

CREATING FERTILE GROUND FOR KNOWLEDGE AT MONSANTO



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About the author:

Bipin Junnarkar is Director of Knowledge Management at The Monsanto Company, based in St. Louis, Missouri. Monsanto is a science-based company devoted to discovering, manufacturing, and marketing agricultural products, performance chemicals used in consumer products, prescription pharmaceuticals, and food ingredients.

Junnarkar has been with the firm for several years, working mostly in the area of management information systems. His long-time emphasis has been on introducing new technologies, processes, roles, and behaviors to tap Monsanto's collective intellect more effectively.

There are various paths by which organizations come to the realization that they must do more to manage their knowledge. For many, it follows in the wake of reengineering and downsizing: with fewer people to do the work, they need to equip each to work smarter. For others, it's a wake-up call from a major customer, taking their business to a more state-of-the-art competitor. But at Monsanto, the motivation is more positive, if no less pressing: here, in the midst of prosperity, the driving concern is *growth*.

White Spaces and Gray Matter

When our Chairman and CEO Bob Shapiro took office in 1995, his first priority was to make Monsanto more growth-oriented. The demands of an increasingly global economy were making it clear that profits for the foreseeable future were not enough; world-class competitors would be vying for share, and Monsanto would have to grow faster to remain a dominant player.

Mr. Shapiro stresses two major themes in his quest for growth: more agility in existing businesses; and faster recognition and exploitation of new business possibilities. With an eye to the first, he effected a "radical decentralization," transforming Monsanto's four huge operating companies into fifteen business units—each of a size more conducive to flexibility, focus, and speed of adaptation. To help with the second, he charged one of those units to focus purely

At Monsanto, a need to grow quickly in new business areas convinced management it must focus on knowledge. Leaving the firm's knowledge base to evolve at its traditional pace would simply not be sufficient. Instead, management needed to actively support the creation of new knowledge (by connecting people and information and converting information into knowledge), the encapsulation of that knowledge into forms that could be shared, and the dissemination of knowledge throughout the organization. Achieving these objectives requires attention to people, process, and technology. The most important process to understand and manage is how new knowledge is created—and the best guide Monsanto has found is the work of Nonaka and Takeuchi.

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on growth opportunities. Called "Growth Enterprises," the unit's mission is: "to grow existing business within business units and create new business by exploiting 'white spaces' where core competencies exist to increase the overall profitability of the enterprise."

The "white spaces" concept is an important one drawn from the work of Gary Hamel and C.K. Prahalad, but it raised immediate challenges. How would we find such spaces? What determines whether they are unexploited opportunities, or truly barren ground? How can priorities be set among the opportunities? The key is in the reference to "core competencies": growth at Monsanto will be driven by how well we are able to apply and build on the knowledge our people already have. The mission of the Growth Enterprises unit was soon accompanied by a vision: "to create and enable a learning and sharing environment where knowledge and information are effectively used across the enterprise."

What Knowledge Management Can Do

From the outset, there has been no quibbling at Monsanto about the need for more explicit knowledge management. Our Board of Directors readily approved a significant investment in it. But the way to apply that investment was not immediately apparent: what would do most to make individuals' knowledge more accessible to others? To ensure that the best knowledge is being applied to decisions? To uncover knowledge gaps and to fill them?

In considering the right approach to knowledge management, it helped to consult the available literature on the topic and, even more so, to share ideas with other managers focusing on knowledge. Our current thinking is that knowledge management at Monsanto should focus on five objectives:

- ⊙ Connecting people with other knowledgeable people
- ⊙ Connecting people with information
- ⊙ Enabling the conversion of information to knowledge
- ⊙ Encapsulating knowledge, to make it easier to transfer
- ⊙ Disseminating knowledge around the firm

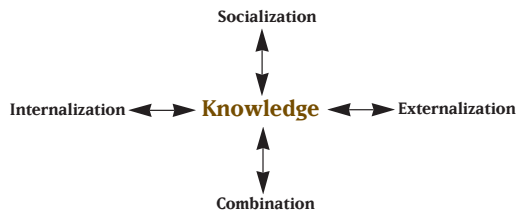
It also seems clear that, despite the claims of some technology vendors, there are no "silver bullets" to accomplish any of these objectives. In our knowledge management efforts, as in any major business initiative, lasting change can only come about through a sustained and balanced interplay of process, technology, and people.

