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Managing the Knowledge Life Cycle

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Knowledge isn't static, but it often gets managed as if it were. Companies that want to develop and use knowledge most profitably should start treating it differently according to the stages of its life.

**Julian Birkinshaw and
Tony Sheehan**

Most executives today recognize that their organizations must be able to manage knowledge effectively — it's a strategic imperative. Just how they should go about developing that ability is the challenge. As in most other areas of management advice, there is no shortage of useful frameworks, models and checklists to choose from. Unfortunately, these solutions are generally undifferentiated; they are presented as applicable in any and all situations, and managers are left to make their own mistakes as they use one tool or another to ill effect. To take only one example, communities of practice, while immensely valuable in some contexts, have limited utility in others.

We believe that executives can begin to take a more nuanced approach to this issue if they realize that knowledge has a life cycle. Life-cycle models have already been usefully developed as a tool for thinking about products and technology, and the idea that knowledge changes form as it diffuses through a population is well established.¹ The practical implications of the knowledge life cycle, however, have not been discussed in detail.

Over the course of a five-year study, we have devised a model to help explain the life of an idea in commercial settings. The model shows that new knowledge is born as something fairly nebulous (often in the head of one individual) and that it takes shape as it is tested, matures through application in a few settings, is diffused to a growing audience, and eventually becomes widely understood and recognized as common practice. (For an overview of our study, see "About the Research.") In this article, we develop the concept of the knowledge life cycle in detail and then describe appropriate

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strategies for managing ideas at each stage of the cycle. We also outline the model's implications for companies' knowledge strategies as a whole.

Knowledge-management tools are not universally applicable; different tools are required at different stages of an idea's life. Executives who understand the dynamics of the life cycle in their industry will be better able to determine what kind of knowledge their organization needs and how they can effectively select and develop the tools and techniques to manage it.

The Four Stages of Knowledge's Life

The knowledge life cycle can be represented as a simple S-curve. Along the curve, knowledge progresses through four stages: creation, mobilization, diffusion and commoditization. (For a graphic representation, see "The Knowledge Life Cycle."²)

About the Research

This article is based on five years of research into knowledge-management practices in large companies. The first author conducted a two-stage study beginning in 1996. The first stage consisted of interviews in 10 multinational service firms, including Accenture, Bovis, Oxford University Press, Royal & Sun Alliance Insurance Group, DHL Worldwide Express, Citibank, McKinsey & Company and KPMG. In the second stage, the author conducted detailed case studies in six companies (Icon Medialab, Roslin Biomed, Pink Elephant, Xansa, Ericsson and Hewlett-Packard) that focused on identifying the elements of an effective knowledge-management strategy. The second author undertook an extensive study of Arup's knowledge-management activities. He conducted more than 100 interviews, initiated a benchmarking study of global design firms and developed a global knowledge-management strategy that is currently being implemented.

Knowledge starts out as nothing more than an idea in someone's head — a scientist in an R&D department experimenting with a new drug compound, say, or a management consultant toying with a new model of organizational change. At this stage, the idea may be rather abstract (and not even well understood by the individual who thought of it) but coherent enough for testing — in a laboratory by the scientist or in conversation with a client by the consultant. Many ideas in the creation stage will run into dead ends or fail to generate interest, but some will become more clearly formed and make it to the mobilization stage.

In this part of the cycle, an idea becomes more concrete and its broader value is established through continued testing and validation. Those involved with the idea's development begin to

codify their tacit knowledge. The scientist may write an academic paper explaining her findings, thereby allowing others with similar training to run their own tests. The management consultant might write up his insights and make them available to colleagues in the same firm. The defining characteristic of the mobilization stage is that the originators share their knowledge with people who make up part of a trusted community.

An idea that clears hurdles within a trusted group passes to the next stage. It is then broadly diffused and becomes widely understood in the relevant marketplace. The scientist's breakthrough will be reverse-engineered or successfully imitated by other companies, and the consultant's tool will be adapted by many other firms.³ In the diffusion stage, the idea as it has been developed and tested is available to virtually anyone who wants to use it.

But the idea's progress through life isn't yet over. In the commoditization stage, the idea is so well known as to be common knowledge or, in economic language, a public good. It may be taught in school or easily found in a library book or on an Internet site. Examples from this stage include knowledge about the molecular structure of aspirin and the design of the internal-combustion engine. In the field of management, a good example is quality management, once a highly specialized and esoteric technique, now standard practice in many companies. (See "The Evolution of Quality Management.")

