
Developing a Knowledge Strategy

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Business organizations are coming to view knowledge as their most valuable and strategic resource. They are realizing that to remain competitive they must explicitly manage their intellectual resources and capabilities. To this end, many organizations have initiated a range of knowledge management projects and programs.¹ The primary focus of these efforts has been on developing new applications of information technology to support the digital capture, storage, retrieval, and distribution of an organization's explicitly documented knowledge.² A smaller number of organizations, on the other hand, believe that the most valuable knowledge is the tacit knowledge existing within peoples' heads, augmented or shared via interpersonal interaction and social relationships. To build their intellectual capital, those organizations are utilizing the "social capital" that develops from people interacting repeatedly over time.³ Many are experimenting with new organizational cultures, forms, and reward systems to enhance those social relationships.⁴

Technical and organizational initiatives, when aligned and integrated, can provide a comprehensive infrastructure to support knowledge management processes. However, while the appropriate infrastructure can enhance an organization's ability to create and exploit knowledge, it does not insure that the organization is making the best investment of its resources or that it is managing the right knowledge in the right way. How should an organization determine which efforts are appropriate, or which knowledge should be managed and developed?

My research with more than 25 firms has found that the most important context for guiding knowledge management is the firm's strategy. An

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organization's strategic context helps to identify knowledge management initiatives that support its purpose or mission, strengthen its competitive position, and create shareholder value. Intuitively, it makes sense that the firm that knows more about its customers, products, technologies, markets, and their linkages should perform better. However, the link between knowledge management and business strategy, while often talked about, has been widely ignored in practice.⁵

Many executives are struggling to articulate the relationship between their organization's competitive strategy and its intellectual resources and capabilities. They do not have well-developed strategic models that help them to link knowledge-oriented processes, technologies, and organizational forms to business strategy, and they are unsure of how to translate the goal of making their organizations more intelligent into a strategic course of action. They need a pragmatic, yet theoretically sound model of what I call *knowledge strategy*.

This article provides a framework for describing and evaluating an organization's knowledge strategy. The framework is illustrated using examples from five companies representing the spectrum of physical and knowledge-based

products and services (see Figure 1).⁶ "Image Corp." is a leading photographic imaging firm manufacturing physical assembled products such as film and photo-processing equipment. Buckman Labs is a leading manufacturer of specialty chemicals, a physical non-assembled product. Lincoln Re, one of the world's largest life/health reinsurers, provides knowledge-based products and services. "LeaseCo," an industrial garment and small equipment-leasing firm, provides a service based on physical products, some requiring assembly. "Big6" is a leading public accounting and professional services firm, providing knowledge-based services. Together, these companies demonstrate the importance of knowledge strategy regardless of industrial sector.

FIGURE 1

	Products	Services
Physical		
• Assembled	Image Corp	↑ ↓
• Non-assembled	Buckman Labs	
Knowledge-based	Lincoln National Re	Big6

Business Strategy

The strengths, weaknesses, opportunities, and threats (SWOT) framework is perhaps the most well-known approach to defining strategy, having influenced both practice and research for over 30 years.⁷ Performing a SWOT analysis involves describing and analyzing a firm's internal capabilities—its strengths and weaknesses—relative to the opportunities and threats of its competitive environment. Organizations are advised to take strategic actions

to preserve or sustain strengths, offset weaknesses, avert or mitigate threats, and capitalize on opportunities. Strategy can be seen as the balancing act between the external environment (opportunities and threats) and the internal capabilities of the firm (strengths and weaknesses).

Application of the SWOT framework has been dominated over the last 20 years by Porter's "five-forces" model.⁸ This model focuses on the external side of strategy, helping firms analyze the forces in an industry that give rise to opportunities and threats. Industries that are structured so as to enable firms to dictate terms to suppliers and customers as well as to provide barriers to new entrants and substitute products are seen as favorable. Strategy becomes a matter of choosing an appropriate industry and positioning the firm within that industry according to a generic strategy of either low cost or product differentiation.

While enjoying much popularity (in no small part because it was perhaps the first attempt to apply solid economic thinking to strategic management in a practical and understandable way), Porter's model has come under criticism.⁹ The main argument is that the model addresses the profitability of industries rather than individual firms and therefore does not help particular firms to identify and leverage unique and sustainable advantages. Its underlying economic theory assumes that the characteristics of particular firms per se do not matter with regard to profit performance.¹⁰ Rather it is the overall pattern of relationships among firms in the industry that makes the difference. If the industry as a whole is structured properly (i.e., with sufficient barriers and other impediments to competition), then all firms should realize excess returns.

It turns out, however, that unique characteristics of particular firms within an industry *can* make a difference in terms of profit performance.¹¹ To put balance back into the original notion of business strategy, recent work in the area of strategic management and economic theory has begun to focus on the internal side of the equation—the firm's resources and capabilities.¹² This new perspective is referred to as the *resource-based view* of the firm.¹³ Strategic management models traditionally have defined the firm's strategy in terms of its product/market positioning—the products it makes and the markets it serves. The resource-based approach suggests, however, that firms should position themselves strategically based on their unique, valuable, and inimitable *resources and capabilities* rather than the products and services derived from those capabilities. Resources and capabilities can be thought of as a platform from which the firm derives various products for various markets.¹⁴ Leveraging resources and capabilities across many markets and products, rather than targeting specific products for specific markets, becomes the strategic driver. While products and markets may come and go, resources and capabilities are more enduring. Therefore, a resource-based strategy provides a more long-term view than the traditional approach, and one more robust in uncertain and dynamic competitive environments. Competitive advantage based on resources and capabilities therefore is potentially more sustainable than that based solely on product and market positioning.

