrative skills was in the making. Today Corning sees a reinvigoration of this marriage between TQM and innovation effectiveness.

**Critical Success Factors**

Several enduring success factors emerged from the innovation conference. First, the articulated formal process provided a framework for training programs at all levels of the company, becoming part of the structure for project reviews and the basis for hiring and deploying personnel. One requirement for attending the training was to be part of an established team. Starting with marketing and technology and later spreading to other areas of the company, attention was paid to fostering innovators and creating integrated technology plans. According to Charlie Craig, later Division Vice President and COO, Science and Technology, “The graphic we use says it all. The exclamation points
represent people, motivation and the excitement of innovation -- the most important ingredients.”

The long-term benefit of having the five-stage innovation process and training people across the company in its use was that, in an era when “time to market” became the competitive issue for industry at large, Corning had already developed the routine practice of including all major parties in any new process or product innovation as early as possible. Ted Kozlowski, one of Corning’s key development managers for many successful products, commented that the relations between people were critical.

Another consequence of the innovation effort was a rise in internal entrepreneurial behavior. At Sullivan Park in particular, technologists were allowed to supplement an essentially flat R&D budget with sales of shelf technology, sales of services in which Corning had particular expertise, and increased government contracting for technologies they wanted to pursue anyway. Those who were willing to expend the effort were given the latitude to form small enterprises.

Yet another success factor was possibly the most unusual for companies at the time: the continuation of a practice of collective self-examination that previous Corning generations had also employed. In reviving the practice of storytelling, the task force showed that reinvigorating shared memory was a powerful way to build the company’s collective ingenuity. It tied the notion of best practices not solely to the dictates of outside experts or to the examples of other companies, but to the recovery of grounded experience in the company itself.

Additional components were to examine innovation as it impacted marketing and manufacturing.

**Innovation in Marketing**

Corning needed to focus on its effectiveness in both approach and deployment of resources to understand current and future customer and market needs – a weak point traditionally. Included in this focus was – and still is -- the assessment of current performance, development and execution of improvement plans. The prescription involved people in all functions and levels collecting data, applying analytical tools, developing insight and sharing that insight throughout the organization, which today supports Roadmapping, Portfolio and the five-stage Innovation Process itself.
In addition to a renewal of innovation at its R&D centers—the obvious place where creativity matters—manufacturing processes, too, would benefit from a return to Corning’s roots. While Corning was working to regain its position at the forefront of innovation, by inventing unique materials, processes and technologies, its manufacturing operations shared some common problems that made it difficult to sustain their lead over competitors. The quality effort was already doing much to improve manufacturing discipline in all of Corning’s plants when management asked Roger Ackerman (who, in 1996, succeeded Jamie Houghton as Chairman & CEO, until 2001) launched a company-wide assessment of its manufacturing operations in 1986.

As the innovation process evolved, the need to develop inherent linkages between technology, marketing, and manufacturing became critical, as each component was an equal leg in the three-legged stool of innovation.

Ed Sever, former plant manufacturing engineer, states:

It’s as true in plants today as it’s ever been -- anytime there’s a major project, we make sure that there’s a plant person assigned to the team...who knows they are the receiver, that it’s their job to help make this thing happen, and they ought to be pulling equally as hard as they’re [R&D] pushing.

HIGH-TECH COMPANY

Knowledge, risk, cost and time to market are critical to successful innovation in a high-technology company. – Charlie Craig

By the early 1990s Corning had demonstrated by means of its effective adoption of quality and innovation as complementary disciplines that a future as a high technology company was a strategic option. Jamie Houghton’s address to the Industrial Research Institute in 1993, on the tenth anniversary of his earlier address to that body, was a sign that this was so. Innovation, Houghton declared, was the glue that bound all functions into a cohesive team of inventors, producers, and innovators. Speaking of the obligations of general management leadership in high-technology product development and marketing, he argued that Corning had significantly improved the effectiveness of its RD&E – the quality and rate of its innovation -- by applying TQM principles to innovation.
In my view, Innovation is absolutely an integral part of Total Quality; in the mid-1980s, it was the largest single cost of quality problem we had in the company. If we can continue to move forward on this, if we can get another 10-20% better in being more effective in linking our technology to the marketplace, we know what a huge opportunity it will be for us. – Jamie Houghton

**Corning Competes**

Immediately following Houghton’s address to the Industrial Research Institute (1993), Corning launched *Corning Competes*, a program designed to reengineer its key business processes. Deliberate in its choice to reengineer rather than restructure, Competes represented a reinvestment in Corning’s business processes through continuous improvement of best practices. It also provided the necessary tools for better communications among the technical and business constituencies. The company needed to enhance its capability to compete for present and future business, while improving its financial performance.