While all knowledge moves through the life cycle, the speed of progress varies enormously from one case to the next. Three factors in particular can accelerate the rate at which knowledge passes through the life cycle. The first is the ability of competitors to obtain the knowledge, through reverse engineering, by hiring people from the idea's source, and by more dubious means. The second is natural leakage, as customers, suppliers and others learn from the company and share their newfound knowledge. The third is deliberate codification and diffusion by the company — a strategy that may make sense if the knowledge is going to be impossible to protect.

Two factors can slow down the life cycle. One is the extent to which intellectual property rights can be established for the knowledge in question. In the pharmaceutical industry, patent protection is highly effective and essentially halts the life cycle at the mobilization stage for the 10 to 20 years during which a compound is protected. The other factor is the stubbornly tacit nature of some knowledge, which resists codification. Compare, for example, the knowledge needed to design a car versus that needed for a new computer system. Cars are made up of multiple interdependent systems, and the way they interact cannot be entirely predicted. In contrast, computer systems are perfectly logical and open to modular design. While both require

high levels of expertise, car design is far harder to codify than computer-system design.

Regardless of the rate of knowledge's progress through the life cycle, companies can generate value for themselves at every stage. Some, such as design company Ideo or boutique consultancy Strategos, make a very good living out of ideas in the creation stage. Others earn considerable profit from knowledge that has reached the commoditization stage. (As the number of consultants who continue to sell quality-management services demonstrates, an idea can be quite valuable even when its basic contours are well known.) The challenge is to understand the appropriate tools and techniques needed to generate value from knowledge in each phase. Four categories must be considered in each: the informal systems for mobilizing and sharing knowledge, information technology systems, human resources, and relationships with external parties.

Creation

The essence of the creation stage is that no one fully understands the idea or emerging body of knowledge, not even those creating it. The process of creation is messy by nature and does not respond well to formal methodologies or rigid timelines.

For businesses, the dominant strategy for working with early-stage knowledge is to flesh out an idea to a point at which its commercial viability can be tested. Thus a software company will put together a prototype to test on beta sites, and a management consultant will look for an existing client who is interested in trying out a new tool. To encourage such activity, companies need to create an environment that allows creativity and experimentation while also providing some structure and discipline. Building that environment requires adjustments in the following areas:

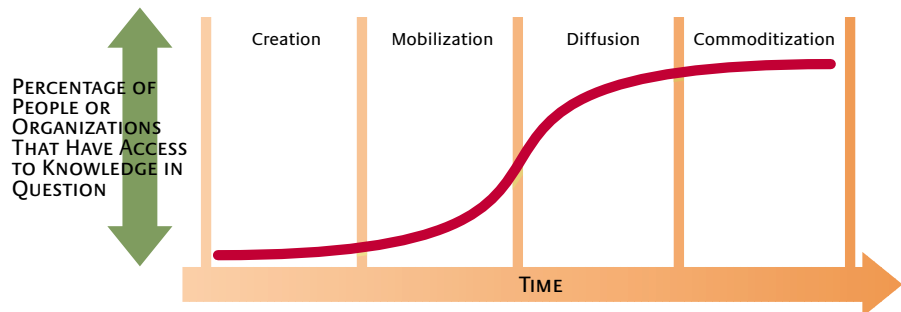
Informal Knowledge Systems Creativity is nourished most effectively when people have the opportunity to interact informally and spontaneously. Companies can help by laying out their space in an open plan that also has many common areas, by giving their people time to experiment, and by providing resources for training programs and conferences.

Consider the London-based advertising agency WCRS. According to one senior manager, the company operates in a state

of “structured chaos.” Informal contact is encouraged on both business and social matters, and the in-house wine bar is the “social hub of the organization.” The high level of social interaction among employees has created bonds of trust and helped the agency to sell bold ideas to clients. One highly successful advertising campaign, for example, could be traced back to an impromptu brainstorming session held in the wine bar between three colleagues who would not normally have worked together. Hewlett-Packard Laboratories also focuses on the creation stage

The Knowledge Life Cycle

Knowledge progresses through four stages as it develops over time. As it becomes accessible to more and more people — first in one organization, then in many, and finally to the general public — companies must use different strategies to realize its maximum value.



of the life cycle. Like a university, it gives its researchers funding for conferences, slack time to pursue pet projects and free access to all laboratory materials and equipment.

