A BRIEF HISTORY OF KNOWLEDGE MANAGEMENT

Today, knowledge is widely recognized as lying at the heart of organizational performance. For more than a decade, firms have tried to manage knowledge. In so doing, a variety of fundamental strategies for managing knowledge have been implemented.

1 Bob Zmud was the accepting Senior Editor for this article.
2 Much research has been done on organizational forms, particularly hierarchies, communities, and markets. A classic article that describes how firms can be organized is Ouchi, W. G., “Markets, Bureaucracies, and Clans,” Administrative Science Quarterly (25), 1980, pp. 129-141.

THREE KNOWLEDGE MANAGEMENT STRATEGIES:
KNOWLEDGE HIERARCHIES,
KNOWLEDGE MARKETS, AND
KNOWLEDGE COMMUNITIES

Executive Summary

We draw on the “fundamental theory of the firm” to present three distinct knowledge management strategies: a knowledge hierarchy, a knowledge market, and a knowledge community. Most firms will use one strategy for some knowledge needs and a different strategy for other knowledge needs. All three strategies deliver knowledge by blending people-to-document (codification) and people-to-people (personalization) approaches, depending on the nature of the knowledge.

A knowledge hierarchy views knowledge as a formal organizational resource. It manages knowledge creation, development, and reuse through deliberate, authority-based processes, using the traditional management hierarchy of a well-defined organizational unit. This knowledge hierarchy strategy is best suited for rapidly changing knowledge where the goal is to substitute expert knowledge for the knowledge of less experienced people.

A knowledge market treats knowledge as an individual resource. It manages knowledge creation, development, and reuse through organizational policies that encourage knowledge sharing. This knowledge market strategy is best suited for knowledge that evolves slowly and where the goal is to augment the knowledge of experts.

A knowledge community views knowledge as a communal resource. It manages knowledge creation, development, and reuse through informal, trust-based processes within a group of individuals. They share a common interest, but they are often spread throughout the firm. This knowledge community strategy is best suited for moderately changing knowledge where the goal is to augment the knowledge of experts.


1 Note that we use the term “reuse” because our focus is the knowledge management strategy rather than the user per se.
In a 1999 article in the *Harvard Business Review*, Hansen, Nohria, and Tierney\(^5\) presented two now-common ways to view knowledge and knowledge management: people-to-documents and people-to-people. In the people-to-documents approach, referred to as “codification,” knowledge is formally identified, codified, and stored in a Knowledge Management System (KMS). In the people-to-people approach, referred to as “personalization,” knowledge is seen as residing with a person. There is no attempt to formally capture and store the knowledge. Instead, the KMS provides pointers to individuals who are likely to have the relevant expertise.

The conventional wisdom is that codification and personalization are distinct knowledge management strategies, and therefore, a firm should not use both strategies, but rather, should choose one strategy or the other, and use it throughout.\(^6\) However, in our work with several firms, we have seen the successful blending of these two strategies, even within the same KMS.\(^7\) Thus, we believe a better way to think about knowledge management is to base it on the “fundamental theory of the firm” – hierarchies, markets, and communities.

**UNDERSTANDING KNOWLEDGE NEEDS**

Organizations create and use many types of knowledge in many knowledge domains. Some knowledge is used primarily within one organizational unit (e.g., corporate tax knowledge), while other knowledge is used across many units (e.g., travel reimbursement knowledge).

A knowledge need is an opportunity to provide knowledge that, if satisfied, helps individuals perform their work more effectively or efficiently. Firms have many knowledge needs, just as they have many information systems needs, training needs, and so on. As a result, each knowledge need may have characteristics that best fit a specific knowledge management strategy.

To illustrate different knowledge needs, consider two knowledge domains in one firm.

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\(^6\) Ibid.


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**Knowledge Needs at Pharmaco**

Pharmaco (a pseudonym) is a multinational pharmaceutical firm with research and manufacturing facilities in five continents and sales operations in six continents. Pharmaco focuses on prescription drugs, so most of its revenue comes from a small set of products. The firm’s success depends, in large part, on developing new products and managing its brands, which have a limited life before generics arrive. Like most pharmaceutical firms, Pharmaco is knowledge-intensive – from its research and development operations to its sales representatives, who market its products to doctors. Pharmaco has a variety of knowledge needs, two of which are research knowledge and sales knowledge.

**Research Knowledge.** Pharmaceutical research, like most scientific research, is knowledge intensive. Teams of researchers work together, often with researchers on other continents, to search for promising compounds that could potentially become useful drugs. This work requires deep knowledge in a study area (e.g., specific diseases) and in research methodologies (e.g., quantitative biology), and it often draws on research done by medical researchers around the world.

Pharmaco’s CEO recognized that sharing research knowledge is critical to Pharmaco’s long-term success. He frequently cited the apocryphal story of a researcher who spent months trying to find a solution to a research problem, only to find the answer in a journal article published by a colleague two cubicles away. Pharmaco believed the key to managing research knowledge was to share it among researchers working in the same disease and the same methodological areas. Each area varied in size from a dozen researchers to more than 100 spread around the world.