As the Innovation process was the #1 cost of quality in the company, the goal of the Innovation Effectiveness team was to enable Corning to get the most from its innovation investment in product and process technologies. To ensure that the company was well positioned for growth and profitability, the team sought to “reengineer the process by which Corning creates, identifies, evaluates, prioritizes and executes against market opportunities.”

Equally pressing within the technology community was the need to drive discontinuous improvement -- to instill a “step change” within the continuum of best practice continuous improvement. The company had to manage a culture change that would enable it to strike a balance between continuous improvement and the step changes necessary to deliver breakthrough technologies. In point of fact, some of Corning’s greatest profit-producing technology breakthroughs had come from just that – from achieving that delicate balance between incremental improvements on the one hand and breakthrough invention on the other -- leading to new product and process commercialization. Going forward, this kind of innovation would be “the ticket” for Corning.

**Innovation Today**

The continued focus on innovation at Corning today – with an ever-evolving, dynamic process, featuring pronounced cross-functional and cross-disciplinary integration -- has allowed the company to make decisions faster and closer to the point of action. Implemented flexibly yet with rigor, it allows people and projects to overcome both internal and external barriers, to be agile – gaining, sharing and acting on new information and insights -- providing more opportunities to innovate, reducing product development time and enhancing customer relationships. In short, it allows the company to outlearn and lead the competition.
Through generations of change at Corning, innovation is the sustaining thread throughout. “Innovation is in Corning’s DNA,” says Charlie Craig. It is what allows the company to reinvent itself – most often through the reuse of its technology -- which it has done sixteen times in its 151-year history. The company champions and nurtures innovation; it uses innovation as a means to succeed.

To illustrate with a current example -- One way Corning is dealing with the telecommunications industry collapse, where an entire market disappeared seemingly overnight, is to repurpose and redirect its investment in intellectual property around optical technologies, clearly into a technology that is non-telecommunications related.

Another use of a core technology resulted in EAGLE2000™, a prime example of innovation at Corning today – innovation at its best.

EAGLE2000™ – Best Practices

*Innovation has always been the hallmark of our success.*  – Jamie Houghton

**Background**

Corning has a long tradition of building on and reusing its existing technology and knowledge bases to innovate and create new business opportunities. An important example is the Fusion process, developed in the early 1960s by Corning engineers. Initially used in combination with a newly developed material, Chemcor (chemically strengthened glass for manufacturing automobile windshields), the Fusion process lived on when the windshield market did not materialize for Corning.

During the 1970s, Corning scientists at the company’s research facility in Fontainebleau, France, used the Fusion process to manufacture sunglass lenses. Long a supplier of tubes to the television industry, Corning began to look for ways to extend its presence in the display markets. Using the Fusion process, it began producing flat panel glass for liquid crystal display applications, such as laptop computers.

As the markets for laptops, PDA’s (Personal Digital Assistants), flat screen monitors and flat screen televisions began to grow in the 1990s, Corning scientists and engineers continued to use the Innovation process – and the Fusion process -- to meet the demands of its customers. EAGLE2000™ is an excellent example of the use of both processes.

**Contemporary Success Story – Innovation at its Best**

*The results for EAGLE2000™ have been fantastic. Not only did this project use the Innovation Process to meet the customers’ demands for lighter weight displays, it also improved our capacity and profitability as well.*  – Randy Rhoads, Project Manager

With its combination of glass properties and manufacturing technology, Corning EAGLE2000™ flat glass substrates enable Active Matrix Liquid Crystal Display (AMLCD) manufacturers to make larger, lighter, thinner and higher resolution displays for computer
monitors and home entertainment. This glass has the industry's lowest thermal expansion, decreasing the effects of thermal down shock and breakage, and due to its remarkably low-density composition, Corning EAGLE 2000™ glass is the lightest AMLCD substrate on the market.

