

Knowledge Management
 Introduction by
 Julie Gravalles, guest editor



Embracing knowledge management (KM) principles propels modern organizations to new heights. According to the *Harvard Business Review*,

Andersen Consulting and Ernst & Young have been able to grow 20 percent annually in recent years due mainly to KM initiatives. The value of managing knowledge is hardly a new concept. The craft guilds that flourished in England during the first half of the millennium thrived because of their "regulation" of knowledge; the KM of the day manifested itself in the apprenticeship system. The economic well-being of localities depended to a large extent on the strong, albeit hardly democratic, craft guilds.

As we peer into the new millennium, we realize again the value of organizational knowledge, a human-created "product" of information, experiences, values, processes, and cultures. The management of this complex "product" is as much about culture as it is about technology. The Gartner Group refers to KM as "a cultural, social, and human systems discipline as well as a technology-enabled program." Increasing numbers of corporations are realizing the significant benefits to be gained by proactively establishing KM practices, providing their staff with the best tools and infrastructure, and creating a learning environment for their employees.

Continued on page two



Knowledge Management Model Guides KM Process

By Cynthia Taylor Small and Jean Tatalias

Imagine you are based in Seoul, Korea, with corporate headquarters located in the United States. You have just received a task from a customer that requires expertise in sensors and signal processing. Your team in Korea has knowledge in this area; however, a better solution can be provided to the customer if the knowledge and expertise of the entire corporation can be leveraged. What do you do? You can call for help, but it's 10 p.m. on the East Coast. Aha! You decide to access the corporate intranet to try and find a document, or, even better, a list of experts that you can e-mail for help. Sound familiar? Being able to find information or expertise quickly to satisfy customer needs is just one of the reasons that knowledge management (KM) at MITRE is a business requirement.

Continued on page two

INSIDE THIS ISSUE

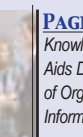
PAGE FIVE
 Forming Knowledge Partners



PAGE SIX
 Benchmarking Sustains Competitive Innovation



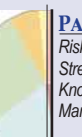
PAGE SEVEN
 Knowledge Fair Provides Informal Forum for Exchanging Information



PAGE EIGHT
 Knowledge Mapping Aids Discovery of Organizational Information



PAGE TEN
 New Knowledge Management Tool Profiles Web Usage Demographics



PAGE ELEVEN
 Risk Assessment Streamlined Using Knowledge Management Tool



Introduction

Continued from page one

Over the past two years, KM has grown in importance for nearly all business ventures—ours and our sponsors' included. The practice of KM can be traced to both commercial business practices and government initiatives such as business process reengineering and total quality management. But today, it has dramatically transformed enterprise thinking and become a critical factor in strategic planning for government and private business. According to the Gartner Group, the early adopters of large-scale KM intentionally have been global consulting organizations. The market forces and strategies of these companies have helped enable rapid worldwide implementation of their innovations. KM, for such companies,

is the price of leadership. And, the enterprises most likely to invest heavily in KM are those seeking competitive advantage, in particular those for which competitive advantage is based on rapid delivery of high-quality, high-value products and services. Clearly, MITRE's sponsors have a compelling need for high-quality, high-value products and services.

In this issue, we focus on the multidimensional aspects of KM. Collected here is a range of articles illustrating MITRE's commitment to ensuring KM is firmly ensconced as a corporate business practice. You will read about Knowledge Partners, a MITRE initiative to enable rapid discovery, creation, and use of global experts and knowledge to solve problems of national and international concern.

Also, you will learn about the MITRE-developed KM model, KM assessment approach, and framework for a KM-enabled enterprise improvement. But the content does not stop there—read about a MITRE-developed KM intranet usage profiling tool, a KM fair, KM and risk assessments, knowledge mapping, and benchmarking.

Collaboration and sharing are integral parts of any KM model, and we believe that by emphasizing these traits we can move our enterprise and our sponsors' missions toward untold successes in the new millennium.

For more information, contact Julie Gravalles at 703-883-7482 or julieg@mitre.org

A Model for KM

Continued from page one

Are you trying to reap the benefits of KM in your organization but finding it difficult to get started? MITRE developed a KM model, a KM assessment approach, and a framework for continuous KM improvement. This article describes our techniques and provides valuable insights that can be used by any organization about to embark upon a KM program or assessing how they stand with regard to KM.

KM at MITRE

KM principles are not new to MITRE. We understand that our success, quality of work, and value to our customers are directly related to the degree to which we share knowledge, leverage the corporate expertise, and provide an environment in which new knowledge is created. While KM is not new at MITRE, we continue to investigate and employ new management and information technologies that allow us to meet the changing needs of our customers.

In March 1998, MITRE's Innovation Team (I-Team), a group comprised of

senior managers who focus on positioning MITRE as an information technology leader, chartered a subteam to assess the state of KM at MITRE and to determine if there were areas where the corporation could continue to improve. Those of you who have already embarked on a similar initiative realize this was no easy task. Immediate questions come to mind: What is KM? Where do we start? How do we achieve this task within the resources allocated? What technology do we need to deploy? Aren't we already doing it? These questions, along with many others, led MITRE to develop a descriptive model for KM.