The researchers worked in separate teams, but often had complementary or overlapping areas of knowledge.

**Sales Knowledge.** The vice president running Pharmaco’s U.S. business unit recognized the need to improve knowledge-sharing among its many thousand field sales representatives. This sales force was organized by division, each with 300-700 representatives selling to a different set of customers (e.g., primary care doctors, specialists, hospitals). The pharmaceutical selling process is knowledge intensive, and the U.S. pharmaceutical industry is highly regulated. Sales representatives must understand diseases, medical research, regulations, Pharmaco’s products, and its competitors’ products, and they must be able to communicate this knowledge effectively.

Most Pharmaco field sales representatives are new college hires with no prior pharmaceutical experience.
They, therefore, receive six months of training when hired, and then two more weeks each year. However, the vice president wanted to augment this training with faster and more efficient delivery of general sales knowledge (e.g., selling techniques, regulations) and drug knowledge, including both basic knowledge (e.g., chemical processes, side effects) and competitive information (e.g., analyses of competitors’ drugs, selling messages against those competitors).

Analyzing Knowledge Needs

To manage knowledge well, a firm must identify the knowledge needs of its users in each knowledge domain. Two factors are important in fully understanding a knowledge need. The first is the goal behind the knowledge reuse, that is, why the users need the knowledge. The second is the expected life span of the knowledge, long or short.

Knowledge Reuse Goal. Organizations have several reasons for promoting knowledge reuse. For some, the primary goal is knowledge augmentation, that is, to augment the knowledge that workers already have by helping them acquire more knowledge in a particular knowledge domain, so that they grow their skills and abilities for performing a particular knowledge task.

A second goal is knowledge substitution, that is, substituting an expert’s superior knowledge for that of non-experts, and using that expert’s knowledge to direct the behavior of the less knowledgeable people. Knowledge substitution is the goal when desirable and persistent differences exist between the knowledge of novices and experts, and management wants work processes standardized and performed in essentially the same way by all.

An example is the knowledge provided to tax preparers. If the preparers have low skills, and work only on standard tax returns, their efficiency and effectiveness might be improved by having them follow a standard process, so knowledge substitution would be useful. If, on the other hand, the preparers are experts working on complex returns in unique situations, they could benefit most from knowledge augmentation, not substitution, because no standard processes exist.

As another example, consider the knowledge provided to doctors. If the knowledge is medical – that is, the focus of their work and where they have high expertise – they could benefit from knowledge augmentation. But, if the doctors work for an HMO that has placed controls on how they practice medicine, then the knowledge reuse goal may be both augmentation and substitution because, in some cases, the HMO administrators’ judgment replaces the doctors’ judgment. Conversely, if the knowledge is IT knowledge that enables the doctors to use a medical information system (where standard use is a goal), then the knowledge reuse goal is likely to be substitution.

Knowledge Life Span. Knowledge changes. What was valid and useful yesterday may not be valid or useful tomorrow. The nature and speed of knowledge change is, therefore, important in deciding how to manage it. Some knowledge changes slowly (e.g., statistics, human behavior) while other knowledge changes very quickly (e.g., competitive information, information security patches). Sometimes change is predictable, thereby lessening the impact of the rate of change. For example, new technologies can be introduced into a firm with ample warning. Likewise, changes to government regulations can have phase-in dates. In other situations, however, change is not predictable, such as when a competitor introduces a new product or a new sales campaign.

The way knowledge degrades is also important. It can degrade gracefully, which means that yesterday’s knowledge may remain valid and useful, but is not today’s best practice. Consuming out-of-date knowledge that degrades gracefully, like consuming out-of-date cereal, is not optimal, but it will not hurt and is often better than nothing. Much “soft” knowledge, such as management knowledge, degrades gracefully.

But knowledge can also degrade sharply. Then yesterday’s knowledge is not only not useful, it is no longer valid. The change is discontinuous; the old knowledge is incorrect. Consuming out-of-date knowledge that degrades sharply, like consuming out-of-date meat, can potentially cause harm, and is often worse than no knowledge at all. Some “technical” knowledge, such as security patches and legal case law, degrades sharply.

The rate of change and the nature of degradation give each piece of knowledge an effective life span, beyond which it should be deleted or revised. Actual life span, on the other hand, is when the knowledge is actually deleted or revised. Knowledge that degrades sharply has a shorter effective life span than knowl-

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9 Ibid.
10 Conner and Prahalad, op. cit.
11 Markus, op. cit.
12 For example, see Access Health in Hansen et al., op. cit.
13 A related concept is that of knowledge half-life, that is, the time it takes a piece of knowledge to receive half the total number of reuses it receives over its actual life span. Knowledge in rapidly changing environments typically has a short half-life. In general, “soft” knowledge will have a longer half-life than “technical” knowledge.
edge that degrades gracefully because it can become dangerous soon after it expires. Actual life span should match effective life span. Most knowledge needs will have a mix of knowledge with short and long effective life spans.