Knowledge as a Strategic Resource

While having unique access to valuable resources is one way to create competitive advantage, in some cases either this may not be possible, or competitors may imitate or develop substitutes for those resources. Companies having superior knowledge, however, are able to coordinate and combine their traditional resources and capabilities in new and distinctive ways, providing more value for their customers than can their competitors.¹⁵ That is, by having superior *intellectual* resources, an organization can understand how to exploit and develop their traditional resources better than competitors, even if some or all of those traditional resources are not unique. Therefore, *knowledge* can be considered the most important strategic resource, and the ability to acquire, integrate, store, share, and apply it the most important capability for building and sustaining competitive advantage.¹⁶ The broadest value proposition, then, for engaging in knowledge management is that it can enhance the organization's fundamental ability to compete.

What is it about knowledge that makes the advantage sustainable? Knowledge—especially context-specific, tacit knowledge embedded in complex organizational routines and developed from experience—tends to be unique and difficult to imitate. Unlike many traditional resources, it is not easily purchased in the marketplace in a ready-to-use form. To acquire similar knowledge, competitors have to engage in similar experiences. However, acquiring knowledge through experience takes time, and competitors are limited in how much they can accelerate their learning merely through greater investment.

LeaseCo, for example, recognized this opportunity by occasionally bidding aggressively on complex, novel, or unpredictable lease opportunities (e.g., leasing personal computers in 1980) to gain unique and leverageable knowledge from those experiences, while attempting to prevent its competitors from gaining that same knowledge. LeaseCo realized a double benefit over its competitors, first by investing in its strategic knowledge platform and second by learning enough about the particular client to competitively and profitably price leases for future opportunities with the same client. Often, enough mutual learning occurred between LeaseCo and its client that the client contracted with LeaseCo for future leases without going out for competitive bids. In essence, LeaseCo created a sustainable (or renewable) knowledge-based barrier to competition. Lincoln Re, as part of its “experimental underwriting” process, similarly invested in its learning by insuring strategically selected novel and difficult classes of risk at favorable rates.

Knowledge-based competitive advantage is also sustainable because the more a firm already knows, the more it can learn.¹⁷ Learning opportunities for an organization that already has a knowledge advantage may be more valuable than for competitors having similar learning opportunities but starting off knowing less.¹⁸ For example, Big6 invested heavily in capturing and sharing knowledge about key engagements across the firm so that it could sustain its areas of

advantage by always building on its latest knowledge, rather than “reinventing the wheel” while giving its competitors a chance to catch up.

Sustainability may also come from an organization already knowing something that uniquely complements newly acquired knowledge, which provides an opportunity for knowledge synergy not available to its competitors. New knowledge is integrated with existing knowledge to develop unique insights and create even more valuable knowledge. Organizations should therefore seek areas of learning and experimentation that can potentially add value to their existing knowledge via synergistic combination. For example, Lincoln Re’s unique (and patented) capability for capturing and distributing medical risk knowledge via expert systems—above and beyond the knowledge stored in these systems—enabled it to outperform competitors. Combining newly acquired risk management knowledge with its “meta-knowledge” (of how to document, codify, and structure that knowledge) provided Lincoln Re a greater benefit than either alone. As an additional benefit, by designing its expert system to function as a generic knowledge platform, Lincoln Re was able to apply it to additional knowledge domains at essentially no additional cost (except for that to codify the content knowledge of those new areas), thus providing an economic advantage for entering new markets.

Sustainability of a knowledge advantage, then, comes from knowing more about some things than competitors, combined with the time constraints faced by competitors in acquiring similar knowledge, regardless of how much they invest to catch up. These examples represent what economists call *increasing returns*.¹⁹ Unlike traditional physical goods that are consumed as they are used (providing decreasing returns over time), knowledge provides *increasing* returns as it is used. The more it is used, the more valuable it becomes, creating a self-reinforcing cycle. If an organization can identify areas where its knowledge leads the competition, and if that unique knowledge can be applied profitably in the marketplace, it can represent a powerful and sustainable competitive advantage.

Organizations should strive to use their learning experiences to build on or complement knowledge positions that provide a current or future competitive advantage. Systematically mapping, categorizing, and benchmarking organizational knowledge not only can help make knowledge more accessible throughout an organization, but by using a knowledge map to prioritize and focus its learning experiences, an organization can create greater leverage for its learning efforts. It can combine its learning experiences into a “critical learning mass” around particular strategic areas of knowledge.

For example, LeaseCo proactively searched for opportunities to build continually on what it knew about leasing formal dress apparel to appearance-conscious organizations. It became one of the most knowledgeable firms in the industry regarding this premium market. Buckman Labs took a similar approach by focusing its learning to maintain and grow its superior knowledge of the pulp and paper industry. Big6 implemented a computer system that tracked its employees’ experiences and formal training and matched their capabilities to the

knowledge and skills required of its current and future engagements. They focused their training, assignments, and recruiting on continually building the knowledge base to support their most strategically important competitive positions.

While a knowledge advantage may be sustainable, building a defensible competitive knowledge position internally is a long-term effort, requiring foresight and planning as well as luck. For example, as part of its prospective risk management process, Lincoln Re has a “early-warning” process in place to monitor research in the medical field for anything that eventually may improve its mortality and risk management knowledge. Using its unique expertise for translating commonly available research data into an estimate of actual experience, Lincoln Re is able to effectively learn about and profitably insure emergent risk management opportunities sooner than its competitors.