EAGLE 2000™ also has improved chemical durability over earlier substrate glasses, which minimizes glass damage during the harsh chemical processes involved with display manufacturing. Corning EAGLE 2000™ glass is made using Corning's Fusion process. This close-tolerance glass draw process, combined with Corning's patented composition, yields glass with truly remarkable qualities: pristine, near-perfect flat surfaces with improved thickness variations that don't require polishing.

By participating early in the Innovation process, Manufacturing -- along with Marketing and Technology -- ensured that the production/delivery process design accommodated all key operational performance requirements. A strong, cross-functional team was established right from the start. This early involvement helped the team to avoid many of the later stage issues that often arise when the Manufacturing function is not an active participant in the early innovation stages. In this way, they were able to influence the design so it allows a more robust manufacturing process.

(Graphic: The current 5 stage Stage-Gate™ innovation process)

We had interesting joint sessions very early on. Manufacturing, Technology, & Marketing worked very, very closely on this -- in the first stages with product development, the detailing of the product and what the customers really required. -- Dan Nolet, Display Technologies

While Marketing conducted an extensive study to identify and quantify the customers’ requirements, Manufacturing defined the performance range of Advanced Display processes, so that Technology was able to identify the various compositions that would not only meet customer needs, but would also work within Manufacturing’s current and expected parameters.
The EAGLE2000™ product team noted the following additional benefits of using the Innovation Process:

- The common language/understanding of the 5 stages made it easier to accommodate the many personnel changes that occurred throughout the project. It also provided the framework to hold their global team together.
- Having a cross-functional team from the start allowed all functions to actively participate in the development of the project objectives. The shared ownership of the project objectives which helped guide the project effectively throughout the 5 stages.
- By proactively using risk management, they had the ability to balance between market requirements, manufacturing capabilities and technical competencies. The key for EAGLE2000™ was to find common denominators for all three areas.
- The five-stage suggested activities helped outline the required work/deliverables for their planning process.

ON-THE-JOB SUPPORT: REINFORCING THE REINFORCEMENTS

*The Innovation Process has evolved well beyond the rudimentary model we adopted two decades ago…and is now imbedded in our culture.* – Joe Miller

On an ongoing and consistent basis, Corning requires employees on project teams to take its Innovation training and follow a comprehensive set of guidelines and tools toward product innovation. The company has, in fact, progressively broadened the training to more teams and functional units, “spreading the language of our business.” Corning also renews its Innovation process periodically – most recently, for instance, to manage the Innovation “pipeline” for new opportunities, assessing risks, costs and value added.
Innovation Effectiveness

These innovation effectiveness processes are the underpinning for the growth of our company. Charles “Skip” Deneka, CTO 1996-2001

Innovation Effectiveness is the umbrella term for Corning’s innovation effort. “Innovation effectiveness encompasses identifying opportunities (Roadmapping), selecting opportunities (Portfolio Decision Making), delivering opportunities (Innovation Project Management) in order to realize benefit (Dollars), and staying closely connected to customers and markets.” – Bruce Kirk, Corporate Innovation Effectiveness leader.

Innovation effectiveness requires --

♦ Understanding the overall corporate and business strategies
♦ Developing sound Roadmaps based on understanding customers, markets, competitors, Corning’s strengths and weaknesses, and estimating resources required for each project submitted to the Portfolio Management Process for funding
♦ Applying the Portfolio Management Process to evaluate, prioritize, and select projects
♦ Executing the selected projects well

Innovation Effectiveness – Ideas into Dollars

Roadmapping – Anticipating and planning for future opportunities. Requires customer focus and forward-looking thinking.
Project Portfolio – Selecting the best opportunities; balancing the risks and benefits; and allocating critical resources. Applying process rigor while retaining flexibility to exercise judgment.

Innovation Project Management – Moving a product, process and/or service idea iteratively through the Stages of Innovation to successful commercialization (dollars). Reduces development time, increases the number of commercially successful products, and cancels the less promising projects earlier. This is the five-stage Stagegate™ Innovation Process, referenced earlier.

Customer & Market Understanding – Truly understanding customers, markets, competitors, and anticipating their actions and reactions. The underpinning of the other three Innovation elements.

Evaluation

At Corning, a significant measurement of the Innovation effectiveness process is the percent of sales of new products from R&D.