Knowledge Creation as a Process

Most managers today would agree that managing an area requires an understanding of the basic processes involved. Certainly I, as a manager tasked with improving knowledge management, felt I needed a better understanding of knowledge processes, and particularly of those involved in knowledge creation.

Figure 1

Modes of Knowledge Conversion



Adapted from Nonaka and Takeuchi, *The Knowledge-Creating Company*.

How does a business become knowledgeable about a new area (a "white space")? What's the difference between collecting data points and advancing knowledge? How would Monsanto know if it were becoming more knowledgeable in net over time?

An excellent resource in thinking about these questions was the work of Ikujiro Nonaka and Hirotaka Takeuchi, who wrote *The Knowledge-Creating Company*.¹ Their starting point became Monsanto's: that, "in a strict sense, knowledge is created only by individuals." That observation, simple as it seems, has served many times as a touchstone for proposed initiatives. Far from denying the value of organization-level knowledge management, it emphasizes the need for explicit efforts to make knowledge more widely known. In their words, "Organizational knowledge creation should be understood as a process that 'organizationally' amplifies the knowledge created by individuals and crystallizes it as a part of the knowledge network of the organization."

That process, as Nonaka and Takeuchi describe it, can seem chaotic—yet there is some orderliness to it. (See Figure 1.) There is certainly no strict sequence of steps 1, 2, 3, and 4, but typically knowledge is created in four ways. "Socialization" involves activities like brainstorming, discussion, and debate, where people expose their knowledge to others and test its validity. "Externalization" involves putting knowledge to use; this happens when the organization makes a decision, for example, or states a goal. "Combination" is the

bringing together of diverse pieces of knowledge to produce new insight. And "internalization" happens when an individual, exposed to someone else's knowledge, makes it their own.

The interesting thing is that the process can start in any of the four quadrants, and will trigger activity in the others. "Organizational Knowledge Creation," explain Nonaka and Takeuchi, "is a spiral process in which the above interaction takes place repeatedly." For this spiral to remain active and ascending, it must take place in an "open system," in which knowledge is constantly exchanged with the outside environment. And it must be fueled by seeming contradictions and paradoxes; by constantly challenging the existing knowledge, these infusions will force higher discoveries and syntheses. (It's important to realize that good knowledge management is not about making everyone's life more comfortable. Better to make it uncomfortable! The knowledge creation process should generate more questions than answers.)

Reflecting on any typical work week, it's clear most of us vacillate between upward and downward spirals. As might be expected, the downward trend is set in motion when knowledge activity does not culminate in "internalization." Meetings may be called, opinions may be vocalized, decisions may be made—but if a significant number of individuals do not leave the table with their own knowledge enhanced, there is no lasting gain. For Monsanto, the process laid out by Nonaka and Takeuchi made the management challenge clear: to stay in an upward spiral.

¹ The Well-Read Manager, pg. 85

² Murray Gell-Mann, pg. 75

Knowledge is created through socialization, externalization, combination, and internalization. The challenge is to support all of these processes so that the organization enjoys an upward spiral of knowledge creation. Since all of them involve making connections among people and information sources, the objective of Monsanto's technology and people-oriented changes has been to turn the company into a "connection-making machine." New IT capabilities have been implemented to create knowledge repositories, cross-link them for easy navigation, and support decision-making. At the same time, people are connecting more effectively through networks or "communities of practice."

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Technology: Building a "Connection-Making Machine"

Socialize, externalize, combine, internalize. At its heart, the knowledge creation process is about making connections. The objective of Monsanto's knowledge work, then, is to facilitate those connections, first, among knowledgeable people (by helping them find and interact with one another) and second, between people and sources of information.