Long lead time explains the attraction of strategic alliances and other forms of external ventures as potentially quicker means for gaining access to knowledge. It also explains why the strategic threat from technological discontinuity tends to come from firms outside of or peripheral to an industry.²⁰ New entrants often enjoy a knowledge base different than that of incumbents, one which can be applied to the products and services of the industry under attack. This has been especially evident in industries where analog products are giving way to digital equivalents. For example, Image Corp. is experiencing a significant shift from physical film substrates to digital imaging. Its knowledge base is built on the science and technology of a physical consumable packaged good. Digital imaging, on the other hand, requires knowledge of computer systems and peripherals, imaging software, electronic distribution channels, and an economic model entirely different than for consumable physical products. The strategic challenge for the firm is to develop sufficient knowledge to support a shift to those new technologies and markets before non-traditional competitors make significant inroads in those markets. At the same time, it must not abandon its years of experience and knowledge about physical imaging that is supporting its core business.

This long learning lead-time or “knowledge friction” highlights the importance of benchmarking and evaluating the strengths, weaknesses, opportunities, and threats of an organization’s current knowledge platform and position, as this knowledge provides the primary opportunity (and constraint) from which to compete and grow over the near-to-intermediate term. This must, in turn, be balanced against the organization’s long-term plans for developing its knowledge platform.

The Knowledge-Strategy Link

The traditional SWOT framework, updated to reflect today’s knowledge-intensive environment, provides a basis for describing a knowledge strategy. In essence, firms need to perform a *knowledge-based* SWOT analysis, mapping their

knowledge resources and capabilities against their strategic opportunities and threats to better understand their points of advantage and weakness. They can use this map to strategically guide their knowledge management efforts, bolstering their knowledge advantages and reducing their knowledge weaknesses. Knowledge strategy, then, can be thought of as balancing knowledge-based resources and capabilities to the knowledge required for providing products or services in ways superior to those of competitors. Identifying which knowledge-based resources and capabilities are valuable, unique, and inimitable as well as how those resources and capabilities support the firm's product and market positions are essential elements of a knowledge strategy.

To explicate the link between strategy and knowledge, an organization must articulate its strategic intent,²¹ identify the knowledge required to execute its intended strategy, and compare that to its actual knowledge, thus revealing its strategic knowledge gaps.

Linking Knowledge to Strategy

Every firm competes in a particular way—operating within some industry and adopting a competitive position within that industry. Competitive strategy may result from an explicit grand decision—the traditional perspective on strategy—or from an accumulation of smaller incremental decisions.²² It may even be revealed in hindsight, by looking back on actual behaviors and events over time.²³ Regardless of the strategy formation process, organizations have a de facto strategy that must first be articulated.

Every strategic position is linked to some set of intellectual resources and capabilities. That is, given what the firm believes it must do to compete, there are some things it must know and know how to do. The strategic choices that companies make—regarding technologies, products, services, markets, processes—have a profound influence on the knowledge, skills, and core competencies required to compete and excel in an industry.

On the other hand, what a firm *does* know and knows how to do limits the ways it can actually compete. The firm, given what it knows, must identify the best product and market opportunities for exploiting that knowledge. For example, Buckman Labs competed on value-added services, requiring it to develop and maintain superior knowledge of how to use its chemicals in various microbiocidal treatment applications to solve its customers' problems. In some markets, Buckman Labs had well-developed knowledge and expertise. In others, it was more limited. Most importantly, it recognized the difference and managed and developed its strategic knowledge accordingly.

Lincoln Re competed directly via the high quality of its knowledge about particular classes of medical risk as well as its knowledge about how to combine ancillary services into an integrated packaged solution for its clients' risk management problems. Lincoln Re, however, knew less about property and casualty risk than some of its competitors and its competitive strategy reflected this.

LeaseCo, which specialized in novel and customized leases, had to know more about the economics of pricing a complex lease than its competitors. LeaseCo did not know as much as its competitors about low-cost, high-volume production or high-volume inventory management. Image Corp. had extensive knowledge and expertise regarding its traditional imaging technologies and products and how they could best be marketed to consumer and industrial customers. Their knowledge regarding digital imaging was much less developed, potentially limiting their ability to compete in that emerging market. Given the strategic importance of the digital imaging market, they were aggressively moving to close this gap.

So-called category killers such as Circuit City and Toys 'R' Us focus their retailing knowledge on one product category at the expense of others. In comparison, many broad-line retailers, led by Wal-Mart, have taken a different competitive knowledge position. They have come to realize that while they know some things about retailing tens of thousands of products to the consumer market, their suppliers are able to develop a more focused understanding about the particular products each supplies. Rather than try to be the consumer expert on every product, these retailers have recognized the limits to what they know and can know. They are asking their suppliers to take responsibility for understanding consumption habits, practices, needs, and buying patterns and to share that knowledge with the retailer. The retailer is, in fact, operating as a knowledge integrator, integrating the knowledge of many suppliers to better serve consumers.

In each case, an organization's competitive position created a knowledge requirement, while its existing knowledge created an opportunity and a constraint on selecting viable competitive positions. Success required dynamically aligning those knowledge-based requirements and capabilities.

A Strategic Framework for Mapping Knowledge

Assessing an organization's knowledge position requires cataloging its existing intellectual resources by creating what is commonly called a knowledge map. Knowledge can be characterized in many ways. Popular taxonomies distinguish between tacit and explicit knowledge, general and situated context-specific knowledge, and individual and collective knowledge.²⁴ Knowledge can also be categorized by type, including declarative (knowledge about), procedural (know-how), causal (know-why), conditional (know when), and relational (know-with). While these distinctions are useful for mapping and managing knowledge at the process level once a knowledge strategy has been formulated, our purpose requires a knowledge taxonomy oriented towards strategy and which reflects the competitive uniqueness of each organization.

