

Using Knowledge Management to Drive Innovation



CONSORTIUM LEARNING FORUM
BEST-PRACTICE REPORT

Project Personnel

Study Personnel

Lou Cataline, project lead
Darcy Lemons
American Productivity & Quality Center

Subject Matter Expert

Kimberly Lopez
American Productivity & Quality Center

Special Advisers

Carla O'Dell
American Productivity & Quality Center

Dorothy Leonard
Harvard Business School

Editor

Paige Leavitt

Designer

Fred Bobovnyk Jr

MEMBERSHIP INFORMATION

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STATEMENT OF PURPOSE

The purpose of publishing this report is to provide a reference point for and insight into the processes and practices associated with certain issues. It should be used as an educational learning tool and is not a "recipe" or step-by-step procedure to be copied or duplicated in any way. This report may not represent current organizational processes, policies, or practices because changes may have occurred since the completion of the study.

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Sponsor Organizations

Air Products and Chemicals Inc.	PetroBras
Boehringer Ingelheim GmbH	Renault S.A.
Bristol-Myers Squibb Company	Siemens Medical Solutions
Canadian International Development Agency	Solvay S.A.
Cargill Inc.	Sun Life Financial Services of Canada Inc.
Cemex S.A. de C.V.	3M*
CitiBank N.A.	TXU Corporation
Conoco Inc.	United Parcel Service (UPS) Inc.
Department of Defense, Canada	U.S. Department of Navy
DuPont	U.S. Department of State
Exxon Mobil Corporation	U.S. General Accounting Office
Halliburton Company	U.S. National Security Agency
Intel Corporation	U.S. Social Security Administration
Johnson & Johnson	The World Bank*
KPMG International	Xerox Corporation

**This organization also participated as a partner organization.*

Partner Organizations

The Boeing Company, Rocketdyne Division

Hallmark Cards Inc. **

Millennium Pharmaceuticals Inc.

NASA and the Jet Propulsion Laboratory

3M

Wells Fargo & Company **

The World Bank

*** Data only. No site visit.*

Executive Summary

This report, based on the tenth consortium benchmarking on knowledge management (KM) conducted by the American Productivity & Quality Center (APQC), explores how innovative organizations manage their knowledge and how to approach KM to drive innovation.

Innovation is important to all organizations in all sectors, whether for-profit, government, or nonprofit. In an economy powered by knowledge workers, the better use of knowledge can lead to faster, less risky, and more vibrant innovation. In technical organizations such as many of those studied by APQC, knowledge is often the raw material as well as the product of their work. Do these organizations—known for their innovation—create, manage, or leverage their knowledge more effectively or differently than other organizations? Is the way they manage knowledge part of the reason these organizations are so innovative? The study team has found the answer to be a resounding “yes.”

With input from the study’s sponsors, APQC has found that organizations are interested in how innovative organizations manage knowledge in domains and functions one would expect to be related to innovation, such as R&D and new product development. Also, many organizations want to know how to address structural and cultural barriers to KM in technical and research settings and how leaders can support the adoption of new behaviors to overcome barriers. Other critical factors are enabling the flow and use of knowledge across boundaries and promoting collaboration in virtual settings. Measurement is a major challenge for most organizations, who want to learn how to measure changes in the rate and value of innovation resulting from increased knowledge sharing and collaboration and want to measure time saved and mistakes avoided through reuse and sharing of knowledge.

This report chronicles the value that innovative organizations find in better managing the flow and reuse of knowledge, effective practices to enhance knowledge creation and reuse for innovation, and implications for other organizations that might wish to better nurture knowledge and its flow to accelerate and enhance innovation.

STUDY FOCUS

This report is the culmination of a collaborative research effort conducted over a six-month period that involved 30 sponsors and seven best-practice partner organizations. These organizations joined with APQC to find best practices in using

knowledge management to drive innovation. The study's approach was to gather data on current knowledge-related innovation policies and practices from both sponsors and partners and then to study the partners in detail. In order to understand whether or not KM should be approached differently if innovation is the desired outcome, the APQC study team gathered data around five scope areas:

1. how to foster a supportive culture and communicate the link among KM, innovation, and business strategy and results;
2. how to enable collaboration in order to create and share new knowledge;
3. how to establish support roles and structures, including key leadership, community, and individual roles, the role of the KM organization, and the role of subject matter experts;
4. how to engage the educational and training functions and incorporate strategies to recruit and train new employees to support knowledge creation and innovation; and
5. how to measure the success of consciously managing knowledge in support of innovation.