Information Technology Systems In the creation stage of the life cycle, systems for codifying and storing knowledge have little value. They can, however, usefully connect people who might share an interest in the nascent idea. Most management consultancies now have directories that identify the company's resident experts in certain industries or subject areas. Discussion forums, videoconferencing facilities and brainstorming software are also useful as connecting devices. Technology at this stage also brings people together at highly specialized Internet forums. For example, Java programmers at Icon Medialab, a Swedish consultancy, often seek out ideas and advice on Internet forums because they know they can interact with others who are at the bleeding edge of technology.

Human Resources Companies that regularly create new knowledge hire (and figure out how to live with) oddballs and mavericks — people who see the world differently and constantly challenge the status quo. Such people typically need special

The Evolution of Quality Management

The field of quality management illustrates the evolution of a body of knowledge over the life cycle. The quality movement had its origins in the work of W. Edwards Deming and Joseph Juran in the 1920s and 1930s. Deming spent the early part of his career developing and applying statistical methodologies to industrial production systems. As head mathematician at the U.S. Bureau of the Census, and then as lecturer at the U.S. Department of Agriculture and at Stanford University, he observed the frustrations engineers experienced in applying the techniques of statistical control. His observations led in turn to his insight that quality cannot be systematically improved without the active support of top management. Juran began his work in the 1920s in the inspection department of the famous Hawthorne works of Western Electric. He saw firsthand the limitations of quality inspections and began publishing in-house pamphlets on methods of controlling quality. In 1945 he became a freelance consultant, and in 1951 he published the "Quality Control Handbook."

Thus the creation stage of quality management took place in the United States, but the ideas were not effectively mobilized until Deming went to Japan in 1947 as an adviser to Gen. Douglas MacArthur's Supreme Allied Command. He began lecturing to the leading industrial companies in Japan in 1950 and found an enthusiastic audience for his ideas. Juran also spent time in Japan in the 1950s, giving a series

of lectures to the Union of Japanese Scientists and Engineers. Japanese companies quickly adapted the ideas of Deming and Juran to their needs, and the quality movement took off.

Once the benefits of quality management had begun to emerge, the practice diffused quickly through Japanese industry. Not until the 1960s, however, did the movement really take hold in the United States and Europe. The process was again spearheaded by Deming and Juran. By that time, quality management had evolved into a relatively codified form — witness Deming's 14 points and seven deadly diseases, and Juran's 10 key steps. Other thinkers emerged in the field, and all the major consultancies developed their own quality-management services. Throughout the 1970s and 1980s, quality-management programs were at the heart of the change agenda in most industrial corporations.

The final phase of evolution in quality-management thinking occurred in the 1980s. Quality techniques were commoditized to such an extent that they became enshrined in certification and compliance tools such as ISO 9000. Rather than managing quality through a separate group, companies began to institutionalize it as a corporatewide capability. Today quality management is part of the standard lexicon of business; it is taught in textbooks and is part of most companies' standard operating procedures. Such commoditization does not prevent companies from selling services focused on quality. The Deming

Institute and the Juran Institute, for example, are still promoting new ways of adapting and extending the principles of quality management.

Indeed, some companies still struggle to implement quality programs, perhaps because of misconceptions about what they entail. A Ford executive had this to say about a visit by Deming in 1990: "We wanted to talk about quality, improvement tools, and which programs work. He wanted to talk to us about management, cultural change, and senior managers' vision for the company."^{*} The implicit belief at Ford was that ideas about quality formed a codified body of knowledge that could be bolted on to the company's existing systems. But Deming's view was that quality management would be effective only if it were treated as an interdependent and central part of a company's entire management philosophy.

As the Ford story indicates, most everyone in the business world has some knowledge of quality management. In theory, after 70 or so years of development, the ideas should be applicable by any manager who reads up on them. In practice, however, the knowledge about how to integrate quality management with the rest of a company's systems is still highly tacit. Knowledge about quality management may be a commodity, but it's not a cheap one.