Information technology, of course, is a key enabler of connections, and this has been a big part of our work to date. Through a variety of information initiatives we have implemented data warehousing, full-text search engines, internet/intranet capabilities, collaborative workgroup software, and major new operational systems (SAP). More broadly, our work in information management has three thrusts:

- ⊙ To create repositories (data warehouses, operational systems) to house important information, both quantitative and qualitative;
- ⊙ To cross-link those repositories so that navigation is easy and the technology is transparent to users; and
- ⊙ To improve our capabilities to perform analyses in support of decision-making.

Our IT focus in knowledge management has been on infrastructure—that is, on creating enterprisewide capabilities and not on delivering information systems *per se*. Together, the systems we have imple-

mented comprise a logical architecture by which end-user applications tap the structured and unstructured knowledge available to the organization.

The People Aspects: Networks and New Roles

As consuming as some of our technology implementations have been, we have tried to keep in mind at all times that any information system is simply a means to an end. Information technology may be a necessary but will never be a sufficient condition for knowledge creation and sharing. Coming back to Nonaka and Takeuchi's observation, we realize at Monsanto that knowledge is fundamentally about people management—equipping and encouraging people to generate knowledge important to our future and share it with others in the organization.

Accordingly, much of our work has been directed at the creation, care, and feeding of networks, or "communities of practice." Networks of people are not only mechanisms for communicating; they help to advance collective understanding by providing a forum for "sense-making." In so doing, they create value for their individual members as well as the organization. What is needed to sustain a vibrant network? We believe it takes information, permeable and natural communication, dynamism in the network itself, and some key supporting roles: what we have come to call "stewards" (or "shepherds"), topic experts, and "cross-pollinators."

Various important “knowledge worker” roles are being recognized and formalized at Monsanto. These include knowledge stewards, topic experts, cross-pollinators, and knowledge teams.

In its ongoing knowledge efforts, Monsanto will benefit from an emerging methodology that ties knowledge management to business strategy. The methodology calls for mapping the business at successive levels, so that the overall business model is translated into requirements for information, knowledge, performance measures, and supporting systems. In future efforts, as always, the greatest successes will come from a balanced approach featuring people, process, and technology-related changes.

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The role of “knowledge steward” can be stated in terms of Nonaka and Takeuchi’s emphasis on the “upward spiral” of knowledge creation. Sustaining that spiral requires focus and resources—and this is the responsibility of the steward. Think about the mission director’s role in Apollo 13, the famous NASA moon shot in which a crew was nearly stranded in space. His role was to clarify the most important knowledge problem facing the group, marshal the right resources and experts, and tighten their collective focus on finding a solution. Importantly, at Monsanto, the steward is not necessarily the ranking member of a given team; playing the role has much more to do with having the right instincts and inclinations than having the right title. Similarly, “topic experts” can come from all walks of the organization; they are the knowledge workers



whose perspectives help the network “make sense” of the information before them, by recognizing patterns and providing context. “Cross-pollinators,” finally, are the conduits to and from other networks and other sources of knowledge. Their activity supports synthesis and “outside the box” thinking by the networks.

Supporting all these functions at Monsanto is a web of knowledge teams, tasked with creating and maintaining a “yellow pages” guide to the company’s knowledge, and serving as points of contact for people seeking information about different subjects. These teams are far more than information “help desks.” They are proactive and creative in thinking about Monsanto’s knowledge needs in their assigned topic areas. If a business manager asks for information, they know not to stop simply at fulfilling the letter of the request. Instead, they probe further into why that information is valuable, how it will be used, and therefore who else might find the same information—or access to the requester’s increasing knowledge—of value. Because these teams must cast a wide net, covering internal and external, qualitative and quantitative information, their composition is similarly diverse: each brings together people trained in information technology, library science, and relevant content areas. The teams are geographically dispersed and self-directed.