This report describes the challenges and successful approaches used by these innovative organizations. The goal is to help guide others in their design and implementation of strategies to enhance effective knowledge creation and reuse in support of innovation.

STUDY FINDINGS

The APQC study team discovered 15 overarching patterns, insights, and findings about innovative organizations that are apparent in a variety of settings and solutions and are often related. Much greater detail is available in the report that follows and in the partners' case studies, including the knowledge-related challenges they faced and how they addressed them.

1. **Efficient Innovation**—Efficient innovation does not imply less creativity. Access to information, ideas, and experience enables individuals and teams to devote their time to build on good ideas and incorporate them into innovative products and processes. Nor does it imply less need for attention to the human and social capital aspects of KM. At the outset of the study, the study team expected to find among the study partners a focus on using KM to enable more innovation. Instead, the greater emphasis was on using KM to become more efficient innovators. Competitive pressures and attrition issues require increased productivity, quality, and yield from innovation processes. The study partners use KM as one way to do that by: reusing designs, knowledge, and lessons learned and thus avoiding to repeat mistakes; helping people connect and knowledge to flow across boundaries; providing efficient access to information, experts, and communities; capturing knowledge; and enabling scientists to focus.
2. **Managing technical and scientific information**—Managing complex and/or technical products, processes, and disciplines is no small feat when dealing with huge

amounts of technical information that crosses many disciplines, formats, and organizational boundaries. The technical and scientific nature and intensity of the partners' processes and products impel them to incorporate information issues into their knowledge management approaches.

3. **Centrality of information technology and repositories**—Information technology (IT) and databases play a much more strategic role in scientific and technology-intensive situations than in many others APQC has studied. IT applications, content management systems, and portals are not just convenient; they are central to how work gets done and innovation happens. Study partners aim to provide people with targeted and meaningful views of prodigious amounts of multi-dimensional information and access to experts that could fuel innovation. IT and database systems enable virtual work, distributed teams, and access to content by the public and other external partners and stakeholders. IT also has a major role in facilitating knowledge flows within project teams.
4. **More conscious knowledge management**—The value placed on knowledge and sharing it is not new. What is new is the realization that the ever-increasing challenges of efficient innovation require more robust information management and KM approaches. With the exception of the World Bank, the partners' formal KM initiatives are fairly recent in origin. The World Bank's formal KM initiative started in 1996; NASA JPL, Boeing Rocketdyne, and 3M since 1999 have made more conscious and concerted knowledge-sharing efforts. Millennium, as a young organization, formed a dedicated KM team in 2000.
5. **A bias against reuse of knowledge**—Although scientists and engineers espouse the values of knowledge sharing as central to innovation, there is a strong bias for invention and a reticence to reuse knowledge. Study partners have a variety of approaches to overcome this strong cultural and professional bias including facilitating diverse teams, making experts available to explain how an earlier invention could work in a new setting, rewarding for reuse, and sharing success stories. Study partners also have a variety of methods to create relationships and trust across boundaries.
6. **Expertise locators**—When knowledge is highly specialized, creating context to make it understandable and useful for others becomes more challenging. Delivering information is not enough to ensure reuse. Access to people with knowledge is at least as important as access to information. Expertise locator systems and people who can assist in identifying potential experts for teams are important enabling approaches to reuse knowledge in 3M, NASA JPL, Boeing Rocketdyne, Millennium, and the World Bank.

7. **Building social capital and spanning boundaries**—Enabling people with ideas and experience to connect with others who can incorporate those ideas into their own creations catalyzes innovation. The focus on information management only increases the need to deal with cultural issues to enable knowledge sharing. This has required the study partners to address cultural issues and boundary-spanning needs.

Causing knowledge to cross boundaries is a challenge in all organizations. Knowledge is sticky and only moves when a process exists to facilitate it. The partners create bridges so that knowledge can cross the boundaries that separate smaller cultures found within their disciplines, programs, and project teams. To build social capital, the study partners use a variety of methods to unite groups and build trust, such as creating venues—physical and virtual—where people can share experiences. Providing opportunities for people to connect with others can lead to “orchestrated serendipity.” The study partners arrange circumstances to increase the likelihood this will occur.