^{*} A. Wilkinson, T. Redman, E. Snape and M. Marchington, "Managing with Total Quality Management: Theory and Practice" (Oxford: Macmillan, 1998).

contracts, nonstandard compensation models and a more patient style of management than is usually found in commercial enterprises. Consider the role Leif Edvinsson played at the Swedish insurance company Skandia in the late 1990s. Edvinsson, one of the originators of the intellectual capital movement, reported directly to chief executive Bjorn Wolrath. He first had responsibility for creating Skandia's Intellectual Capital Report and later moved gradually into more of a free-

agent role in which he created the company's Future Center and proselytized his ideas inside and outside the company. Although Edvinsson had his critics, strong support at the very top of the company allowed him to pursue his unconventional but influential agenda.

External Relationships Contacts with outsiders such as customers or suppliers are the most common stimulus of new ideas.

Companies that are focused on the first stage of the life cycle deliberately seek out relationships with external partners that are likely to lead to knowledge creation. 3M, for example, has an active “lead users” program for developing new ideas in partnership with customers. In the world of engineering, companies will often take on high-profile projects on a break-even basis because such projects give them an opportunity to push industry practice. Otis Elevator engaged in that practice when it built elevators on

to spread their knowledge throughout the company. HP Canada has centers of excellence in R&D; Sara Lee has them in manufacturing and in support activities; and 3M Europe has them in corporate marketing. In the case of 3M Europe, the center for key account management was based in Stockholm, and the manager in charge of the group would travel to other 3M businesses in Europe to explain the center’s recent work and how its new knowledge could be spread throughout the company.

<p>Knowledge-management tools are not universally applicable; different tools are required at different stages of an idea’s life.</p>	
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Sugarloaf Mountain in Rio de Janeiro, a tricky piece of engineering that had significant PR and visibility benefits.

Mobilization

In this stage, knowledge continues to be refined, and the company that developed the idea attempts to extract value from it. To do that, the company must find ways to mobilize the knowledge internally while keeping it hidden from outsiders — ideally, by keeping it proprietary.

Patent protection locks in proprietary knowledge for a time, but many services based on knowledge cannot be meaningfully protected. And even if a term can be protected — the Balanced Scorecard, for example — it is almost impossible to stop imitators from using the same concept under a different name. The best policy in such cases is to keep the knowledge relatively uncoded while creating internal mechanisms for exploitation. Approaches for doing that are as follows:

Informal Knowledge Systems The goal is to build informal networks among people so that knowledge can be transferred internally through experience. The community of practice is an effective means of accomplishing that transfer in the mobilization stage. Many companies have adapted this idea by encouraging the establishment of informal communities. Computer-services company CSC has several hundred communities of professional employees, each one based on a particular competence or practice area. To be true communities of *practice* (as distinct from communities of users), they should be kept informal and their size should be limited to a relatively small number of members who have existing expertise.⁴

Another tool that many companies use is the *center of excellence*: a small group of experts in a single location with a mandate

Information Technology Systems As is true in the creation stage, the IT focus in the mobilization phase is on technology that enables the informal transfer of knowledge. A good yellow-pages database is essential; in addition, companies need systems that can flag the existence of current ideas and projects. In management consulting firms, consultants often post white papers or thought pieces on a knowledge database, accessible internally only through their intranets. These documents typically provide readers with just enough information to make sense of the idea; others in the firm can get in touch with the author if they want to pursue it further. To reduce the possibility of “leakage,” such papers should be written in a form of shorthand that makes far more sense to another employee of the firm than to outsiders. For example, a paper on corporate strategy at Bain & Company might build on the firm’s “adjacency matrix” — a concept well understood by members of the firm but less so by outsiders. IT systems often make it possible for readers to add comment on the usefulness of such articles.

Human Resources Knowledge is truly mobilized when creative new ideas are transformed into commercial products and services. To pull that off, “ambidextrous” people — thinkers as well as doers, mavericks as well as pragmatists — are needed. McKinsey & Company encourages the development of such people by putting a significant number of its consultants on a career track in which their time is divided between knowledge creation and client-facing work. Those who gain experience with both roles can ensure that the necessary links are made between the first two stages of the life cycle. Another way of developing ambidextrous people is by making some client-facing employees into individual centers of excellence. Chase Manhattan Bank, for example, used to identify “top guns” — individuals who were recognized leaders

in their sectors and could be called on to answer questions or provide advice in their area of expertise.⁵