Categorizing or describing what a business firm knows and must know about its industry or competitive position is not easy. Although firms within particular industries, firms maintaining similar competitive positions, or those employing similar technologies and other resources often share some common

knowledge, there are no simple answers regarding what a firm must know to be competitive—if there were, then there would be no sustainable advantage.

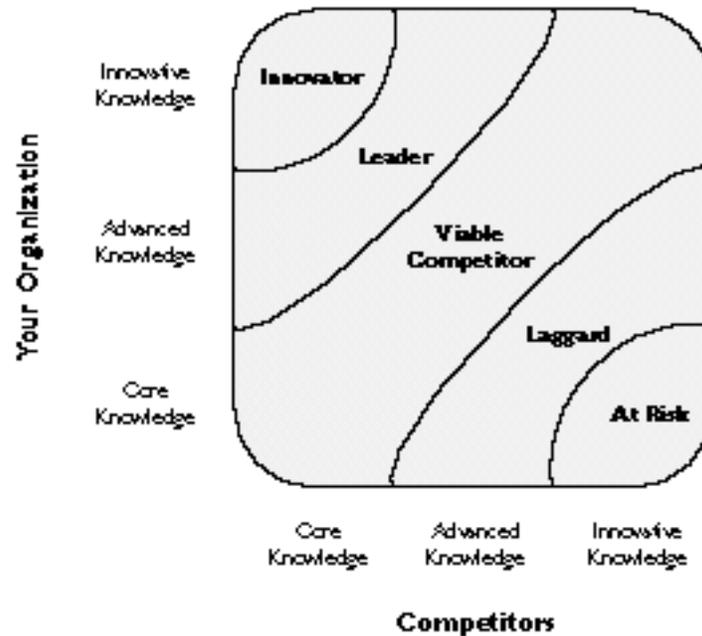
Each company I have worked with has developed an approach to describing and classifying its strategic or competitive knowledge that is in some ways unique. In fact, each firm's general awareness of and orientation to the link between knowledge and strategy tends to be somewhat unique and may, itself, represent an advantage. Regardless of how knowledge is categorized based on content, every firm's strategic knowledge can be categorized by its ability to support a competitive position. Specifically, knowledge can be classified according to whether it is *core*, *advanced*, or *innovative*.

Core knowledge is that minimum scope and level of knowledge required just to "play the game." Having that level of knowledge and capability will not assure the long-term competitive viability of a firm, but does present a basic industry knowledge barrier to entry. Core knowledge tends to be commonly held by members of an industry and therefore provides little advantage other than over nonmembers.

Advanced knowledge enables a firm to be competitively viable. The firm may have generally the same level, scope, or quality of knowledge as its competitors although the specific knowledge content will often vary among competitors, enabling knowledge differentiation. Firms may choose to compete on knowledge head-on in the same strategic position, hoping to know more than a competitor. They instead may choose to compete for that position by differentiating their knowledge. LeaseCo, for example, competed with others for the custom lease market but used their knowledge of lease pricing and equipment sourcing rather than garment finishing or equipment integration to compete for that position. Buckman Labs competed in certain markets based on its superior knowledge of how to apply its chemicals to solve the process treatment problems of its customers. Big6 knew how to deliver accounting, tax, and consulting solutions of a quality sufficient to enable it to attract and retain high-quality clients.

Innovative knowledge is that knowledge that enables a firm to lead its industry and competitors and to significantly differentiate itself from its competitors. Innovative knowledge often enables a firm to change the rules of the game itself.²⁵ LeaseCo, based on its extensive knowledge of cost accounting and lease economics, challenged the traditional way leases were priced in its industry. Not only did this confuse the competition to LeaseCo's advantage, but it also allowed LeaseCo to identify many profitable opportunities passed over by competitors while avoiding potentially unprofitable ventures. Lincoln Re developed highly innovative knowledge not only about assessing risk, but also about how to codify, structure, distribute, leverage, and market that knowledge using expert systems. Big6 developed expertise in particular industries and services that clearly led its competitors. Buckman Labs developed innovative knowledge for delivering more comprehensive solutions to its customers to help increase their overall processing plant efficiency and quality.

FIGURE 2



Knowledge is not static and what is innovative knowledge today will ultimately become the core knowledge of tomorrow. Thus defending and growing a competitive position requires continual learning and knowledge acquisition. The ability of an organization to learn, accumulate knowledge from its experiences, and reapply that knowledge is itself a skill or competence that—beyond the core competencies directly related to delivering its product or service—may provide strategic advantage.

Although knowledge is dynamic, this strategic knowledge framework (Figure 2) does offer the ability to take a snapshot of where the firm is today vis-à-vis its desired strategic knowledge profile (to assess its internal knowledge gaps) and vis-à-vis its competitors (to assess its external knowledge gaps). Additionally, it can be used to plot the historical path and future trajectory of the firm's knowledge. The framework may be applied by area of competency or, taking a more traditional strategic perspective, by SBU, division, product line, function, or market position. Regardless of the particular way each firm categorizes its knowledge, each category can be further broken down into elements that are core, competitive, or innovative to produce a strategic knowledge map.

Gap Analysis

Having mapped the firm's competitive knowledge position, an organization can perform a gap analysis. The gap between what a firm must do to compete and what it actually *is* doing represents a *strategic* gap. Addressing this gap is the stuff of traditional strategic management. As suggested by the SWOT framework, strengths and weaknesses represent what the firm can do, opportunities and threats dictate what it must do. Strategy, then, represents how the firm balances its competitive "cans" and "musts" to develop and protect its strategic niche.