One of the sponsors described a vision of a seamless process of knowledge and information flows. “Seamless collaboration [would exist] across subject areas, leading to reuse and repurposing of past analysis to leverage new research/analytical efforts.” It may be seamless to the end user, but the behind-the-scenes resources are extensive.

8. **Enabling work**—The study partners use a variety of KM approaches and principles to put information and knowledge in the hands of people when they need it, be it before, during, or after projects and just in time, just enough, and “just for me.” They attempt to utilize the collective knowledge of the organization—often including knowledge from partners, suppliers, and customers—to bear during the innovation process. Examples include creating maps to information organized by discipline, conducting and capturing project reviews and After-Action Reviews, and using communities of practice as a source of ideas and support. As APQC has found in other studies, if you want people to use knowledge and information during their projects, you have to put it where they trip over it.
9. **Communities of practice (CoPs)**—Communities of practice are primarily used to provide a forum for cross-disciplinary knowledge sharing among professionals. Communities also play the essential role of expeditor to overcome barriers created by a formal structure; through community relationships, people can find someone to open doors or supply connections and information to help their project proceed.

All of the partners have approaches for forming and facilitating virtual teams and communities, inside the organization and with partners. Turning innovative ideas

into useful products has long depended on collaborative work relationships. In a global organization, those relationships are often virtual work relationships. Study partners have explicit techniques for enabling virtual teams.

10. **Culture change**—How do best-practice organizations send the message that best practices and lessons learned drive innovation and prevent mistakes or reinvention? The study partners create an awareness of available resources for knowledge sharing, connect people across boundaries, and address rewards systems that help or hinder knowledge flows. They also publicize knowledge sources and resources and showcase success stories and lessons learned.
11. **Human resource practices**—The study partners are purposeful in how they use human resource practices to set the stage for knowledge sharing and innovation, including their hiring and selection processes, rewards and recognition, and their expectations for knowledge sharing in everyday work. All five study partners had processes to recruit for certain innovative personalities that can succeed in their cultures. They look for people who are problem solvers, have a strong work ethic, and are highly creative. All have extensive reward and recognition systems for innovation, and most include knowledge-sharing behaviors in their performance appraisal systems.

To further encourage innovative people, 3M, Boeing Rocketdyne, and NASA JPL have vehicles for nurturing ideas and encouraging innovators who may not be part of the currently funded agenda, but who may hold the promise of future breakthroughs.

12. **KM and learning**—Linking knowledge management efforts with the learning function is most powerfully demonstrated in the World Bank. A core group located in the World Bank Institute facilitates KM. In addition to enabling communities and distance learning, the institute helps multidisciplinary teams build both their own and client capacities to address key challenges, such as HIV/AIDS. The focus is to improve both team accomplishment (immediate performance) and mastery (performance over time). The program provides facilitators to assist the team in tapping into its own diverse knowledge.
13. **External collaboration**—Knowledge sharing with the external world is present in all of the partners. Collaboration initiatives are a major focus for KM efforts within the World Bank and NASA JPL. The KM team at Millennium has a major focus on enabling information and knowledge sharing with its strategic partners. The study found less use of collaborative techniques to capture customer knowledge, but there were notable exceptions such as Millennium, whose strategy depends on matching biopharmaceuticals to target populations of patients.

14. **KM infrastructure and resources**—Each of the partners has a KM infrastructure that supports, guides, and links all of their KM initiatives, even though it doesn't dictate actions. Partner organizations typically have three critical elements in their knowledge management support structures: a steering group, usually including or sponsored by senior executives; a KM core group; and resources from different business units/functions to augment or operationalize the initiatives.

The study partners have strong, active support from senior-level executives and an ongoing KM group responsible for stewarding the process. For example, Millennium hired an experienced KM leader to drive their KM strategy and has dedicated, significant central resources to KM. Other partners use a more decentralized model, but all have explicit roles and people dedicated full or part time to enabling KM strategies and interventions.

Information specialists and corporate research librarians have a more central and explicit role than in traditional KM initiatives, again perhaps due to the technical topics and challenges involved. They organize and facilitate communities of practice, manage the behind-the-scenes content management processes, and help people find answers and experts, among other roles. Some serve on the KM steering team.