External Relationships Strong relationships with leading customers and other partners continue to be important in this phase of the life cycle. The focus shifts from experimentation, however, to the application of tested ideas. In some cases, commercial arrangements in which risk and profit are shared may help focus collab-

copied very badly). Consider, for example, the ease with which all the major consultancies developed reengineering, ERP implementation and knowledge-management offerings. In such a crowded market, the challenge is to differentiate the service and delivery aspects of the offering; that can be done by focusing on one particular client sector or emphasizing an existing track record or relationship. Again, managers concerned with knowledge in this phase should consider the following levers:

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orative teams from different companies on shared goals. Alliance contracts are a common means of achieving that focus in the off-shore-platform construction sector. In manufacturing, Bae Systems successfully developed the silicon gyroscope (an innovation used in automobile braking systems) by supplementing the work of an internal team with powerful external partnerships.⁶

All these approaches assume that the knowledge in question can be kept under wraps. If that is not the case, some level of diffusion (through codification) may be advisable as long as a significant component of the knowledge remains tacit. For example, the McKinsey Quarterly provides access to many of the firm's latest ideas at no cost to the reader. By giving away some of its knowledge, McKinsey broadens executives' awareness of the work it is doing and is likely to win contracts to implement the ideas before competitors can put together their own offerings.

Diffusion

In the diffusion stage, the company no longer tries to keep an idea or technology under wraps — quite the opposite. It accepts the fact that leakage and imitation are bound to occur and begins to propagate the idea deliberately — selling it to a broad base of customers, marketing the concept through various media, and to some degree inviting others to join the bandwagon. Rather than attempt to protect the unprotectable, it makes far more sense to extract value from the knowledge by diffusing it.

Many knowledge-based service companies have good reason to move their ideas rapidly into the diffusion stage. In the world of computer software, for example, diffusing the product builds usage, creates network economies, and preempts competitors; the money is made, according to this strategy, by selling upgrades and service contracts. In the consulting business, concepts are hard to patent and easy to copy (even if many are

Informal Knowledge Systems The emphasis in this stage is on packaging and standardizing knowledge in such a way that it can be disseminated widely and quickly. Informal systems based on personal networks are not sufficient for those tasks. Instead, systems should focus on training people in company methodologies and encouraging their use. For example, CSC has “communities of users”: distributed networks of people somewhat akin to a community of practice but with an emphasis on applying the knowledge in question rather than creating new knowledge. Similarly, Ericsson created a network of Java programmers spread out across six locations to ensure that new applications picked up by one programmer could be quickly diffused to others in the network.

Information Technology Systems The extensive knowledge databases that most large consultancies (and many other companies) have built are most useful during the diffusion and commoditization stages. The act of codifying and standardizing knowledge opens it up to hundreds of people throughout the organization while also making it far easier for a competitor to copy. Competitive advantage, then, comes from the ease of access to information or the quality of previous work, rather than the underlying idea or model. Consider Egon Zehnder, the consulting firm that specializes in recruiting. Rather than allow individual consultants to build their own proprietary lists of contacts, Egon Zehnder has a single common database with information about recruiters and the recruited. The firm makes this approach possible (and acceptable to employees) by paying straight salaries rather than commission-based compensation. As a result, it has a much larger and more comprehensive database than its competitors.

IT systems in the diffusion stage can also be used to identify new trends — such as the data warehouse applications developed by First American to help turn around its traditional banking

business in the 1990s. First American didn't create those applications, but it was very effective at identifying the right systems to apply to its specific needs. By becoming more aware of its important customers and their needs, the bank was able to improve its business performance markedly.

Human Resources The diffusion stage requires people who are good at working with customers and recognize the value of applying the company's knowledge to their problems. Such people must be alert to new opportunities because ideas typically come from existing customer relationships. In the early 1990s, a district sales manager for HP in Canada, Gerhard Schmid, picked up on his customers' need for a software application that would allow them to access data from remote locations, such as an oil platform. Rather than just inform the product-development group, Schmid put together a small development team in Calgary to build the software application his customer was looking for, and the product was subsequently rolled out worldwide.

External Relationships When competitors are selling services of similar intellectual content, the relationship with customers has to shift toward other aspects of service — a successful track record or special skills in one sector. Clever use of branding can also create a perception of difference when the product is actually very similar to another. Many consulting firms, for example, invest in their own in-house journals and encourage their people to write books as a means of raising the profile of ideas that are almost by definition not proprietary.