MANAGING KNOWLEDGE

Managing knowledge involves deciding how new knowledge will be created, developed, and reused. These three decision factors represent the three fundamental processes in knowledge management\(^{14}\) (see Figure 1). Knowledge needs differ, so deciding how best to manage each of these three knowledge processes must be made separately for each knowledge need.

<table>
<thead>
<tr>
<th>Figure 1: Knowledge Management Processes</th>
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<tbody>
<tr>
<td><strong>Knowledge Creation</strong></td>
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<tr>
<td>• Initially create knowledge, and</td>
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<tr>
<td>identify it as “knowledge.”</td>
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<tr>
<td>• Continually revise and maintain</td>
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<tr>
<td>the knowledge over time.</td>
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<td><strong>Knowledge Development</strong></td>
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<tr>
<td>• Validate the knowledge and/or its</td>
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<td>source.</td>
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<tr>
<td>• Prepare the knowledge and/or its</td>
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<tr>
<td>source to facilitate knowledge</td>
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<tr>
<td>transfer and reuse.</td>
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<tr>
<td><strong>Knowledge Reuse</strong></td>
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<tr>
<td>• Users locate and select new</td>
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<td>knowledge for their use.</td>
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<tr>
<td>• Users “contextualize” knowledge</td>
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<td>to fit their environment.</td>
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<td>• Users apply new knowledge in</td>
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<td>their environment, and gradually,</td>
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<td>refine it over time as they learn to</td>
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<td>use it.</td>
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**Knowledge Creation**

Knowledge creation includes initially creating the knowledge, as well as identifying it, and deciding whether or not to include it in the KMS. Creation can involve either preparing documents or recognizing individuals who hold the knowledge. Knowledge creation also includes routine ongoing maintenance, that is, revising knowledge and removing knowledge or sources that are no longer useful.

**Knowledge Development**

Knowledge development refers to preparing knowledge for transfer. For knowledge documents, development includes verifying that the knowledge is correct, and writing documents so that the knowledge is easier to use and apply. Often, standard document templates and consistent search terms are used to make knowledge easier to locate and absorb. For knowledge that is intended for transfer from person-to-person, development includes verifying that the person is, indeed, an expert, and providing some training on effective ways to transfer knowledge.

When knowledge is first created, it is closely tied to its originating context. To use it in a different context, it must be “contextualized” to fit the new environment. This usually means *deconstructing* it (that is, putting it into a general form), then *reconstructing* it into its new context.\(^{15}\) Deconstruction and reconstruction across different parts of a firm are difficult because users must understand how to modify the knowledge to fit their own context.

For example, at Pharmaco, sales representatives working with different types of doctors need different knowledge about the same drugs. Although the doctors may prescribe the same drug, the nature of the patients and their treatment plans can be quite different, requiring sales representatives to have different knowledge. Sales representatives working with psychiatrists treating patients hospitalized with clinical depression need different knowledge about a drug than do those working with primary care doctors treating patients with mild depression.

Efforts spent on knowledge development lower the cost of reuse. Well-developed knowledge is simpler to find and to recognize as being relevant. It can also be customized so that users in different contexts can reuse it more easily. Pharmaco initially provided the same in-depth detailed knowledge about its drugs to all sales representatives. However, it soon realized that the best “selling process script” for an anti-depression drug was different for psychiatrists than for primary care doctors because they have different criteria for selecting drugs (e.g., knowledge about the sexual side effects of anti-depression drugs was not important to psychiatrists treating hospitalized patients, but was needed by primary care doctors). By customizing the selling process scripts to the criteria used by the different target markets, Pharmaco was able to better equip its sales representatives.

\(^{14}\) Many authors have provided different frameworks for thinking about knowledge management processes. We integrate the frameworks of Alavi and Leidner, op. cit., and Markus, op. cit.

Knowledge Reuse

Knowledge reuse involves three steps:

1. Users first must find and select the knowledge that appears appropriate to their use.
2. Users must then contextualize the knowledge to their environment. When knowledge is well-developed, contextualization is simpler.
3. Users can then apply the knowledge to their work.

Often, users’ initial performance on a job drops when they begin to use new knowledge because they must change their work processes to use it. But their performance gradually improves over time as the knowledge is refined by practice.16 Unfortunately, users initially have no clear indicators of the quality of the knowledge. They can ascertain its value (or lack of value) only after using it.17 For example, based on a suggestion from a sales representative, Pharmacore recommended the use of an Internet-based mapping site to help sales representatives better plan their sales call routes each day. Initially, they encountered a learning curve in using the site. But once they began using it, they learned how to better plan their routes to save time and mileage.

These three knowledge processes and their resulting knowledge can be managed in three ways:18 via a knowledge hierarchy, a knowledge market, or a knowledge community. These three knowledge management strategies (KMSs) are discussed in the next sections.