*Improve our Innovation effectiveness to reposition Corning for growth*

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The Innovation Process is a learning machine that drives the company’s sustainable value and growth. Corning’s focus on quality and knowledge sharing tools/practices provides the “rate-change enablers” that increase the rate of organizational learning – bringing Corning differential value and competitive advantage – which, in turn, increases the rate of innovation.

The Learning Machine – Providing New Angles on Insight

♦ Morning Meetings
  - A forum to share proprietary research results in progress
  - 30-minute talk on work or current state of the science or project
  - Additional time scheduled for Q&A and discussion
  - Audience and speaker exchange ideas and gain insights

♦ Technical Tutorials
  - Education on a technology, including orientation, strategy, technical components
  - Offered at multiple levels
  - Encourages tacit knowledge exchange

♦ Research Reviews
  - Enable business leaders and technology community members to stay abreast of rapidly changing technologies and market trends.
  - Two hours in length, with time for interaction within the technology community, as well as with the business partners.
  - Begin with opening remarks by the specific project leader, followed by presentations by key project members.

♦ Communities of Practice
  - Individuals who come together over a common interest, one that could be directly or indirectly related to their current work
  - Formal (sanctioned), e.g. Centers of Excellence
  - Informal (grass roots), e.g. software programmers
Knowledge Management/Organizational Learning

These knowledge sharing tools and practices are only a few of many examples that have emanated from within the Technology Community. They are illustrative of how innovation is coupled with other ongoing Corning business practices into everyday activities and processes, providing new insights for Corning. It is about how scientists, engineers, technicians and commercial managers are sharing knowledge, experience, and perspective on a regular basis. In doing so, they are optimizing, leveraging, reusing this key knowledge, experience and perspective – all critical components of learning -- within a technology context. For Corning, this translates into new product and process innovation – ideas into dollars.

A key ongoing goal of Corning’s learning machine is to increase its knowledge re-use quotient. To do this, the company increases the number of perspectives (people and disciplines) within the organization, it improves interdisciplinary sharing -- the number of interactions that occur among disciplines -- and it provides the necessary tools to synthesize all those interactions to reformulate the company’s knowledge for re-use. It also includes tactical elements like ergonomics and facilities design to ensure that these interactions occur, e.g. secure video conferencing, facilities and informal meeting areas. This is basically the real-time tapping of the institutional knowledge and memory – through people, in a global culture, in everyday circumstances within the workplace.

Another key element is building the knowledge (technology) warehouse. This is basically an archive -- a technology cupboard -- from which one can research, identify and access technology for re-use. At Corning, technology investments are never lost – they are either shelved as tangible objects (samples, patents, technical reports, lab notebooks) or accessed through the intangible, tacit corporate memory, through storytelling, oral histories and other everyday means. The company constantly builds its knowledge cache, “packages” it in a complete, relevant form, and trains its employees how to access it for further use – a way to preserve and build upon its core competencies and critical capabilities. The Innovation process -- an iterative process -- is the learning catalyst; it is what ties together both modes of learning into a “learning machine.”

Enhancing the Learning Culture – Building Bridges to Enable Innovation

In order to create and sustain the learning culture to enable innovation, bridges must be built. To illustrate this concept using a current example, in the context of a formal community of practice, is a move toward bridging manufacturing effectiveness with innovation effectiveness through process engineering.

A leading example is the bridging of two traditionally disparate internal initiatives – manufacturing process improvement and the knowledge management/organizational learning effort -- focusing on the unifying theme of innovation. Doing so will provide a real-time opportunity to address pressing process technology issues facing Corning today.
– in short, an opportunity to drive improved profitability now, to reinvigorate Quality, and to be “ready” for the next upturn.

This type of interactive, dynamic collaboration will yield the company not only the standard cost containment, greater resource availability, and larger internal target audiences, but will help ensure the company’s stability and growth. It helps rebuild the network, enhances the learning culture, and expands technical know-how through optimizing synergies.