KM Definition and Model

MITRE's survey of industry and academic literature uncovered many KM definitions and models. Our goal was not to create yet another definition, but to define KM within the context of MITRE's mission and goals. The working definition—"corporate strategies employed to foster innovation, knowledge transfer, improved business process, and enhanced learning"—was adopted along with a very simple vision. The vision states "Create a

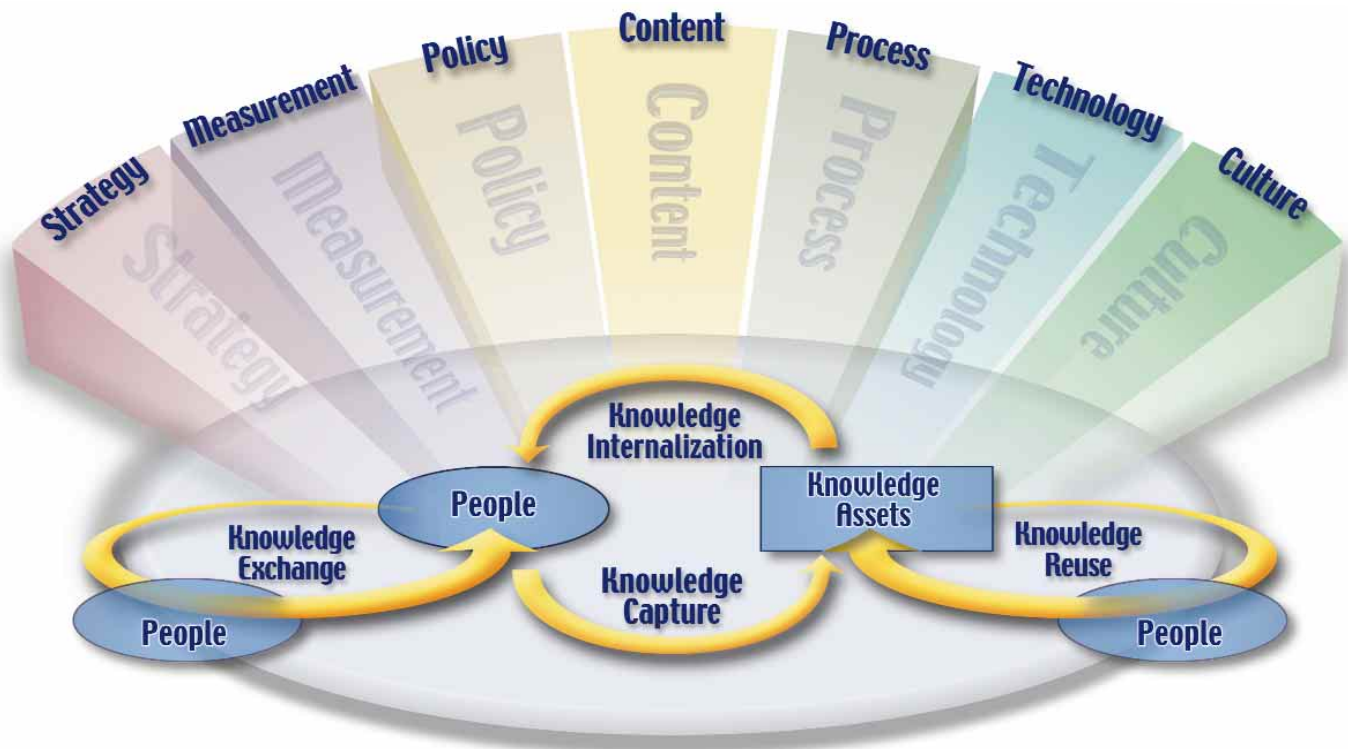
learning environment to continually enhance MITRE's value to its customers. In that environment, knowledge creation, sharing, and reuse are explicitly valued, expected, supported, and rewarded."

In order to guide our KM assessment and future activities (from a practitioner's perspective), we developed a descriptive KM model. The model supports a holistic approach that includes organizational, cultural, and technological aspects.

The components of the model were derived from KM research performed in MITRE's technology program and a survey and comparison of KM models (e.g., Ernst & Young, American Productivity & Quality Center, and DataWare) being used in industry or described in the literature.

As illustrated, KM is viewed from a two-dimensional perspective. The first dimension consists of the activities that are critical to knowledge creation and innovation: knowledge exchange, knowledge capture, knowledge reuse, and knowledge internalization. Collectively, these processes build a learning organization—

Continued on page three



one skilled at creating, acquiring, and transferring knowledge as well as adapting its actions to reflect new insight and innovation.

The second dimension consists of those elements that enable or influence knowledge-creation activities. These include Strategy—the alignment of corporate and KM strategies; Measurement—the measures or metrics captured to determine if KM improvement is occurring or if a benefit is being derived; Policy—the written policy or guidance that is provided by the organization; Content—the subset of the corporate knowledge base that is captured electronically; Process—the processes that knowledge workers use to achieve organization mission and goals; Technology—the information technology that facilitates the identification, creation, and diffusion of knowledge among organizational elements within and across enterprises; and Culture—the environment and context in which KM processes must occur (often described in terms of values, norms, and practices).

KM Assessment Approach

MITRE used its KM model as the framework for the assessment. The goal of the KM assessment was to identify strengths and weaknesses (from an enterprise perspective) in our knowledge-leveraging capability, to benchmark the corporation against other KM leaders, and to recommend next steps.

To identify strengths and weaknesses, we assessed or reviewed each of the components of the enabling dimension. A rating of green, yellow, or red was given, depending on whether the goals were being met, partially met, or not achieved. The methodology for each assessment was tailored to the component target state. A variety of techniques were used during the assessment including surveys, metrics capture and analysis, observation, and interviews.