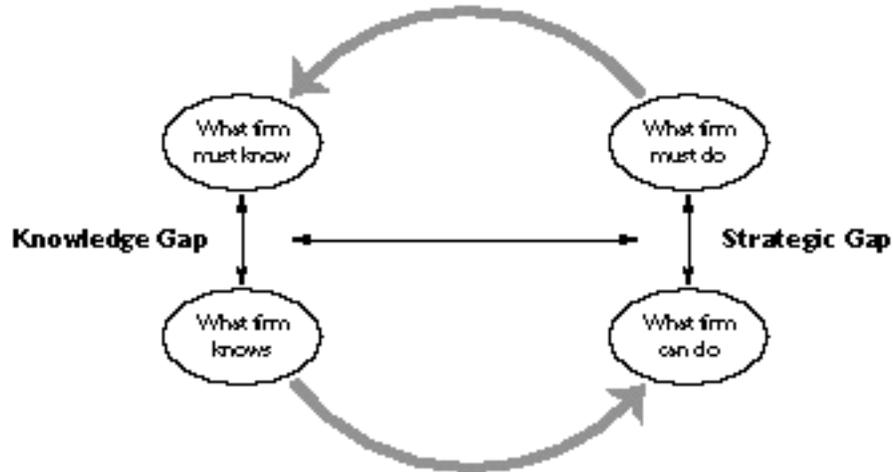
At the same time, underlying a firm's strategic gap is a potential *knowledge* gap. That is, given a gap between what a firm must do to compete and what it can do, there may also be a gap between what the firm must know to execute its strategy and what it does know. Based on a strategic knowledge and capabilities map, an organization can identify the extent to which its various categories of existing knowledge are in alignment with its strategic requirements. The result is a set of potential knowledge gaps. In some cases, an organization might even know *more* than needed to support its competitive position. Nevertheless, a knowledge strategy must address any possible misalignments. The greater the number, variety, or size of the current and future knowledge gaps, and the more volatile the knowledge base because of a dynamic or uncertain competitive environment, the more aggressive the knowledge strategy required. A firm not capable of executing its intended or required strategy must either align its strategy with its capabilities or acquire the capabilities to execute its strategy.

Having performed a strategic evaluation of its knowledge-based resources and capabilities, an organization can determine which knowledge should be developed or acquired. To give knowledge management a strategic focus, the firm's knowledge management initiatives should be directed toward closing this strategic knowledge gap. The important issue is that the knowledge gap is directly derived from and aligned with the strategic gap (see Figure 3). This simultaneous alignment of strategy and knowledge is a crucial element of a firm's knowledge strategy. In many firms, knowledge management efforts are divorced from strategic planning and execution. However, having an appropriate knowledge strategy in place is essential for assuring that knowledge management efforts are being driven by and are supporting the firm's competitive strategy. For example, to insure alignment, Lincoln Re placed responsibility for knowledge management and corporate strategy within the same senior executive position.

A Knowledge Strategy Framework

A knowledge strategy, paralleling the traditional SWOT analysis, describes the overall approach an organization intends to take to align its knowledge resources and capabilities to the intellectual requirements of its strategy. It can be described along two dimensions reflecting its degree of aggressiveness. The

FIGURE 3



first addresses the degree to which an organization needs to increase its knowledge in a particular area *vs.* the opportunity it may have to leverage existing but underutilized knowledge resources—that is, the extent to which the firm is primarily a creator *vs.* user of knowledge. The second dimension addresses whether the primary sources of knowledge are internal or external. Together these characteristics help a firm to describe and evaluate its current and desired knowledge strategy.²⁶

Exploration vs. Exploitation

To the extent that an organization finds itself to be at a lower level of knowledge than required to execute its strategy or to defend its position, it requires a high level of knowledge processing to close its *internal* knowledge gap. To the extent that many competitors in an organization’s industry are operating at higher levels of knowledge across many more knowledge positions, a high level of knowledge processing is required to close the *external* competitive knowledge gap. To the extent that knowledge in the industry is changing rapidly, the organization may need to be creating new knowledge just to keep pace. In these situations, the organization’s requirement is to be an *explorer*—a creator or acquirer of the knowledge required to become and to remain competitive in its strategic position.

On the other hand, when knowledge resources and capabilities significantly exceed the requirements of a competitive position, the organization has the opportunity to further exploit that knowledge platform, possibly within or across other competitive niches. In this situation, the organization’s requirement

is to be a knowledge *exploiter*. For example, Dow Chemicals screened its portfolio of 29,000 patents to see which should be exploited (and by whom), which could be licensed, and which should be abandoned. This generated \$125 million in licensing income and \$40 million in savings over 10 years.²⁷ Big6 aggressively sought to sell additional engagements leveraging its experiences, and Lincoln Re aggressively sought reinsurance deals that exploited its existing knowledge regarding insurance risk, service integration, and deal making.

Exploitation and exploration are not mutually exclusive. An organization may need to develop one area of knowledge while simultaneously exploiting another. Ultimately, the ideal for most companies is to maintain a balance between exploration and exploitation within all areas of strategic knowledge. Exploration provides the knowledge capital to propel the company into new niches while maintaining the viability of existing ones. Exploitation of that knowledge provides the financial capital to fuel successive rounds of innovation and exploration. Exploration without exploitation cannot be economically sustained over the long run unless it is subsidized or directly generates a revenue stream (e.g., a research institute). Exploitation without exploration will ultimately result in trying to pump from a dry well. Eventually knowledge becomes stale or obsolete. Those companies that closely integrate knowledge exploration and exploitation I refer to as *innovators*.

Firms that are extremely efficient in exploiting others' knowledge may enjoy some long-term success as an exploiter. However, given the difficulty in transferring knowledge, these cases are rare. Success in those cases usually requires competing against firms whose ability to exploit is not well developed and who make their tacit knowledge accessible to outsiders. For example, recall Apple's exploitation of Xerox's development of the personal computer graphical user interface. The value from knowledge exploitation may be greater when done by the firm creating it or via some form of joint venture between explorer and exploiter firms.