KNOWLEDGE HIERARCHIES

By choosing the knowledge hierarchy strategy for a specific knowledge need, an organization chooses to manage that knowledge as an organizational resource; that is, to be managed by someone given formal authority to achieve a specific goal. A hierarchy typically supports knowledge within one unit, whether a traditional functional unit (e.g., sales), or a unit organized around a product or product line (e.g., business unit), a process (e.g., new product development19), or a project (e.g., a shuttle launch), or any other unit with a clear mission.20

Characteristics of Knowledge Hierarchies

Knowledge hierarchies support a well-defined set of users who are performing specific tasks in specific contexts. The knowledge is designed to fit the specific knowledge needs of the organizational unit, and it is intended to be the single source of knowledge within its scope. Specific individuals are formally charged with creating knowledge, capturing knowledge from others, and developing that knowledge into a form that is easily consumable by the target users. The KMS staff may be experts who create knowledge, they may act as editors for other experts who create the knowledge, or they may do both. (See Figure 2.)

Knowledge hierarchies contain quite specific knowledge that is customized for the target users. That knowledge applies to a majority of the target users and is reused repeatedly. For example, an automobile manufacturer might develop a knowledge hierarchy to support its network of dealerships, so that a significant number of users can reuse the same knowledge to do their jobs more effectively and efficiently. By providing knowledge that affects how employees conduct their work, knowledge hierarchies result in economies of scale and scope.

However, the costs of knowledge creation and development are high in a knowledge hierarchy because the organization must invest significantly in a KMS staff to play a lead role in creating and developing the knowledge to ensure its accuracy and completeness. This staff will also likely work with experts outside the knowledge management organization, and will make sure these individuals are approved before they are included as “experts” in the KMS. The staff will also spend considerable effort maintaining the knowledge to ensure that it remains accurate, that out-of-date knowledge is removed, and that all knowledge documents are validated before being placed in the KMS. These investments in staff and knowledge management procedures are non-trivial, and are continual fixed operational costs. In addition, because the knowledge needs to be validated, organized, and maintained, the variable costs of knowledge development can be high.

18 Adler, P.S., op. cit., for a good discussion of the three fundamental ways firms can be managed.
19 For example, see Seemann, op. cit.
20 For a good discussion of different types of hierarchies, see Malone, T. W., “Modeling Coordination in Organizations and Markets,” Management Science (33:10), 1987, pp. 1317-1332.
In a knowledge hierarchy, the average knowledge quality is high because that knowledge is carefully managed. Reuse is easier because it has been validated in a context close to the context in which it will be reused. This rigor also reduces users’ uncertainty over its value to them, which is a major cost in their use of knowledge.21

A knowledge hierarchy can promote the use of organizational routines and best practices by including them as knowledge templates in the KMS.22 For example, Access Health furnishes its primary care providers with a medical diagnosis process as part of its KMS.23 Thus, a knowledge hierarchy can formalize organizational knowledge and practices so they can be diffused more readily and foster uniformity.

We can thus liken a knowledge hierarchy to a supply depot. The depot is organized systematically with strict controls on layout and content. The depot serves all users’ needs, so they expect items to be available and appropriate for their use. Knowledge items are stored in a consistent manner, so that a simple search should bring up the needed items, and the format will be consistent in style, so that reuse is simple.

### When to Use Knowledge Hierarchies

Knowledge hierarchies are well suited for knowledge substitution. They can be used to transfer knowledge from more knowledgeable individuals to less knowledgeable ones and to standardize the knowledge used, thereby increasing efficiency and effectiveness.24

Knowledge hierarchies are appropriate for knowledge with short, medium, and long life spans. But they are particularly appropriate for short life-span environments because in uncertain environments where knowledge changes quickly, formal management is more effective than ad hoc management in responding

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22 Szulanski, op. cit.
23 Hansen et al., op. cit.
24 Conner and Prahalad, op. cit.
Three Knowledge Management Strategies

In the absence of a hierarchy, individual experts in line positions could spend too much time creating and developing knowledge, which would be to the detriment of their core responsibilities. In addition, they might not perform these activities in a coordinated and timely manner, so that the knowledge remains in the KMS beyond its effective life span.

Consider, for example, the knowledge needs of an international accounting firm. Tax law changes are often discontinuous, so life spans are often short. When a major change occurs, old knowledge must be removed, and new knowledge created and developed. In a knowledge hierarchy, one person is responsible for each knowledge item. This formal responsibility, and the ability to identify knowledge owners and coordinate changes, means that the hierarchy can respond to the discontinuous change in an orderly fashion. The knowledge owners know the knowledge must be changed; they know that they are responsible; and they know the people they need to work with to ensure that the knowledge remains consistent. Otherwise, each knowledge provider must revise the knowledge contributions he or she has made, perhaps years earlier, and perhaps in an area they no longer work in. As we know from thousands of outdated Web pages—a global knowledge “market”—such changes are often not made in a timely fashion.

How to Implement Knowledge Hierarchies

A knowledge hierarchy, which requires people, procedures, and software, is implemented through the existing management hierarchy inside a clearly defined organizational unit. The knowledge management team typically reports to the unit manager. Most knowledge management team members have line experience in the unit, and are recognized as experts who can create knowledge and evaluate knowledge created by others. Some team members may even be experts in knowledge management, and can help develop the knowledge hierarchy operating procedures. They may also ensure that others’ knowledge is packaged appropriately.