To address the benchmarking goal, MITRE compared its KM practices with other KM leaders. The following summary

of the assessment components is provided to help the reader more fully understand the assessment.

The Policy assessment used a proposed policy framework for information sharing and information stewardship. Policies assessed included collaboration and teamwork, responsibility for information products, publishing and dissemination, information protection, and roles and responsibility in information policy. The MITRE environment was then examined to determine if a policy (interpreted to include mission statement and performance evaluation criteria) existed and whether the intent of the policy was being followed.

Content was assessed to determine if it satisfied MITRE's business needs and if the information was accessible through the company's intranet. We established a top-level value chain to identify major processes in which MITRE staff participated and gathered data on content sufficiency, quality, and existing intranet

Continued on page four

A Model for KM

Continued from page three

metrics. The state of content was assessed as follows:

- Red—insufficient for business needs
- Yellow—available to some degree but exhibiting less consistency or currency than desired
- Green—available, maintained, and accessible

The Process assessment examined a subset of mission-oriented processes that staff use on a routine basis in support of MITRE's customers. These processes involved tasks such as technology/product assessment, task leadership, prototyping, and strategic planning. Interviews were conducted with staff from across MITRE's operating centers to obtain a picture of the extent of integration and the level of knowledge at which the activities of knowledge exchange, knowledge capture,

(yellow), or had no operational capability (red).

In its Alignment with KM Leaders assessment, MITRE identified and captured KM practices in each of these areas and then compared MITRE practices in each area to the practices of other KM leaders. A rating was given depending on whether the best industry practice was widely evidenced at MITRE (green); evidenced, but not at the enterprise level (yellow); or showed minimal or no evidence of practice (red). During the assessment, no attempt was made to determine if the practice should be a priority to MITRE; this judgment occurred during the consolidation and recommendation phase.

The Strategy, Measurement, and Culture elements were not directly assessed. The Strategy and Measurement elements were addressed in the Alignment with KM Leaders assessment. Having a KM strategy was cited by the KM leaders as critical to KM implementation. Many KM leaders had initiated measurement activities,

but recommended that it not be the focus of initial KM efforts. Culture was addressed in the Alignment and Process

MITRE's approach to KM improvement is twofold: enhance the state of the corporate enablers and pilot solutions to key knowledge challenges.

and knowledge reuse are being performed. For example, knowledge exchange at all levels of the organization would receive a rating of green, whereas exchange at only the department level would receive a yellow rating.

The Technology assessment evaluated MITRE's use of KM technologies based on a review of benchmarking studies, conference proceedings, Web resources, and KM journals identifying these technologies and the best practice features for each. A rating was given in each area depending on whether a technology was operational and exhibited best practice features (green), operational or in prototype with some best practice features

assessments. The identification of cultural barriers was identified by KM leaders as an important step to KM improvement.

KM Continuous Improvement

MITRE's approach to KM improvement is twofold: enhance the state of corporate enablers and pilot solutions to key knowledge challenges. The assessment resulted in a list of strengths and weaknesses, as derived from the green, yellow, and red rating, and a list of recommendations. One of the recommendations was the appointment of Center Knowledge Managers (CKMs). A primary responsibility of each CKM is to identify knowledge challenges of their oper-

ating center and to pilot solutions. KM pilots currently underway are focusing on the following topics:

- Development of portals for the direct-funded work program and research
- Capturing and transferring of knowledge for improved strategic resources alignment
- Utilization of an extranet and process support to stimulate knowledge sharing with customers
- Development of process and tool support for the organization and knowledge capture of Technical Exchange Meetings

Summary

Assessing the current state of KM in your organization is an important step toward achieving the organization's vision. It is important not to just focus on the ratings (i.e., red, yellow, green), but to capture and share the KM practices discovered along the way. The assessment process must be tailored to the mission and goals of the organization. Assessment is an iterative process that must be revisited on a recurring basis. The target of MITRE's first assessment was enterprise-wide knowledge enabling; future assessment will focus on domain and Center-specific needs.

Measurement, while not discussed in this article, is an important part of MITRE's KM program. During our assessment activities, MITRE identified metrics by using the Goal/Question/Metric paradigm originated by Professor Vic Basili of the University of Maryland. An enterprise KM measurement framework is currently under development.



For more information, contact Cynthia Taylor Small at 703-883-6639 or csmall@mitre.org

Forming Knowledge Partners *By Mark Maybury*



Knowledge Partners (KP) is a MITRE initiative to enable rapid discovery, creation, and use of global experts and knowledge to solve problems of national concern. MITRE is frequently challenged by sponsors with interdisciplinary and/or inter-organizational problems. Also, we are often called on to organize and participate in blue ribbon panels and advisory boards (e.g., Defense Science Board, Science Advisory Boards). According to MITRE President and CEO Vic DeMarines, "Knowledge Partners is being established to complement classic MITRE roles in order to more effectively address short- and long-term sponsor tasks, including studies and analyses, design of enterprise architectures, and strategic planning and decision support."

MITRE is currently formulating a range of Web-based services for KP participants. These will include specification and refinement of a customer requirement/information need, discovery of experts and/or preexisting knowledge (i.e., because the answer may already exist); and formation and support of teams (i.e., if the knowledge doesn't exist and if the expert doesn't exist, then learning must occur). KP will provide services for negotiation of terms with an expert and/or team, support for team collaboration and execution, and capture, delivery, and evaluation of knowledge and results.