15. **Measurement**—Although the study partners have many success stories of knowledge sharing contributing to important innovation, they did not demonstrate any breakthrough approaches for linking the impact of enhanced knowledge management to innovation outcomes or efficiency. Most of the best-practice organizations measure some aspect of their innovation rates and effectiveness and may also measure KM activities, but have not developed sophisticated methods to create metrics that track the relationship between the two or tie KM to the bottom line. Partners and sponsors both reported that the most frequent methods to measure the success of knowledge transfer are conducting user surveys, tracking the number of knowledge objects accessed and used, tracking knowledge transfer activities, and capturing meaningful stories of the power of knowledge capture and transfer for innovation. Partners treat KM as a strategic enabler and have not yet addressed the measurement link to outcomes.

APQC's Benchmarking Model: The Four-Phased Methodology



METHODOLOGY

APQC's benchmarking methodology was developed in 1993 and serves as one of the premier methods for successful benchmarking in the world. It is an extremely powerful tool for identifying best and innovative practices and for facilitating the actual transfer of those practices.

Phase 1: Plan

The planning phase of the study began in February 2002. During that period, secondary research sources were used to identify potential best-practice organizations. Candidate organizations

were invited to participate in a screening process. Based on the results of the screening process, as well as company capacity or willingness to participate in the study, the final list of seven partners was determined.

A kickoff meeting was held in June 2002, during which the sponsors refined the study scope, gave input on the data collection tools, and indicated their preferences for site visits to partner organizations.

Finalizing the data collection tools and piloting it within the sponsor group concluded the planning phase.

Phase 2: Collect

Three tools were used to collect information for this study.

1. **Screening survey**—qualitative and quantitative questions designed to determine whether or not an organization has best practices that fit within the study scope
2. **Detailed questionnaire**—quantitative questions designed to collect objective data across all participating organizations
3. **Site visit guide**—qualitative questions that parallel the areas of inquiry in the detailed questionnaire, which serves as the structured discussion framework for all site visits

Partners were selected to host day-long site visits attended by sponsors and members of the study team. The APQC study team prepared written reports (case studies) of each site visit and submitted it to the partner organization for approval or verification.

Phase 3: Analyze

The subject matter experts and APQC analyzed both the quantitative and qualitative information gained from the data collection tools. An analysis of the data, as well as case examples based on the site visits, is contained in this report.

Phase 4: Adapt

Adaptation and improvement stemming from the best practices in this report occur after organizations apply key findings to their own operations. APQC staff members are available to help organizations create action plans based on the study findings.

PARTICIPANT REPRESENTATION

The 30 organizations that sponsored this study represent both the public and private sector and a variety of industries. Almost one-third of participants were government, 21 percent were from the manufacturing industry, and 12 percent were from the health care and pharmaceutical industries. Other industries represented by the sponsors include transportation, telecommunications, insurance, chemical/petroleum, and financial services.

Fifty-seven percent of the study partners and 54 percent of the study sponsors that completed the detailed questionnaire reported data from an enterprise perspective. The remaining organizations reported data from a business unit or departmental perspective.

The comments of study sponsors about their vision of KM-enabled innovation enriched APQC's understanding of what issues are most pressing to organizations. When asked what best practices using KM to support innovation would look like, study sponsors gave a variety of answers.

- “Best practices in using KM to drive innovation would show a relatively seamless process, where best practices and lessons learned are shared across the organization and where experts and expertise are known.”
- “Cross-disciplinary teams dedicated to a task or problem would have sufficient resources and time to think out solutions in new and insightful ways. The best practice would identify mechanisms for the establishment and functioning of these teams.”
- “The knowledge capture and reuse process is integrated with the research process. Part of this is ‘implementing’ a sharing culture across the organization.”
- “Our goal is to create an organization that gets increasingly better at reducing the ‘cycle time of decisions’ from initial recognition/submission of an innovative idea to full implementation of that idea.”
- “When an individual has an innovative idea, he or she knows where and how to record it, and the systems are in place to nurture the idea, help it progress through evaluation and development, and bring it to market, using the best practices at each stage, with vigorous collaboration, too.”
- “A cross-functional, highly collaborative global team would involve customers to develop new solutions to customers’ problems, leverage all available explicit internal and external knowledge, codify new tacit knowledge, [and] use appropriate technical tools.”

With these ambitious ideal scenarios in mind, APQC and the study sponsors selected five best-practice partners to visit from a number of companies provided as candidates by APQC. The site visit partners selected were 3M, Boeing and its Rocketdyne Division, NASA JPL (Jet Propulsion Laboratory), Millennium Pharmaceuticals, and the World Bank.