Exploration and exploitation typically occur in different parts of an organization and are often separated temporally and culturally as well as organizationally. Balancing exploitation and exploration requires a well-developed internal knowledge transfer capability between functions such as R&D, sales, marketing, manufacturing, and customer service. This requires a culture, reward systems, and communication networks that support the flow of knowledge and a well-functioning organizational memory (both as embedded in humans and in technology) to transcend the time delays between developing and applying knowledge as well as between applying and developing the next round of knowledge. This knowledge transfer and integration capability is itself strategic.

The creation of unique, strategic knowledge takes time, forcing the firm to balance short- and long-term strategic resource decisions. The firm therefore must determine whether its efforts are best focused on longer-term knowledge exploration, shorter-term exploitation, or both. It must then balance its knowledge-processing resources and efforts accordingly. For example, Image Corp.

focused its recruiting and training on the knowledge required to support its future digital products and services. It also implemented computer-based conferencing technologies and created opportunities for face-to-face interaction to support knowledge transfer between its few highly knowledgeable technical, sales, and marketing people in the growing digital products division and their counterparts in traditional products divisions. It did not, however, abandon its existing analog imaging niche but implemented a computer-based knowledge sharing capability among its sales and marketing personnel to exploit as much of their existing knowledge about selling and marketing traditional products as possible.

It is not enough for an organization merely to engage in both exploration and exploitation. More importantly, those activities must be linked and coordinated so that they can reinforce one another. For example, Big6 turned its learning experiences first into semi-structured documents that could be accessed and reused by others immediately and eventually into formal, structured methods for efficiently delivering the service. They established organizational units having explicit responsibility for this function. In this way, they actively managed the exploitation of their exploratory knowledge. New insights gained in the field from reapplying and adapting this knowledge to different contexts were subsequently captured and integrated into existing methods, closing the exploitation/exploration loop. Lincoln Re explored new areas of risk via its prospective R&D process, using the knowledge gained to create new risk management products and services. Those products generated a loss-experience history that could be monitored and analyzed to create additional learning, closing the loop. Image Corp. and Buckman Labs linked their R&D personnel and technical specialists to their field-based marketing, sales, and technical support staffs to insure that new products were developed with the customers' needs in mind and that customer needs were quickly and accurately communicated to the product development group. New knowledge and insights were therefore more effectively exploited in the marketplace in the form of better products, while interaction with the customers generated knowledge to guide future developments. LeaseCo aggressively attempted to explore knowledge via taking on novel leases and to exploit that learning across its other clients and markets.

Internal vs. External Knowledge

A second way to orient a knowledge strategy is to describe the firm's primary sources of knowledge.²⁸ Knowledge sources may lie within or outside the firm. Internal knowledge may be resident within peoples' heads; embedded in behaviors, procedures, software and equipment; recorded in various documents; or stored in databases and online repositories. Common sources of external knowledge include publications, universities, government agencies, professional associations, personal relations, consultants, vendors, knowledge brokers, and interorganizational alliances.

Knowledge generated within the firm is especially valuable because it tends to be unique, specific, and tacitly held. It is therefore more difficult for

competitors to imitate, making it strategically valuable. Knowledge from outside the firm—while more abstract, more costly to obtain, and more widely available to competitors—can provide for fresh thinking and a context for benchmarking internal knowledge. Commonly available external knowledge combined with unique internal knowledge can still result in new and unique insights. Buckman labs, for example, maintains close links to universities, taking the generic body of microbiological knowledge and reapplying it within the specific context of its own products and customer applications. Lincoln Re has similarly obtained and reapplied knowledge through its university ties. Joint ventures provide an important means to obtain external knowledge that is tacit, has not been widely distributed, and therefore retains its competitive value.²⁹ The biotechnology industry, for example, thrives on the collaboration that occurs among firms.³⁰

Many externally oriented organizations create opportunities for ongoing dialog with their customers to exchange knowledge. These mechanisms range in formality and include user groups, joint ventures, beta-testing, web sites, electronic mail, toll-free numbers, customer care centers, customer advisory boards, conferences, and social gatherings. For example, Lincoln Re maintains strong relationships with its clients through a company-sponsored user group. An advisory council and periodic conferences also provide many opportunities for Lincoln Re to gain access to valuable external customer knowledge and to share its internal knowledge regarding its products and markets. Often, firms use computer-based conferencing systems to supplement face-to-face interaction. They also are creating electronically based repositories to be used for collecting external knowledge, both informal and formal. These materials include papers and presentation slides from conferences, comments and observations acquired in the field, knowledge picked up at trade shows, and lessons learned from interactions with customers. Buckman Labs is quite well-known for their worldwide online conferencing capability and their efforts to build customer-focused knowledge repositories.