KP will leverage existing MITRE/government efforts such as environmental studies, studies in national security, and technical analyses. KP will be facilitated by MITRE's knowledge of and collaborations

with leading information technology enterprises, and supported by our award winning intranet (the MITRE Information Infrastructure or MII), worldwide video teleconferencing, our Collaborative Virtual Workspace tool (cvw.mitre.org), and Risk Assessment and Management Program (see page 11).

KP will help MITRE tap the vast reservoir of knowledge embodied in its retirees through Reserves at the Ready, a pilot project designed to offer highly qualified,



MITRE retirees opportunities to support short-term work program requirements. When becoming a member of the reserves, MITRE retirees become Part Time on Call employees with their resumes available via the MII. Project leaders can call upon them to perform project work that draws upon their typically extensive experience base or to mentor new or recently promoted staff. Upon completion of assignments, reserves will update their online resume to include current experience. MITRE is initially piloting this program at our Bedford Air Force Center and Washington Command, Control, and Communication operating

centers. "MITRE retirees offer a unique source of world-class expertise," says Executive Director of the Air Force Resource Center Rich Byrne. "All of them have demonstrated a commitment to serving the nation. Leveraging this resource to help mentor our next generation leaders is an exciting and powerful opportunity."

KP will enhance MITRE's existing infrastructure by establishing an e-commerce environment to facilitate interactions. While the initial focus will be on internal

partnerships, KP will provide an opportunity to explore new organizational models that enable efficient teaming of leading talent across Federally Funded Research and Development Centers, national laboratories, academia, and industry. Accordingly, KP will provide an opportunity to explore new organizational models that enable efficient teaming of leading talent. KP aims to establish MITRE as a leader in applied knowledge management by drawing from and refining MITRE core competencies and Web-based services in expert finding, capture and reuse of knowledge and lessons learned,

and project and partnership creation (leader identification, team formulation, collaboration).


In summary, KP promises to bring interdisciplinary expertise to bear on demanding multidisciplinary challenges of national concern. Please contact us to learn how your organization could participate in or benefit from KP.



For more information, contact Mark Maybury at 781-271-7230 or maybury@mitre.org

Benchmarking Sustains Competitive Innovation

By Kevin Buck



In the context of organizational performance enhancement, “benchmarking” is the search for industry “best practices,” activities that lead to superior performance. Organizations frequently benchmark with other companies, yet the capacity for organizations to absorb knowledge from outside the enterprise is as much a social as a technical process. The pace and scope of knowledge mobilization that is motivated by benchmarking depends upon the organization’s willingness to share information, experiment, and work with outsiders. While innovation results from many knowledge management initiatives, learning- and knowledge-based organizations must embrace benchmarking as a process that encourages organizational plasticity through comparison and exploration. Benchmarking is all about listening to the winds of technological and process change to sustain a competitive innovation edge. It is a discipline that makes tacit knowledge whole and invigorates an organization with the knowledge to make informed choices.

One of MITRE’s knowledge management (KM) initiatives involves participation in an American Productivity & Quality Center (APQC) benchmarking study (<http://www.apqc.org/proposal/6506ttt/>), which examines innovative organizations and their successful KM initiatives. An important part of KM at MITRE is knowledge exchange, both internally and externally. In recent discussions, Principal Engineer Cynthia Taylor Small said, “We believe that organizations that share and seek out best practices demonstrate visible dedication to the renewal of organizational knowledge. Important performance improvements through best practices

Candidate Selection Scorecard		
Benchmarking Candidate:		
Rating:	 Confirmed Best-In-Class	
	 Not Confirmed Best-In-Class	
	 Confirmed Not Best-In-Class	
Alignment of Interests		
Criteria	Emphasizes creating value from intellectual capital	Achieves shared vision and values
Source	Direct Survey	Direct Survey and Media
Measurement Expertise		
Criteria	Collects many IT metrics	Integrates IT metrics into organization
Source	Direct Survey and Media	Direct Survey and Media
Commitment to Leveraging Knowledge		
Criteria	Develops successful mechanisms to collect, process and share organizational knowledge	Utilizes reward systems for encouraging knowledge sharing and cross-fertilization
Source	Direct Survey and Media	Direct Survey
Financial Performance		
Criteria	Strong EPS and CF/Share growth in past 5 years	Noted for the quality, quantity, and velocity of innovation
Source	Direct Survey	Direct Survey and Media
Quality Initiatives		
Criteria	Received Malcolm Baldrige or Deming Award in areas relevant to IT performance enhancement	Complies with Y2K
Source	Media	Direct Survey and Media
Human Resource Innovation		
Criteria	Noted for retaining highest caliber IT employees	Noted for best practice skill enhancement techniques, growing meta skills and/or building cross operational skill sets
Source	Media	Media

IT = Information Technology

This candidate selection scorecard was developed and employed by a MITRE operating center to benchmark best-of-breed information technology (IT) performance and strategy management systems for MITRE’s Office of the Chief Information Officer.

transfer initiatives are realized by knowledge sharing of this sort. They can and should be considered the single most important employee activity in learning organizations.”

Benchmarking success stories abound, and proponents claim that benchmarking allows organizations to better meet customer requirements, determine true measures of productivity, and establish goals. Prudent organizations temper benchmarking eagerness with an appreciation for numerous known risks. The risk that a benchmarking effort will fail is increased if the sponsoring, or “host,” organization does not agree that part-

ners selected for benchmarking apply the best available technological, operational, or organizational processes. Benchmarking partners should not be selected simply because they are willing to benchmark or because the partners are vendors interested in attracting more business. Benchmarking should be approached on a partnership basis in which both parties expect to gain from the information sharing.