Companies should also keep a close eye on competitors to take advantage of knowledge that is entering the diffusion stage. Engaging in reverse engineering, hiring staff from competitors and reading their written materials are all ways of staying up to speed on emerging ideas.

Commoditization

This stage is about how to manage knowledge that is already well known. At this point, the basic ideas have been thoroughly diffused.

Many companies will take the attitude that once knowledge is widely understood, there is nothing they can do with it — they might as well move on to more interesting areas. But the truth is, there are plenty of opportunities to extract value from knowledge that has reached commodity status. Consider an engineering firm that specializes in the construction of skyscrapers. While the knowledge required to build such structures has been well known for some time, the events of September 11 mean that old principles have to be revisited and new ones generated. There are a number of approaches to extracting value at this stage:

Informal Knowledge Systems In this stage, formal knowledge systems have more value than informal ones. Companies have to focus on supplying best practices that can add value to well-developed processes. Systems are needed that encourage new ways of commercializing existing knowledge. Derwent, for example, a business within the Thomson group, takes public-source patents, interprets and packages them, and sells them as easy-to-use databases. And PinkRoccade, the Dutch IT services company, developed a highly profitable business selling training in ITIL (information technology infrastructure library) that is essentially a set of standards and protocols for systems development. The initial insight in both cases was creative, but the actual work is highly standardized and needs to be managed accordingly.

Information Technology Systems To create value out of commoditized knowledge, it is imperative to stay current. Derwent continually updates its patent database, and Pink Roccade keeps up with the latest standards in IT infrastructure. Companies seeking to thrive in this stage have to manage content actively by maintaining standards within old documents, adding new information as it becomes available, and archiving documents that are no longer current. Effective search and retrieval systems are also at a premium in this stage because of the enormous volume of documents that have accumulated over time.

Human Resources The employee skill sets needed in this stage are similar to those required in the diffusion phase. Companies have to understand, however, that because the demand for the knowledge is declining at this point, career opportunities relating to that knowledge are declining, too. A common approach to solving this problem is the use of contract employees. Many large companies still have Cobol programmers, for example, but they are typically contractors who have been programming in Cobol for 20 years. Companies working with commoditized knowledge also have to find ways of redeploying their human resources in more fertile opportunities. They should wind down some projects and close down communities of users in sunset technologies while continuing to invest in areas that still have commercial potential.

External Relationships Companies can create value from widely held knowledge by influencing how it is used. Arup (the engineering consultancy and employer of the second author), for example, developed a solution to the “wobbling” Millennium bridge across the Thames River in London. Rather than keep its innovative solution proprietary, it chose to contribute its knowledge to best-practice bridge-building standards as a means of promoting its name as a technology leader. That

approach is also widely used in the high-technology arena — Ericsson, for example, has developed and promoted standards in GSM, 3G, Bluetooth and other mobile technologies. The goal is to make the company's knowledge the de facto standard.

Another approach is to focus on customers in sectors where the knowledge in question is not yet at the commoditization stage. For example, the use of polymer composite materials in the U.S. construction industry is well developed, but it has

fully develop these new areas, and the client-relationship managers could not be easily convinced of the benefits of selling the unproven techniques to their clients. The organization that the firm had created proved to be ill equipped to deal with creation- or mobilization-stage knowledge.

As that story indicates, most companies are best served by focusing on one, or at most two, stages of the life cycle. Arup spans stages two and three, for example. Much of its bread-and-butter

No company can realistically aim to be active in all four stages of the life cycle. Many companies have struggled, usually in vain, trying to span all four.

lagged behind in the United Kingdom, where until recently patent protections were in effect — a clear opportunity for construction businesses poised to exploit it. An international company that can take commoditized knowledge in one country and roll it out in others has located a powerful source of competitive advantage.

Strategic Implications

In addition to helping companies navigate each stage of the knowledge life cycle, the model also has implications for knowledge strategy as a whole. Three lessons from our research stand out.

The first is that no company can realistically aim to be active in all four stages of the cycle. Many companies have struggled, usually in vain, trying to span all four. EDS, for example, specializes in diffusion-stage knowledge. In 1994 it acquired A.T. Kearney, a consulting firm that profits from mobilization-stage knowledge. The two cultures clashed, and EDS ultimately decided to keep the two businesses operating as stand-alone entities because they had such different approaches to their work.