Aggressive vs. Conservative

Combining the knowledge exploitation *vs.* exploration orientation of the firm with its internally acquired *vs.* externally acquired orientation towards knowledge sources provides a more complete picture of a firm's knowledge strategy (Figure 4). Firms oriented toward exploiting internal knowledge exhibit the most conservative knowledge strategy, while unbounded innovators (those who closely integrate knowledge exploration and exploitation without regard to organizational boundaries) represent the most aggressive strategy. In knowledge-intensive industries, firms that pursue an aggressive knowledge strategy tend to outperform those competitors who pursue less aggressive knowledge strategies over time.³¹

In cases where a firm's knowledge significantly lags its competitors or the firm is defending a knowledge position, an aggressive knowledge strategy will be required to remain viable.³² Buckman Labs, for example, prioritized its knowledge management efforts by focusing on several markets where its treatment

FIGURE 4

Unbounded			Aggressive
External			
Internal	Conservative		
	Exploiter	Explorer	Innovator

applications knowledge lagged its current or potential competitors, although to maintain existing advantages it continually created and renewed its knowledge of all markets. It took a more aggressive knowledge strategy in those markets than in markets where its knowledge led the industry. LeaseCo claimed the premium, upscale-garment, service-intensive market as a competitive niche and aggressively sought to learn as much as possible about serving that market. Image Corp. found itself needing to aggressively acquire knowledge about digital imaging to ward off both traditional and new competitors. Lincoln Re staked out superior knowledge of risk underwriting and pricing as well as how to integrate multiple services into innovative and comprehensive risk management solutions, and it put in place an aggressive knowledge strategy to maintain this competitive differentiation.

Industry Learning Cycles

Knowledge strategy cannot be formulated in isolation of what competitors are doing. Comparing aggressive and conservative strategies, then, also requires looking at the overall flow of industry knowledge. At the industry level, there is the potential for knowledge to diffuse out from the firm and into the industry at large where it can be absorbed by competitors. At the same time, a similar process may be occurring with other firms in the industry, creating the opportunity for the firm to absorb knowledge from the industry.

Firms taking a conservative strategy view knowledge primarily as an proprietary asset to be protected. They attempt to create barriers to its diffusion or transfer outside of the firm. Aggressive firms, however, take a Shumpeterian

view of knowledge as an ongoing process of creative destruction. Rather than wait for a competitor to destroy the value of their knowledge, these firms aggressively seek to obsolete their own knowledge, always staying one step ahead of the competition. Aggressive firms are less concerned with erecting barriers to the diffusion or transfer of knowledge, rather they protect their knowledge resources by recruiting and developing intelligent, loyal, and committed employees and support them with a culture of learning, commitment, and collaboration. The firm's advantage comes from being able to absorb external knowledge and integrate it with their internal knowledge to develop new insights faster than the competition. For example, Lincoln Re's competitors were often able to acquire and imitate the underwriting guidelines Lincoln Re provided its clients. However, they were not able to replicate Lincoln Re's skilled medical and actuarial researchers, their deep understanding of how the medical research related to managing and pricing risk, and their unique process for experimenting with that publicly available research to improve and expand their existing knowledge.

The strategic knowledge environment of an industry can be viewed as the sum of the interactions among the knowledge strategies of the individual firms in the industry. In industries with many firms pursuing conservative knowledge strategies, knowledge leaks into the industry slowly and the opportunities to learn from the industry at large may be limited. In industries with many aggressive firms, knowledge flows between individual firms and the industry at large relatively quickly. Only those firms with the best learning capability and the greatest capacity for absorbing external knowledge will survive. Lincoln Re, Buckman, Big6, and Image Corp. were all operating in industries where knowledge was changing rapidly enough that an aggressive strategy was needed just to keep up with the pace of change. Buckman was faced with adding service expertise to its product and manufacturing knowledge. Lincoln Re and Big6 were selling their knowledge directly, transferring it out of the organization at a price. This opened the way for diffusion among competitors and further drove the need to aggressively and continually learn and develop new knowledge.

Positioning

Knowledge can profoundly change the way an organization positions itself in its industry and in doing so, can radically change the organization itself. Buckman Labs exemplified this in their shift from selling chemical products to providing broad microbiocidal treatment solutions. Lincoln Re similarly repositioned themselves from selling reinsurance to selling their knowledge in the form of comprehensive risk management solutions. The case of Bay State Shippers provides an even more profound example. Originally a freight forwarder (a "travel agent for freight"), Bay State took responsibility for physically routing a shipment from its point of origin to its intended destination, potentially via several modes of transportation (e.g., truck, rail, ship). Using satellite systems, barcodes, and other information technologies, Bay State created the ability to

track a package throughout its multi-modal trip, functioning as “information central.” While this tracking data was useful to customers, Bay State found a way to add significantly more value while at the same time repositioning themselves from freight handlers to knowledge brokers. Bay State was sitting on a huge amount of transaction data describing point-to-point travel times for various routings and modalities. By analyzing this data and combining it with their employees’ experience, they learned how to predict shipment transit times for particular routes and modalities, and they were able to learn about travel patterns in great detail. For example, they might find that particular goods shipped by train through a certain part of Iowa always ran into delays at particular freight yard on Fridays. They combined this knowledge with their ability to track shipments in real time and to create an early warning system for customers. Customers could list their shipments on a computer screen. Shipments highlighted in green indicated expected on time delivery. Yellow indicated the freight was running behind forecasted time. If red, the shipment was expected to arrive late. Customers could now plan and react more intelligently. Beyond this freight control capability, Bay State was able to use their routing knowledge to recommend the most efficient and effective routing for the customer’s needs, helping them to avoid delays in the first place. Bay State used its superior knowledge to carve out a significant competitive advantage. In fact, they (like American Airlines and its Sabre reservation system, and Lincoln Re and its Life Underwriting System) eventually saw enough value in the knowledge-based routing system to create a company to sell the system.³³

Conclusion

Knowledge is the fundamental basis of competition. Competing successfully on knowledge requires either aligning strategy to what the organization knows or developing the knowledge and capabilities needed to support a desired strategy. Organizations must strategically assess their knowledge resources and capabilities, and they need to broadly conceptualize their knowledge strategy to address any gaps. A summary of the process is outlined in Table 1. An organization’s knowledge strategy must then be translated into an organizational and technical architecture to support knowledge creation, management, and utilization processes for closing those gaps.³⁴

If knowledge management is to take hold rather than become merely a passing fad, it will have to be solidly linked to the creation of economic value and competitive advantage. This can be accomplished by grounding knowledge management within the context of business strategy. Given the state of the art in knowledge management, firms just starting to build a knowledge management infrastructure are not far behind their more established rivals. By developing the proper strategic grounding, they will be able to focus and prioritize their investments in knowledge management and come out ahead of competitors who have not grounded their efforts in strategy.