Research on benchmarking best practices suggests that criteria for selecting benchmarking partners should be developed in advance, and an ample pool of benchmarking candidates should be

identified. A candidate selection scorecard should be developed and applied in identifying relative benchmarking candidate ratings.

A candidate selection scorecard (see illustration) was recently developed and employed by MITRE's Economic and Decision Analysis Center in benchmarking best-of-class information technology (IT) performance and strategy management systems for MITRE's Chief Information Officer. As depicted in the illustration, MITRE considered it essential that selected benchmarking partners clearly exhibit six key attributes or characteristics. The benchmarking candidates must have clearly demonstrated an interest in aligning the IT organization, strategic business unit (SBU), and governance activities; performance measurement expertise; commitment to leveraging knowledge; ongoing process quality improvement initiatives; and IT human resource innovation. Criteria for realistically and logically determining the presence of these desirable attributes within benchmarking candidate organizations were then identified. The candidate selection scorecard was

then used to document sources relied upon in rating each candidate's performance against the attributes and key contributing criteria. As depicted in the illustration a traffic light (i.e., red, yellow, green) rating scheme was employed to characterize each benchmarking candidate.

Benchmarking activities often fail if key benchmarking stakeholders do not support the benchmarking partners selected. Examples of key stakeholders include the managers responsible for funding the benchmarking effort and staff in the host benchmarking organization who will ultimately be held accountable for implementing best practices identified through benchmarking. The candidate selection scorecard, tailored to the specific needs of these stakeholders, can be used to substantiate and communicate the reasons why the host benchmarking organization should compare processes and performance with selected best-of-class external partners.

Experience suggests that the most desirable benchmarking candidates may

not necessarily have the time nor the motivation to meaningfully participate in another organization's benchmarking activity. Organizations deemed best-in-class are typically deluged with benchmarking requests and can thus afford to be selective about benchmarking partners. It is recommended that host benchmarking organizations identify many more candidates than will ultimately agree to benchmark, and it should be expected that some selected partners will decline a benchmarking invitation or may back out of the benchmarking at the last minute. It is also recommended that host benchmarking organizations balance their desire to benchmark only the best organizations with the need to partner with organizations that are eager to openly share relevant information before, during, and after the formal benchmarking activity.



For more information, contact Kevin Buck at 937-431-1511 or kbuck@mitre.org

Knowledge Fair Provides Informal Forum for Exchanging Information *By Tony Zawilski*

Four MITRE divisions collaborated to implement the simplest knowledge management (KM) activity—a knowledge fair. Knowledge fairs complement formal technical exchange meetings and provide a venue for knowledge producers and consumers to share and trade. All it takes is a real or virtual place, a guest list, an incentive, and a little publicity. For our knowledge fair, we had a conference room at lunch hour, departments with shared interests in information management technologies, a dozen pizzas, and e-mail invitations. We discouraged presentations and preparation. We limited data collection to comments on 3x5 cards. We kept it simple and tried not to interfere with the process. We formulated approximate cost-benefit

(C/B) goals and feel that we met them. Comments collected from the over 50 participants included:

- “This was a good chance for me to find out what the people I don't see very often are doing. A good way to find out about new projects and programs.”
- Two specific comments that indicated we had met our C/B goal were:
 - *“I made an excellent contact in [another division] for my [sponsor] project.”*
 - *“The person I was talking to pointed me to books and tools [that could help me] organize our design process.”*
- Two response cards indicated reciprocity in knowledge exchange:

- *“Linked up with someone who used one of the tools [needed for our research], and I answered some of his questions about logic programming.”*
- *“Met someone who knows about logic programming (which I need).”*

Overall, it seems that our knowledge fair succeeded as a low-cost approach that improved knowledge exchange. In the future, we hope to expand the scope of our KM activities to gain experiences that will prove valuable to MITRE and our sponsors.




For more information, contact Tony Zawilski at 703-883-6086 or zawilski@mitre.org

Knowledge Mapping Aids Discovery of Organizational Information

By Ray D'Amore, Manu Konchady, and Leo Obrst

Guest Editor's Note: Knowledge maps, the cartographic view of "knowledge" within an organization, help in discovering the location, ownership, value, and use of organizational knowledge. Additionally, such maps help us to learn the roles and expertise of people, to identify constraints to the flow of knowledge, and to highlight opportunities to leverage existing knowledge. According to Gartner Group research, this year more than 50 percent of knowledge management programs will implement knowledge maps that are more complex than current public Web sites. This requires an understanding of ways in which knowledge maps can vary and an investment of highly skilled human labor.

 MITRE researchers are performing leading research in knowledge mapping. The following are descriptions by three researchers whose goal is to enhance the value of the considerable repository of knowledge available in the MITRE Information Infrastructure (MII), the company intranet. The separate efforts described below are complementary and provide a view of how organizational knowledge may be mined in the future.