All of the study partners selected for site visits had certain characteristics in common: they are outstanding innovators, usually working with technical and complex information, and they have a bevy of experts working in a variety of interdependent disciplines who must collaborate and share knowledge for innovation to occur. These organizations have a strong emphasis on knowledge initiatives that cross boundaries, and most are enabling multifunctional teams to access and use relevant information and knowledge. And all partners could articulate the role of knowledge in innovation and how they were managing it.

The partners differed in the maturity and breadth of their formal KM efforts, their missions—some were for profit and others were not for profit—and the pressures to be more disciplined in their efforts to manage knowledge. These factors led to different approaches to collaborate and opposing philosophies about rewards among the partners. Some of the partners selected were measuring their KM efforts and attempt to link it to outcomes; others only measure innovation.

Both the partners' commonalities and their diversity contributed to the study team's ability to extract major patterns and a variety of successful approaches that will be elaborated in the remainder of this report.

ORGANIZATION OF REPORT

The purpose of this report is to guide the successful design and implementation of knowledge management in support of innovation. Chapter 1 will present a model for knowledge-enabled learning and innovation, which was created to illustrate how the findings can be applied to different parts of the innovation and knowledge cycle in organizations. The model serves to illustrate the ways partners enable knowledge at various stages in the innovation and organizational learning process. The structure of the report follows the model.

Chapter 1 provides definitions of innovation and knowledge used throughout the study, as well as a brief introduction to the best-practice partners. It also introduces the model for knowledge-enabled innovation that will serve as the organizing schema for the subsequent chapters.

Chapter 2 describes the first component of the model, the culture and organizational context, and how study partners address the structural and cultural barriers to innovation.

Chapter 3 describes the second component of the model, which is how partners recognize when an innovation is needed and how they elevate and nurture new ideas for future innovation.

Chapter 4 provides case examples of forming teams, because teams are the way study partners and most organizations transform inventive ideas into actual

innovations. This chapter also addresses the use of virtual teams and virtual collaboration.

Chapter 5 explains how, after a team is formed, various KM approaches can enable the work process itself, especially when the work is highly technical in nature. Many of the information management approaches are found at this stage.

Chapter 6 addresses how organizations convert local lessons and knowledge into organizational knowledge.

Chapter 7 showcases the outcomes the partners are experiencing, how they are measuring innovation, and ideas for more rigorous measurement of innovation.

Chapter 8 addresses the KM infrastructure, including the roles and staffing of the KM organization and lessons learned by the KM practitioners in the partner organizations.

The five case studies provide detailed stories and context for understanding how the study partners designed and implemented their approaches.

Together, these chapters and the case studies address the question that drove the study, “Does KM differ if innovation is the desired outcome? If so, how?” Throughout the report, issues are also raised about the further potential for using KM principles and approaches for even more impact on innovation.

SUBJECT MATTER EXPERTISE

Kimberly Lopez

A KM specialist in APQC’s KM practice area, Kimberly Lopez has worked extensively in designing KM solutions and systems for Fortune 500 organizations. In addition to being a contributing author of APQC’s knowledge management publications, she authored “How to Measure the Value of Knowledge Management” for *KM Review*. Lopez also has led process and metric benchmarking studies in the areas of knowledge management, after-sales support systems, technology-based training, employee recruiting and retention, and faculty instructional development.

SPECIAL ADVISERS

Carla O’Dell

Carla O’Dell is the president of APQC. The focus of O’Dell’s current work is KM and the sharing of best practices. Under her direction, APQC has become a national leader in developing knowledge management publications, training, and consortium benchmarking studies. She is the co-author of *If Only We Knew What We Know: The Transfer of Internal Knowledge and Best Practice*, with C. Jackson Grayson and Nilly Essaides (Free Press, 1998).

Dorothy Leonard

Dorothy Leonard is a Harvard Business School professor. She has more than 30 years of experience in research, consulting, and teaching about innovation, technology commercialization, and organizational capabilities. That work culminated in her book *Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation*

S U M M A R Y

(Harvard Business School Press, 1998). *When Sparks Fly: Igniting Creativity in Groups* (Harvard Business School Press, 1999) co-authored by Walter Swap, explores the theme of knowledge generation.

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