A midsize U.K. consultancy we know of also illustrates this problem. Since the firm's founding in 1996, it has successfully worked with knowledge in stages three and four. It has, for example, managed the implementation of ERP systems and guided companies through culture change programs. In the process, the firm itself did not offer unique ideas or offerings; its success came from the deep implementation experience of its consultants. As the company grew, however, senior managers decided to invest in "practice development" — that is, in new techniques and tools that could be used to offer greater value to clients. The new tools never took off. The executives running the company were reluctant to invest sufficient resources to

work takes place in the diffusion stage, but it extracts the most value through the mobilization of new ideas and by using new technologies to a much greater extent than its competitors.⁷

The second lesson applies particularly to companies that bridge stages two and three: A fine balance must be struck between hoarding knowledge and sharing it. Hoarding is usually the preferred strategy because it gives a company more time to commercialize and exploit its distinctive knowledge. But hoarding can backfire: A boutique consultancy we know persisted in trying to sell its organizational-learning methodology as if it were a unique product, when in fact most of its competitors had developed equally effective offerings under their own names. Sales of the product never took off, but because the company's managers had become so inwardly focused on the technical qualities of their product, they failed to understand why. Hoarding is also a problem in cases where strong potential network economies exist because of the development of a common standard. In most of the classic "standard wars," the losing party failed because it hoarded its knowledge for too long.

A third lesson concerns knowledge that has been corrupted — an all-too-common phenomenon. An interesting concept like reengineering becomes popular, gets picked up by dozens of companies, and gradually is misapplied and corrupted to such an extent that the value of the original idea is lost. Unfortunately, there are no easy ways of avoiding such scenarios. A company that has originated the concept can trademark the term and aggressively defend it, but that approach rarely succeeds. Alternatively, it can try to distance itself from the discredited concept and relaunch the original idea with a new name. If those approaches fail, the best bet is to acknowledge the loss in value and move on, looking for the next big idea.

As these three lessons make clear, the life-cycle concept isn't a plug-and-play application. Executives still have to do the hard work of figuring out which stage (or stages) their companies are best suited to exploit. They still have to achieve the delicate balance between hoarding and sharing. And they still can't avoid the possible corruption of an idea over time. Nevertheless, the concept that knowledge has a life can be a powerful tool for understanding how ideas are transformed into commercial products and services. By better understanding this process of evolution, organizations can tailor their knowledge-management techniques to the particular stage of the life cycle they are in and extract greater value from their knowledge assets.

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1. See, for example, M.H. Boisot, "Knowledge Assets: Securing Competitive Advantage in the Information Economy" (New York: Oxford University Press, 1999); E.M. Rogers, "Diffusion of Innovations" (New York: Free Press, 1962); and K. Moore and J. Birkinshaw, "Managing Knowledge in Global Service Firms: Centres of Excellence," *Academy of Management Executive* 12 (November 1998): 81-92.
2. Our model builds particularly on the ideas developed by M. Boisot in "Knowledge Assets." The key point is that while more and more companies or individuals are aware of and have access to a form of knowl-

edge as it moves up the vertical axis in later stages, the knowledge is not necessarily more valuable to them or applicable without substantial effort. In some cases, knowledge can be fully diffused but not applied or used appropriately.

3. Patent protection, of course, may limit other companies' ability to use new knowledge. In this article, we do not give much consideration to patent protection since it rarely applies to knowledge services like management consulting.
4. See E. Wenger and W. Snyder, "Communities of Practice: The Organizational Frontier," *Harvard Business Review* (January-February 2000): 139-146.
5. M. Arend, "New Chase CIO Setting up Centers of Excellence," *ABA Banking Journal* (March 1992): 62.
6. See <http://www.livinginnovation.org/displaySection.html?id=99&cold=34&secList=99+100+101+102>.
7. Our argument is at odds with the often-quoted distinction between personalization and codification strategies set out by M. Hansen, N. Nohria and T. Tierney in "What's Your Strategy for Managing Knowledge?" *Harvard Business Review* (March-April 1999): 106-116. They argue that a company should essentially choose one knowledge strategy or the other. Our belief is that organizations should follow strategies according to the life-cycle stage of the knowledge in question. A company bridging stages two and three is likely to need both personalization and codification capabilities.

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