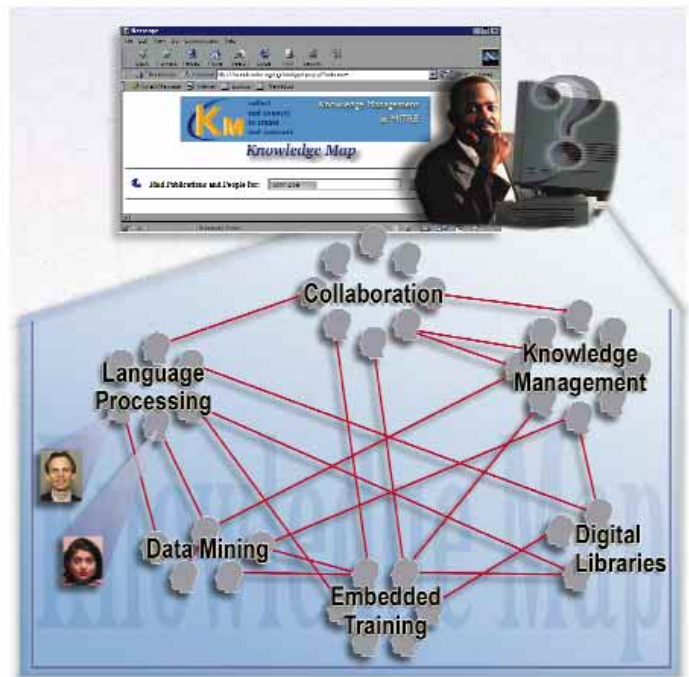
(The following section was contributed by Ray D'Amore and Manu Konchady.)

Knowledge Mapping on the MITRE Intranet

Formal views of an enterprise may not always reflect the actual interest areas, roles, and relationships of the people within an organization. For example, organizational hierarchies that define communication between supervisors and subordinates provide, at best, only a partial representation of actual communication or work relationships. The use of topic detection technology to discern actual work relationships (or knowledge networks) across the enterprise has implications for how organizations can assess workflow, areas of expertise, and collaboration. Here topic detection can ferret out interest areas and tasking and characterize how work is being addressed within an actual organization (i.e., who, what, where, and when). Because work groups can form and disperse quickly to meet project demands, we have what can be characterized as emergent networks to

complement what sometimes exists in formal organizations. We are investigating how using topic detection technology to create knowledge maps may provide a more effective way of mapping corporate roles and expertise in a fluid work environment.

We have applied topic detection technology to the MII as a basis for generating knowledge maps. In particular, we have used specialized clustering technology to extract information usage patterns from MII transfer folders (folders assigned to individuals to facilitate sharing). Linking derived topics with personnel information provided a basis for assessing affinity groups within an organization. In the initial experiment, a sample of items from each transfer folder was obtained. Each item (e.g., a Microsoft Word or PowerPoint file) was represented by a weighted vector consisting of keyword and frequency information as well as metadata associated with each transfer folder (e.g., owner, organization). The pairwise similarity is computed across all sampled items and provides the basis for automatically generating topic clusters, using a simulated annealing clustering algorithm. The overall approach supports generating both semantic as well as organizational links



among staff members within a topic cluster or across related clusters. In a full-scale application, we would expect to index all items within the transfer folder and incorporate temporal information into the clustering algorithm so as to identify changes in work patterns over time. The initial prototype allows users to navigate through topic clusters and their associated people, as well as search for specific topics using queries. The selected topics allow for easy access to MII personnel information as well as transfer folder items.

The derived groups reflect shared interest in some technology, joint work on a project, or other workflow aspects. In some cases we have uncovered staff who are in

key oversight roles, as well as those that serve as information “hubs”—providing information to the division. How accurate is mapping? In some cases the clustering results have mirrored current division and department structure, especially where departments are rather homogeneous (e.g., a department focused on collaboration). However, it has also identified virtual groups that span multiple departments and a number of these have been validated by informal discussions with staff members. We are currently preparing a more formal assessment, comparing formal organization charts to expertise networks gleaned using clustering, as well as those identified through staff survey inputs. The automatically derived knowledge maps may provide a basis for assessing ongoing work within an organization to include areas of expertise and, more specifically, the experts themselves. The technology being developed is applicable to a wide range of public information spaces such as document publishing, resumes, and Web pages. This work is being supported by the Smart Yellow Pages MITRE-Sponsored Research.

The Organizational Model and Its Knowledge Map

(The following section was contributed by Leo Obrst.)

What’s next in the evolving knowledge management paradigm after an organization links its employees and their documents together so that it is possible to conduct a successful search for everything an employee writes?

One prospective answer takes something old and weds it to something new. The something old is business process reengineering combined with enterprise modeling. The something new is ontological engineering, which has recently emerged



A Technology Center “community of interest” found by examining public information sharing and related project work areas.

as an offshoot of knowledge representation and knowledge engineering. Under one view, an ontology is a specification of a conceptualization (i.e., the terms of a conceptualized domain representing its entities, relationships, attributes and the semantics of the attributes). These combined technologies can begin to enable a usable organizational model, that is, a knowledge map of the organization.

Currently, the knowledge about a typical organization’s business data, its knowledge sources, and its conceptual interrelationships exists only as informal knowledge residing in the minds of personnel (management and staff) and in their documents, the latter of which must be interpreted by personnel with access to their internal model of the organization. In the organization of the future, however, knowledge increasingly will be collected, structured, interpreted, and used automatically. This increasing automatization is possible because most knowledge is in fact relatively fixed. On a daily basis, for example, we do not typically have to drastically modify our knowledge of gravity, traffic, eating, per-

forming our work, doing arithmetic, and talking in English, even though particular atomic instances of these kinds of knowledge change: I am eating red beans and rice on October 18, 1999, at 6 p.m. When relatively fixed knowledge about an organization is captured and a process is built to link it to knowledge that changes often (dynamic knowledge), the result is an organizational knowledge repository, growing over time and able to be reasoned over—as, for example, by software agents performing e-commerce transactions across a supply chain of virtual enterprises. These technologies, especially when coupled with emerging Web technologies such as Extensible Markup Language (XML) and semantic extensions of XML,

can help build a usable knowledge-based model of the organization leading to this vision of the future.