Learning Coaches – Establishing a new Core Competency in R&D

The only way to make sure the culture and discipline are sustained is to have an experienced advisor present. Our Learning Coach center of excellence will ensure company-wide implementation and learning. – Charlie Craig

Once the elements of the learning culture are in place, and the organization understands how it learns most effectively, the process is catalyzed with learning coaches, similar to Six Sigma black belts. These are individuals whose role it is to become knowledge networking “agents” or learning advisors within the organization. Part of a Learning Coach center of excellence, they are trained as innovation project managers and are highly skilled at process excellence around Innovation effectiveness and how people learn. These learning coaches join teams, prompt them to share knowledge, to cross boundaries, learn together and become more effective collaborators.
A member of several project teams at once, a learning coach cross-fertilizes the teams with new knowledge on an ongoing basis and provides a learning bridge between projects – for sharing best practices and lessons learned. He also instills “the thrill of a hobby” into the innovation environment – stimulating deeper and quicker learning, enabling greater satisfaction through work.

By integrating capabilities and competencies, and recycling learning, Corning is constantly optimizing the process. This is a virtuous cycle -- it is all about prompting and leveraging change, about building knowledge, about converting intellectual assets into productive use, about learning better together to innovate better. Corning is, then, able to realize in unique ways new opportunities and solutions it never before thought possible – discontinuous improvement…breakthrough invention. It is, in the end, about competitive advantage. It is about setting the pace for innovation.

LESSONS LEARNED

_Innovation is about flexible management and good judgment._ – Roger Ackerman

Lessons Learned include --

♦ _Start with a strong, visible, influential champion, one who has a true passion for innovation, who acts as a rallying point and a change agent, and who inspires a cadre of true believers at all levels of the organization._ MacAvoy was able to bring together marketing, manufacturing, technology, and human resources to “fix” the problem. Champions will change over time, but their presence and level of support cannot change. Corning has maintained its innovation champions for two decades, e.g. MacAvoy, Deneka, Ackerman, Miller, Craig, Houghton.

♦ _Establish a strategic link between the initiative and the company’s core values and goals._ From the outset, MacAvoy and his team underscored the significant tie to Total Quality Management, profitability and growth.

♦ _Establish a progressive, formal yet fluid and iterative process with built-in flexibility._ The process cannot be reduced to the checking-off of boxes, as in a cookbook – that’s the fastest way to introduce bureaucracy and stifle creativity. Today’s model emphasizes judgment by the project leader and the sponsor to determine the rigor needed at any specific innovation stage – as opposed to the original model, a linear one, where the main activity was doing everything that the innovation guide indicated.

♦ _Encourage cross-functional, cross-disciplinary project teams, in which people openly collaborate, share, cross boundaries and act on their collective knowledge, experience and perspective._ By definition, there should be a great degree of communication and “overlap” between project teams.

♦ _Learn from both best practices and lessons learned._ When Corning effectively uses the Innovation process, it allows management to overcome a natural
inclination not to stop a project that is far down the pipeline due to resource expenditure. Corning is learning that it isn’t best practices alone, but lessons learned that stimulate innovation.

(At Corning, investment in technology is never lost; technology is re-used to develop new materials and processes to exploit new markets. For example, a material that failed at its initial target market – sunglasses – has become a steady, profitable business for the semi-conductor industry.)

♦ Know who the customer is and what their requirements are. Never forget that market and customer understanding is the underpinning of the three core elements of Innovation Effectiveness – Roadmapping, Portfolio management, and Innovation Project management.

As Corning reinvents itself for the future, Chairman & CEO Jamie Houghton points out that, unlike when he first became chairman in 1983, Corning’s technology cupboard is full. He and others attribute this competitive advantage to a rigorous, dynamic and fluid Innovation process. This is all well and good…but the fact of the matter is that Corning, in this time of crisis due to the telecomm debacle, is about to find out -- real-time -- just how good it is at innovation effectiveness. Given Corning’s long history of innovation and reinvention, the attitude of the organization is to step up and welcome the challenge.

POSTLOGUE -- CONTINUOUS IMPROVEMENT

Focus on a few areas that truly influence innovation’s process effectiveness:

♦ Focus on the selection and prioritization of opportunities and projects: What to work on (innovation opportunities) is just as important as how well the innovation work is done (innovation projects).

♦ Capture and share lessons learned at each diamond decision in the five-stage Stage-Gate™ process.

♦ Ensure senior leadership involvement to drive consistent use of the process.

♦ Put the right people in the right roles – the critical elements for success:
  - Quality of innovation project leadership
  - Engaged innovation project sponsors
  - Team skills matched to project objective

♦ Install learning coaches to develop the skills of innovation project sponsors, team leaders, and team members.