KMS software delivers knowledge to users in two ways: codification and personalization. With codification, the person-to-document approach, knowledge is packaged into documents, and users interact with those documents, rather than with the experts who have the knowledge. The advantage of codification is that experts are taken away from their work for only a short time to develop the knowledge. From then on, the knowledge can be reused over and over without their involvement. The disadvantage is that each user must select and contextualize the knowledge without help from the expert. Therefore, hierarchies typically ensure that codified knowledge is contextualized to the user’s environment by storing multiple copies of the same knowledge, contextualized for different types of target users.

With personalization, the person-to-person approach, knowledge is transferred from expert to user in person, by phone, by e-mail, etc. The advantage is that the expert can help users select and contextualize the knowledge. The disadvantage is that this personal assistance takes experts away from their regular work, which can be expensive. The organization may even need to hire additional experts to fulfill this function.

Choosing between codification and personalization is a tactical decision that depends mainly on the frequency of expected reuse and the amount of assistance that the users’ are expected to need to select and contextualize the knowledge for their use. Contrary to initial research done in the 1990s, we have commonly seen personalization and codification combined in the same KMS. These KMSs use codification to deliver frequently used knowledge, and personalization to deliver less frequently used knowledge, or knowledge that is difficult to contextualize without expert assistance.

We have seen six knowledge delivery approaches commonly used in knowledge hierarchies (see Figure 3). Four use codification and two use personalization. All six approaches could be used in the same KMS, although most use only 3-4 approaches.

27 Compare to Hansen et al., op. cit.
28 Compare to Hansen et al., op. cit.
29 For example, Seemann, op. cit., provides a detailed description of blending codification and personalization.
Pharmaco’s Sales Knowledge Hierarchy

Pharmaco’s sales knowledge need was to substitute the knowledge of sales managers, experienced sales representatives, brand managers, scientists, and lawyers for the knowledge of less-experienced sales representatives, to ensure that they followed the best sales processes. Sales and medical knowledge typically have long life spans, while competitive knowledge often has a short life span. Sales knowledge evolves slowly because much of it is based on human behavior – the best way to sell tomorrow is likely to be similar to today’s approach. However, Pharmaco’s sales representatives operate in a regulated environment, and regulated knowledge can change quickly. Thus, the correct procedure under today’s regulations may not be correct tomorrow if the regulations have changed. Figure 4 describes Pharmaco’s knowledge needs for both sales knowledge and research knowledge.

Given management’s desire to use knowledge substitution for its short life-span knowledge, the KM manager settled on a knowledge hierarchy. Pharmaco used Lotus Notes to build the KMS because it was standard on the sales representatives’ laptops and because management wanted the KMS to be an integral part of the sales representatives’ computer desktops.

The sales operations management team was made responsible for creating and developing general sales knowledge common to all the divisions. The team is...
assisted by several full-time knowledge associates, typically senior sales representatives and sales managers, each of whom serve a 2-3 year rotation before moving back into sales or sales management. These associates create new knowledge and repackage knowledge from other sources.

The brand team creates knowledge about each drug. They, too, work with the assistance of one or more knowledge associates assigned part-time or full-time. These knowledge associates have marketing or brand management backgrounds, and typically, they return to marketing or brand management after their rotation. Drug knowledge is customized for each division because the knowledge needed to interact with specialists differs from that needed to interact with primary care doctors.

Sales representatives also contribute knowledge, but it comprises less than 5% of the knowledge in the KMS. This knowledge goes through a 5-step validation process before being added to the KMS. Each item is evaluated by a peer review panel of expert sales representatives to ensure that it is relevant and new. Then it is reviewed by the legal department, sales management, and the brand team before the knowledge management team rewrites it to fit the KMS’s style guidelines.

Knowledge is posted in the KMS for the sales representatives to “pull” off as they need to. Several times a month, the sales management team also “pushes” critical knowledge to the representatives; that is, instructs them to read a specific document within 24 hours. The representatives are required to read, internalize, and act on this pushed knowledge, and they are sanctioned by their line managers if they do not. For example, when a national newspaper published an article erroneously implying that one of Pharmaco’s drugs was not effective, the firm used the KMS to ensure that all its sales representatives had the firm’s official, scientifically-based, marketing-oriented, legally-vetted response by the start of the next day.

**Figure 4: Pharmaco’s Knowledge Needs**

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| Knowledge Life Span  | Short-Long                  | Medium                       |

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**Characteristic of Knowledge Markets**

A knowledge market focuses on knowledge capture, rather than on knowledge creation and development; that is, in a knowledge market, there is no systematic knowledge creation or development. Each individual acts independently, and the contributed knowledge is generally not formally managed. The combined actions of knowledge seekers and contributors influence the content and focus of the knowledge in the KMS. Knowledge may be created through unsolicited contributions (i.e., a “knowledge push”) or in response to a request from an individual (i.e., a “knowledge pull”). (See Figure 2.)