Currently, MITRE is working on several knowledge management pilots. One pilot is trying to identify the entities, relationships, and constraints within the operating center. The goal of this particular pilot is to construct an organizational ontology and its supporting knowledge base. The resulting knowledge map will enable additional data and knowledge linkages to be made, facilitate knowledge capture, and promote the construction of knowledge management applications.



For more information, contact Ray D'Amore at 703-883-1764 or rdamore@mitre.org

or



Trish Carbone at 703-883-5523 or carbone@mitre.org

New Knowledge Management Tool Profiles Web Usage Demographics

By Robert McCready

With the volume of Web-based information increasing at an unprecedented pace, information stewards desperately need to be able to evaluate quickly and accurately the usefulness of their Web collections. We are only now beginning to address the question of how to appraise the value of a corporation's online knowledge. One important aspect of appraising value is examining the extent to which collections are being used and determining what sorts of employees are using them. Raw hit counts of Web page usage deliver too much information at too high a level of detail. And while a survey completed by every employee would provide a solution to this problem, this method would consume an unacceptable amount of resources.

To address this problem, MITRE is developing a tool called Intranet Usage Profiler (IUP) that exploits data already collected in corporate Web logs of intranet usage. IUP underscores an axiom of knowledge management (KM) that an organization's information processing directly correlates with the capacity of its work force to produce innovation. A research company that values creativity like MITRE, is an ideal environment in which to deploy a KM system based on this belief. The advantage of using a KM tool like IUP is that, with IUP, information stewards do not need to require employees to monitor the use of their own collections.

Necessary information is extracted from existing Web logs, so the overhead, both financial and computational, is minimal.

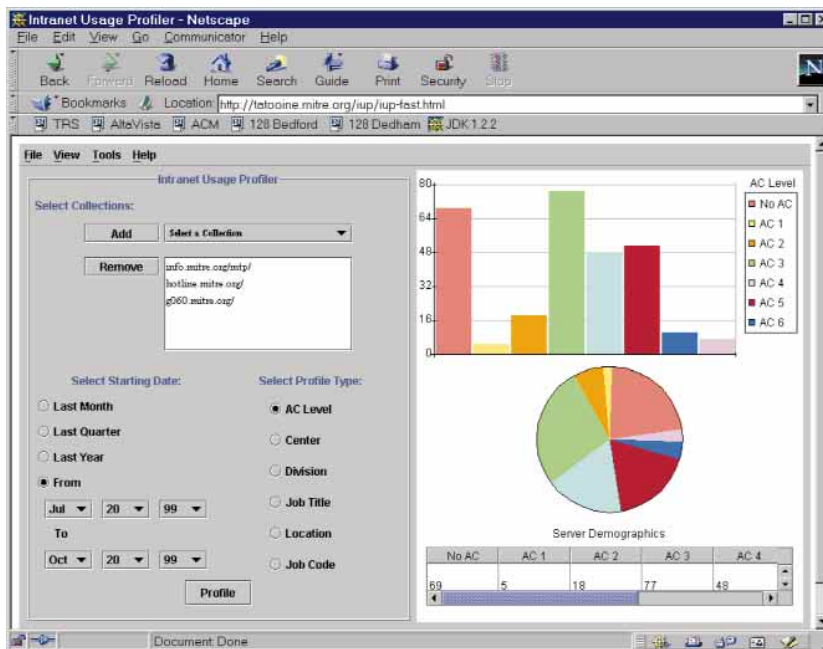
IUP provides collection stewards, who are responsible for maintaining sets of MITRE's intranet Web pages, with a tool for profiling usage of Web collections. It is a Web-based application that captures information about the consumption trends of the MITRE community through analysis of Web usage. The contents of the harvested Web logs record the name of the requesting machine, the requested file name, and a time stamp. IUP works by associating who owns a computer, determined from MITRE's property database, with demographic information about the owner obtained through the company's Lightweight Directory Access Protocol "white pages" directory. By combining these results in a database, we can more fully and accurately answer the question "Who is looking at my col-

lection?" For example, IUP can answer all of these questions:

- Which seniority level uses my Web collection the most?
- Which division is increasing usage of my collection at the fastest rate?
- Which Web collections do people I work with find worth reading?
- Is my collection's targeted audience my actual audience?

Since the developers of IUP were trying to create an open portal into a collection of private corporate information, IUP is designed to uphold its own self-imposed privacy policy, whose rules are intended to protect the privacy of individual users of the intranet without compromising IUP's viability. Our rules for privacy are twofold: "What you can see is identical to what I can see" and "Nobody can monitor individual usage."

IUP implements the first privacy rule of equal views for all users by delivering the information to the user via a Java applet imbedded within its own Web page. Because it is online, MITRE employees can access the system through a Web browser and see for themselves the nature of the information that the tool generates. IUP enforces the second privacy rule, ensuring that IUP isn't used as a monitoring tool, by filtering findings from any query when the



MITRE's Intranet Usage Profiler (IUP) tool tells us about usage patterns.

result is fewer than three individuals. This means if the number of employees from a division viewing a collection is, for example, two, IUP will not return any information. This type of filtering is designed to prevent a user from cross-referencing multiple queries from the system to find more information than the privacy policy permits. While creating an application that follows these rules limits IUP's functionality, this is an intentional choice made to avoid the possibility that IUP could be used as a monitoring tool. Any slight loss in functionality is more than offset by having a tool that can be used and positively accepted by the MITRE community.