Figure 2

The Information Map Points to Sources of Existing Information

	Quantitative Structured	Qualitative Unstructured
Internal	<ul style="list-style-type: none"> ⊙ Financial ⊙ Sales ⊙ Budgeting ⊙ LRP 	<ul style="list-style-type: none"> ⊙ Strategic Plan ⊙ Monthly Reports ⊙ Documents
External	<ul style="list-style-type: none"> ⊙ Point of Sale ⊙ Financials 	<ul style="list-style-type: none"> ⊙ Competitor Info. ⊙ Newswires ⊙ Federal Register



Mapping the Way Forward

If there is any such thing as a "knowledge management methodology," it is being invented on the fly by organizations like Monsanto in the midst of knowledge experiments. With the benefit of only our experience to date, we would propose a methodology based on a series of maps, charting the knowledge challenges facing a firm at progressively finer degrees of resolution.

First, it makes sense to map the overall business model driving the firm's performance and profitability. What actions and decisions are most important to its success? We have come to call a map drawn at this level a "learning map"—mainly because it is so useful as tool to educate the entire organization and help them to internalize the strategic aims of the business.

Once a learning map has illustrated what drives the business, it is possible to construct an "information map" noting the information required to support that activity and decision-making. This information map must consider qualitative (or unstructured) information as well as quantitative, and information from both internal and external sources. (See Figure 2.)

A "knowledge map" can come next, illustrating how information is codified, transformed into knowledge, and used. Among the important uses of this map are to highlight knowledge strengths and shortfalls in the organization and to inform the creation and support of knowledge networks.

The fourth type of map is something more widely known as a "Balanced Scorecard"—that is, the set of performance measures that top management should use to gauge the health and progress of the business. Such scorecards are "balanced" because they combine traditional financial measures (which lag performance) with important non-financial measures (which are often leading indicators). Many firms are implementing balanced scorecards with or without knowledge initiatives. It's important to include them in a knowledge management methodology for two reasons: 1) because knowledge fuels performance in fundamental ways, and 2) because measures must be defined to track the impact of knowledge management efforts.

All four of these maps highlight needs for data and information storage, manipulation, and integration. Thus, the final map is an information technology map reflecting the infrastructure and systems needed to support the knowledge work of the organization.

This basic five-map methodology, stated here at a very high level, is the framework we intend to apply to our ongoing knowledge management efforts at Monsanto.

● A Prescription for Knowledge Management, pg. 26

● Research Roundup, pg. 87

Knowledge Management: The Essential Elements

If Monsanto's efforts at knowledge management are succeeding, it is probably due most to our holistic approach. Rather than relying on a single bullet—like knowledge-sharing incentives, for example, or groupware—Monsanto is drawing on a whole arsenal of people-, process-, and technology-related changes. The first priority in terms of people has been to recognize and formalize the roles of different kinds of "knowledge workers." The work on process has been, first, to focus on knowledge creation, and then to define ways in which individual knowledge becomes an organizational asset. And the focus of technology efforts has been to impose better organization on knowledge and enable connections among people and information.

Is it working? Certainly, Monsanto is growing profitably, and our success in "exploiting white spaces"—particularly in the exploding field of biotechnology—has been proven. One of our most interesting new products, for example, is Bollgard™, which can properly be called a "smart product."

Bollgard is a new kind of cotton plant, genetically engineered for greater defense against a pest which accounts for 80% of cotton plant destruction in the United States. In fact, in one six-month period since the firm began actively managing knowledge, it was awarded four regulatory approvals to sell innovative new products—this, in an industry where the typical EPA approval process has taken over eight years.

Is this purely due to better knowledge management?

Of course not. The number of variables that come into play in a regulatory approval process is great.

But does there seem to be a direct correlation between investment in knowledge and better performance in new product and business development? Clearly, yes. Monsanto is moving ahead as a source of innovation and effectiveness. And if stock price is any indicator, the word is getting out that we have some very productive units, and that we are figuring out how to engage the collective intellect of our people.