In a knowledge market, the knowledge undergoes little validation or organization. No one is formally responsible for ensuring that knowledge items are correct, and that the knowledge in the market is complete. Only minimal formal procedures ensure that the knowledge is maintained over time. In essence, the market is a decentralized *laissez-faire* operation – albeit one with policies, guidelines, and incentives. As a result, knowledge acquisition costs are comparatively low, as are knowledge development costs, because the knowledge assets can be stored with little development, and questions and answers can be posted on a discussion list with little extra effort.

A knowledge market may have some structure. It may, for instance, be organized around a specific area of interest (such as Web development, tax accounting practices, etc.). But the knowledge usually is not specific to a unit or functional area. Therefore, it does not affect an individual’s job in any formal way. Its use is not a *routine* required practice (i.e., use is ad hoc), and typically, each piece of knowledge is not reused as extensively as in a knowledge hierarchy. Because users are often from different units, the knowledge typi-

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30 We use the term “knowledge market” as an analogy, in the same way that Alder, op. cit., uses it to refer to “markets” internal to a firm. We do not intend it as a description of solely external markets where knowledge can actually be bought and sold, such as Google Answers (answers.google.com), although such external markets do fit our definition.

cally is not custom-fitted to a user’s context. Instead, each user must contextualize the knowledge for his or her own environment and purposes.

In a knowledge market, knowledge reuse costs are relatively high, compared to a knowledge hierarchy, for three reasons. First, search costs are higher. With no formal knowledge development, knowledge items are packaged differently. Thus, users need to search more KMSs, and different places within those KMSs, to find relevant knowledge. Second, contextualization costs are higher than in a knowledge hierarchy. Users must deconstruct knowledge and then reconstruct it for their own environment because contributors often come from different parts of the firm. Third, knowledge quality is uncertain because the system is not actively managed. Although knowledge management teams could build post-hoc assessment and rating mechanisms for users to assess knowledge quality, these are typically difficult and costly. As a result, markets are less suited to novice users because search is more difficult, contextualizing knowledge is more difficult, and quality is more variable.

We liken a knowledge market to a bazaar, where the layout may be managed, but the contributors and contributions are not. Users do not know whether the items they seek are in the bazaar, nor do they know the quality of those items when they find them – hence, caveat emptor. In addition, knowledge sources can change. The bazaar is not formally or systematically organized, and knowledge development is handled by each contributor. Looking for something specific in a bazaar can entail an extensive search. On the other hand, by browsing, users might discover useful unanticipated knowledge.

**When to Use Knowledge Markets**

Knowledge markets are suitable only for knowledge augmentation, not substitution, because the knowledge is not validated or developed, and reuse is ad hoc. In this case, knowledge substitution is an impractical goal. Markets are also best suited to knowledge with long life spans, where changes are slow and continuous. Markets have little central planning, so the agents in a market react to minor changes in the environment autonomously, and the knowledge evolves naturally to reflect the changes. A market does not respond well when knowledge has a short life span.

As noted above, knowledge reuse is more difficult in markets than in hierarchies because search and transaction delivery approaches most commonly used in knowledge markets. They are often combined in the same KMS.

**How to Implement Knowledge Markets**

A knowledge market requires lower investments in people, procedures, and software than a knowledge hierarchy. A market is typically implemented by a staff knowledge management team responsible for developing procedures and providing software, but the team has no direct responsibility for the knowledge. Such a team is typically composed of knowledge management experts, who help develop and recommend operating policies (and incentives) that line management adopts and implements. Thus, the team’s primary role is to manage the KMS software not the knowledge.

Figure 3 shows the four codification and personalization delivery approaches most commonly used in knowledge markets. They are often combined in the same KMS.

**Pharmaco’s Failed Global Knowledge Market**

Pharmaco’s CEO decided to launch a major knowledge management initiative to help all the firm’s knowledge workers augment their knowledge by using the knowledge of others and sharing their own knowledge. The team chose a knowledge market strategy because the knowledge was to have a wide scope, the system was aimed at knowledge augmentation, and the knowledge life span was expected to be long. The team’s role was to manage the KMS software and to coach the users to create the knowledge content.

The team focused on the technical challenge of finding a viable software package that could be used globally. It selected a “Web portal” (a highly flexible, Web-based system designed to provide dynamic content). The team wanted to launch the market with some easily accessible content. It chose Pharmaco’s human resources knowledge (a knowledge repository, an expert directory, and a set of templates), which was already on the Web, and the corporate library (a document repository), which included the online subscriptions to a host of scientific journals. In addition, the knowledge market went live with approximately 60 tools for employees to create and share knowledge, such as document repositories, people directories, question and answer discussion forums, and a tips and stories database.