Presently, IUP logs demographics of employees viewing pages within the corporate intranet. What we would like to be able to do is identify unique pages that are "authorities" and "hubs" from within these corporate Web collections. "Authorities" are Web pages to which other sites link frequently in order to provide access to information on a partic-

ular topic. "Hubs" are sites that cite many of those authorities. IBM has produced some promising new algorithms for doing just this in the new Clever search engine. This work focuses on analysis of hyperlinks within the Web pages. Hyperlinks are usually the blue underlined text inside a Web page that, when "clicked on" by the mouse, send the Web browser to a new page. By recording and analyzing these links between pages, Clever can assign values to different pages. These values can increase a page's rating as either an "authority" or a "hub." If the methods from the Clever project were combined with our own profiling techniques, IUP could rate how proficient the MITRE community is at finding the knowledge it is looking for. This would allow IUP to answer not only "Who is looking at my collection?" but also "How are people looking at my collection?"

In addition to these technical issues, the development team would like to address more social concerns. Does implement-

ing a public, company-wide metric system such as IUP have any negative effects? Does deploying a tool such as IUP enhance a company's ability to learn where the online information is? By identifying strengths and weaknesses in its corporate knowledge base, does a company truly become more innovative? Disseminating the answers to these and similar questions could make a useful contribution to the fields of knowledge management and information stewardship.

Related URLs:

The IUP Homepage:
<http://tatooine.mitre.org/iup/home/>

Knowledge Management Archive:
<http://www.brint.com/km/>



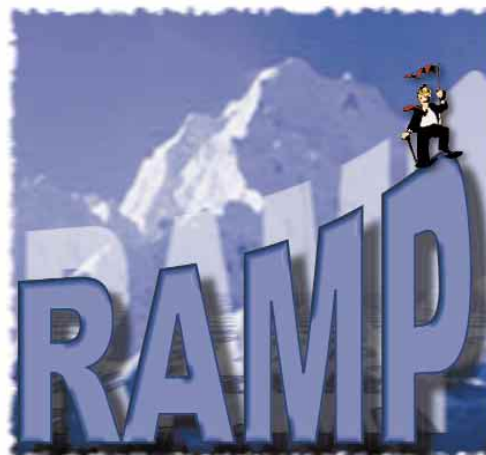
For more information, contact Robert McCready at 781-271-2288 or rmccread@mitre.org

Risk Assessment Streamlined Using Knowledge Management Tool *By Audrey Taub*



When working on a project that involves integrating commercial off-the-shelf (COTS) and existing non-COTS systems and equipment, how do you assess possible risks before you begin acquisition planning? One quick way of looking at a wide variety of risks that have been encountered in similar projects is by using MITRE's Risk Assessment and Management Program (RAMP), an intranet repository of project risks, risk mitigation strategies, and lessons learned.

Every year MITRE captures risk-related experiences from dozens of ongoing projects and adds them to the database. The objective of RAMP is to



offer project managers a knowledge management tool to help identify and quantify specific areas of risk on analogous projects, review risk mitigation options and actions, and assess how effective such actions might be at

reducing cost, schedule, and performance risks on their projects. RAMP currently offers information on more than 400 project-specific risks, spanning more than 180 projects from two of MITRE's Federally Funded Research and Development Centers—the Department of Defense C³I and the Center for Advanced Aviation System Development. Through the distillation of information from multiple sources, RAMP allows MITRE staff to more effectively and efficiently serve present and future sponsors.



For more information, contact Audrey Taub at 781-271-8363 or ataub@mitre.org



A worker who transforms personal and corporate experience into knowledge—acquiring, applying, sharing, and disseminating it and in the process leveraging it across organizational boundaries. A knowledge worker's values and ongoing educational, personal, and professional growth are aligned with corporate vision, management aspirations, and the pursuit of strategic goals.

In Our Next issue

DATA MINING



The next issue of *The EDGE* will focus on data mining—the process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data. It will explore a wide range of MITRE research and work on sponsor problems, from advanced visionary prototypes to custom solutions for specific sponsor needs to infrastructure for data collection and analysis. It will emphasize how that work might transform data mining results into usable information for the benefit of our sponsors.

The EDGE MP 00W0000050-01

The Edge is published four times a year by The MITRE Corporation.

Regina Hansen, *Managing Editor*
Francis McLoughlin, *Editor*
John Schleith, *Art Director*
John Gratz, *Cover Illustration*

Tom Backman, *Review Board*
Reza Eftekari, *Review Board*
Frederick Kuhl, *Review Board*
Bhavani Thuraisingham, *Review Board*

Stephen Huffman, *Co-Publisher*
Mark Maybury, *Co-Publisher*

For newsletter feedback or submission information, contact:

Regina Hansen
Mail Stop: W650
Telephone: (703) 883-7301

© 2000 The MITRE Corporation. All rights reserved.
This document has been approved for public release.

The MITRE Corporation
202 Burlington Road
Bedford, MA 01730-1420

1820 Dolley Madison Boulevard
McLean, VA 22102

www.mitre.org



A publication of the MITRE I-Team
<http://www.mitre.org/resources/specialty/i-team/homepage/>