Within six months, it was clear that the market was not successful. There were virtually no contributions from employees. A few employees accessed the library, but the primary access was to the human resources knowledge. The users had changed the in-

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33 Conner and Prahalad, op. cit.; Williamson, op. cit.
34 Ibid.
tended global knowledge market into a human resources knowledge hierarchy. Pharmaco continued to operate the KMS, but shifted its focus to being a human resources knowledge hierarchy. Its new goal was to substitute the expert knowledge of the human resources group for the knowledge of managers and employees.

KNOWLEDGE COMMUNITIES

A knowledge community lies between a knowledge market and a knowledge hierarchy.35 The organization chooses to manage the knowledge for a specific knowledge need as a communal resource that is shared among members of communities within the firm. The firm treats the exchange of knowledge as a trust-based process. Individual users decide how knowledge is to be developed and used, but those decisions are heavily shaped by the community members’ norms and active involvement.36 The firm can intervene in the community, but these interventions may be secondary to the community’s social norms.

Characteristics of Knowledge Communities

In a knowledge community, a firm relies on individual users for knowledge creation, development, and reuse. These individuals seek and contribute knowledge as they desire, but they do so as members within a community of like-minded members. The community is organized around a specific issue or set of issues of interest to its members. Consequently, many members know each other. For example, a firm with a federal IT governance structure may have a number of IT professionals who are interested in Web services, and who are spread across many organizational units. They may choose to form a Web services community. Often, knowledge communities and their knowledge are firm-wide, rather than specific to one business unit. So they typically provide less specific knowledge than a hierarchy and more specific knowledge than a market. (See Figure 2.)

Some members of the community serve as coordinators to assist contributors and users. They maintain the community, and ensure that the knowledge and its structure are useful. They may hold formally established positions as coordinators in the firm, or may undertake the role to serve the community. Coordinators generally influence knowledge creation and development, but not to the same extent as managers in a knowledge hierarchy. They can develop captured knowledge, but they typically do not create new knowledge. In a knowledge community, knowledge development costs are higher than in a knowledge market because the coordinator invests time to establish, package, and maintain the knowledge. Even when coordinators work only part-time, this work still takes away from their other activities.

Knowledge reuse costs in a community are lower than in a market, but higher than in a hierarchy. The lower reuse costs result from the community’s tendency to regulate quality. In a community, a person’s reputation, the potential for reciprocal assistance, and a person’s identification with the community are important.37 Individuals who routinely share high-quality knowledge will receive positive feedback (directly or indirectly), while those who share low-quality knowledge will receive negative feedback. Such feedback reinforces higher-quality contributions, and discourages lower-quality ones. As well, in a knowledge community, the transaction costs of knowledge search, access, contextualization, and reuse are all lower than in a knowledge market because the coordinator assists in knowledge development, and so, because the coordinator invests more effort, individual users need to spend less effort locating required knowledge.

We liken a knowledge community to a shopping mall. The mall is a set of stores operated by different individuals with different items and policies. But the mall operator acts as a coordinator to provide some order and consistency across the individual stores. The mall is designed to ensure that individual stores are complementary in some way, but there is no guarantee of completeness or consistency. Users may require different items from different stores even for the same task.

When to Use Knowledge Communities

A knowledge community is suited to knowledge augmentation for the same reason a knowledge market is suited to augmentation: reuse is ad hoc and at the user’s choice, so substitution is impractical. Knowledge communities are suited to knowledge with medium to long life spans; they adapt autonomously to incremental environmental changes, so their knowledge gracefully evolves to reflect the changes.38 Knowledge communities are not suited to knowledge that has a short life span and requires frequent changes because a community’s inherent autonomous, incremental adaptation cannot keep pace.39 The community coordinator must take a more active role in managing

36 Adler, op. cit.
38 Conner and Prahalad, op. cit.; Williamson, op. cit.
39 Ibid.
such knowledge. Because community coordinators typically do not have as many resources as managers in a knowledge hierarchy, they will have difficulty sustaining a community with short life-span knowledge. In this case, management should consider a hierarchy.

**How to Implement Knowledge Communities**

As with a knowledge market, the knowledge management team’s main role in a knowledge community is advisory. The team operates the KMS and coaches and mentors community members on how to manage their community knowledge. One major difference, however, is that the team must also develop and nurture a network of knowledge community coordinators.

Because knowledge communities are “in between” knowledge hierarchies and knowledge markets, they often use the same codified and personalized delivery approaches as hierarchies and markets. Figure 3 shows six commonly used approaches. The question-and-answer forum tends to be more closely managed than in a knowledge market to discourage low-quality knowledge contributions. On the other hand, the expert directories, the knowledge repositories, and the tips, stories, and opinions all tend to be less tightly managed than in a knowledge hierarchy. So, overall, the community knowledge is not as well validated and developed, and, not as complete as in a knowledge hierarchy.

**Pharmaco’s Research Knowledge Communities**

The failure of the global knowledge market drove Pharmaco’s KM team to step back and rethink how to meet the knowledge needs of the firm. The team decided to focus its KM efforts on a dozen long-standing informal “communities,” most of which were research communities with well-defined knowledge needs. The primary goal would be to augment the knowledge of scientific researchers. Since most of these users were experts, the knowledge would not be to reinforce standard operating procedures. Pharmaco’s research knowledge tends to have a medium to long life span because it evolves slowly. (See Figure 4.)

The team worked with the thought leaders in these informal communities, introduced them to the KMS, and identified ways the KMS software could be made more useful for their community. The portal software provided one common architecture, but each community could select the software tools that best met its needs.

Today, Pharmaco has many research knowledge communities. Each has at least one coordinator to ensure that the community thrives. These volunteers receive no extra compensation, but they are highly visible in their community. They welcome new members, develop and maintain standards of conduct and standards for knowledge, maintain the community calendar, monitor the discussion forum and archive older discussions, develop knowledge items, ensure that the knowledge in the community remains relevant, and serve as the primary point of contact for the community.

The KMS software contains some 150 tools, but only a handful are used. The four most commonly used tools are the discussion forum; the tips, stories, and opinions; the knowledge repository; and the community calendar. In a discussion forum, any community member can pose a question or request, and any member can respond. Each discussion item is typically initiated as its own thread; usually, two or three discussion threads are active at a time, depending on the community’s size.

The tips tool lets any community member document a best practice or advice via a short entry. Sometimes, coordinators believe a particular item in the discussion forum has long-term value, and should be moved to the tips area. Either the coordinator or the contributor then prepares a tips document.

The knowledge repository is similar to the tips area, but houses more formal documents, such as corporate standards, access to online journals, and templates.

Coordinators post suggested items to the community calendar. Typical calendar items include face-to-face meetings held by a part or all of the community, seminars and workshops offered by members of community, and more formal presentations likely to be of interest to the community.

**RECOMMENDATIONS**

Effectively managing knowledge is a major challenge for organizations today. But, the traditional recommendation that firms should adopt just one knowledge management strategy and employ it throughout their organization is erroneous. Knowledge needs have different characteristics, so they need to be managed in different ways, rather than via a single generic strategy for the firm or an entire business unit. We conclude with four overarching recommendations for knowledge management.

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40 See Hansen et al., op. cit.
Select the Knowledge Strategy that Fits the Knowledge Need

Each knowledge need is different, and each may call for a different knowledge management strategy (i.e., a knowledge hierarchy, a knowledge market, or a knowledge community). Managers can use the characteristics of these three fundamental knowledge management strategies to decide how to organize and manage each knowledge need. The deciding factors are the goal (to substitute or to augment existing knowledge) and the knowledge life span (how rapidly decision-makers must react to quickly changing knowledge). Not all KMSs will perfectly match our three strategies—nor should they. A successful KMS may very well be a hybrid of the three archetypal strategies that we have discussed here.  

Focus on Knowledge Hierarchies and Knowledge Communities

Examples of successful knowledge hierarchies and knowledge communities are more plentiful than examples of successful knowledge markets. (Note, for instance, Pharmaco’s experiences.) Knowledge markets are seductive because they are quicker to establish, and they have lower operating costs than knowledge hierarchies and knowledge communities. But we have seen virtually no successful knowledge markets, except Google Answers, the successful public for-profit knowledge market. We believe knowledge markets may only be suitable for a few specialized applications, but we cannot demonstrate that belief, yet. Firms should, therefore, focus on knowledge hierarchies and knowledge communities. We believe most firms will eventually operate sets of knowledge hierarchies and knowledge communities to meet the variety of knowledge needs they face.

Build Multiple KMSs for Different Organizational Units

Figure 4 shows that the knowledge needs we identified at Pharmaco have different characteristics (and we have examined just a few of the firm’s many knowledge needs). Most firms, like Pharmaco, have many different knowledge needs, so a single KMS based on a single strategy is unlikely to satisfy all the needs at once. More likely, organizational units will operate various knowledge hierarchies, and user groups will operate various knowledge communities. In other words, typically, within a firm, there will not be one KMS, nor will there even be a single KMS for a given type of knowledge need. Only in unusual cases will a firm use the same strategy and the same KMS for all of its knowledge needs.

Ideally, a firm could use the same infrastructure and KMS software to support all its KMSs, and in so doing, gain economies of scale in operating costs and a consistent user interface, which reduces the learning curve across KMSs. However, not all KMS software packages support all knowledge delivery approaches equally well. To select KMS software, a firm should first understand its knowledge needs, then choose its management strategies, and finally, identify the most appropriate delivery approaches for those strategies. In other words, a firm should not compromise its knowledge management needs to use a single software package throughout. Flexibility is important.

Implement Knowledge Management in Steps

The first step on the knowledge management path is to examine the firm’s different knowledge domains to identify critical knowledge needs. The second step is to examine each knowledge need in turn, analyzing its knowledge reuse goal and its knowledge life spans, to select the best-fit knowledge management strategy. Once the strategy has been selected for a given knowledge need, the third step is to identify the knowledge delivery approaches (i.e., software tools), and the people and/or the units that will operate the KMS, and then to develop the operating procedures. The key point, however, is that each knowledge need must be considered separately—no single strategy will fit all.

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