TABLE I.

Step	Key Question	Action
1	How do you want to play the game?	Articulate desired or intended strategy
2	What do you need to know?	Articulate strategy → knowledge link
3	What do you know?	Create internal knowledge map
4	What's your internal knowledge gap?	Compare what you need to know to what you do know
5	What do your competitors know?	Create external (competitor/industry) knowledge map
6	What's your external knowledge gap?	Compare what you know to what your competitors know
7	What is your learning cycle?	Assess your dynamic learning capabilities and intentions
8	What are your competitors' and industry learning cycles and capabilities	Assess your industry's and competitors' dynamic learning capabilities and intentions
9	What is your learning gap?	Compare your dynamic learning capabilities to those of your competitors and your industry
10	What's your internal strategic gap?	Assess how your internal knowledge gap affects your current strategy
11	What's your external strategic gap?	Assess how your external knowledge gap affects your current strategy
12	What's your industry cycle strategic gap?	Assess how your dynamic learning gap affects your future strategy
13	What's your new current and future strategy?	Determine if and how your knowledge and learning gaps require a revision in strategy
14	What's your knowledge strategy?	Determine how aggressive you will be to close your knowledge gaps — regarding exploration vs. exploitation — regarding internal vs. external sources

Notes

1. For a good overview of knowledge management, see T. Davenport and L. Prusak, *Working Knowledge* (Cambridge, MA: Harvard Business School Press, 1998).
2. For example, see T. Davenport, S. Jarvenpaa, and M. Beers, "Improving Knowledge Work Processes," *Sloan Management Review*, 37/4 (Summer 1996): 53-66; P. Goodman and E. Darr, "Exchanging Best Practices Through Computer-Aided Systems," *The Academy of Management Executive*, 10/2 (1996): 7-19.
3. J. Nahapiet and S. Ghoshal, "Social Capital, Intellectual Capital, and the Organizational Advantage," *Academy of Management Review*, 23/2 (1998): 242-267.
4. J.B. Quinn, P. Anderson, and S. Finkelstein, "Leveraging Intellect," *Academy of Management Executive*, 10/3 (1996): 7-27.

5. For example, strategy was not identified as a motivating factor or key evaluation criterion regarding knowledge management efforts in a field study of 31 projects in 24 companies [T. Davenport, D.W. De Long, and M.C. Beers, "Successful Knowledge Management Projects," *Sloan Management Review*, 39/2 (1998): 43-58], a survey of 431 U.S. and European companies [R. Ruggles, "The State of the Notion: Knowledge Management in Practice," *California Management Review*, 40/3 (Spring 1998): 80-89], or a survey of 100 U.S. and European companies [D.E. Leidner, panel presentation, Organization and Information Cultures in Knowledge Management Initiatives, 6th European Conference on Information Systems, Aix-en-Provence, June 1998].
6. Image Corp., LeaseCo, and Big6 are pseudonyms.
7. K.R. Andrews, *The Concept of Corporate Strategy* (Homewood, IL: Dow-Jones Irwin, 1971).
8. M.E. Porter, *Competitive Strategy: Techniques for Analyzing Industries and Competitors* (New York, NY: Free Press, 1980).
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12. While many authors distinguish (often not consistently) between capabilities and competences, the term capabilities as used here is meant to include both.
13. J.B. Barney, "The Resource-Based Theory of the Firm," *Organization Science*, 7/5 (September/October 1996): 469-476; D.J. Collis and C. A. Montgomery, "Competing on Resources: Strategy in the 1990s," *Harvard Business Review*, 73/4 (July/August, 1995): 118-128; R. M. Grant, "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation," *California Management Review*, 33/3 (Spring 1991): 114-135; C. K. Prahalad and G. Hamel, "The Core Competence of the Corporation," *Harvard Business Review*, 68/3 (May/June 1990): 79-91.
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15. E.T. Penrose, *The Theory of The Growth of the Firm* (White Plains, NY: M.E. Sharpe, Inc., U.S. edition, 1980), pp. 76-80; P. M. Romer, "Beyond the Knowledge Worker," World Link, Davos '95, January/February 1995; D.J. Teece, G. Pisano, and A. Shuen, "Dynamic Capabilities and Strategic Management," *Strategic Management Journal*, 18/7 (1997): 509-533.
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27. D. Cohen, "Toward a Knowledge Context: Report on the First Annual U.C. Berkeley Forum on Knowledge and the Firm," *California Management Review*, 40/3 (Spring 1998): 22-39.
28. Bierly and Chakrabarti, op. cit.
29. J. Badaracco, Jr., *The Knowledge Link: How Firms Compete Through Strategic Alliances* (Boston, MA: Harvard Business School Press, 1991).
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31. Bierly and Chakrabarti, op. cit.
32. L. Kim, "Crisis Construction and Organizational Learning: Capability Building in Catching-up at Hyundai Motor," *Organization Science*, 9/4 (1998): 506-521.
33. In 1992, Bay State Shippers spun off their software product, COMMAND, into Tie Logistics, Inc. In 1993, Tie Logistics won the Computerworld Smithsonian Transportation Award for innovative use of information technology in transportation, and COMMAND was made part of the permanent Information Age exhibit at the Smithsonian National Museum of American History. C.H. Robinson Worldwide, Inc acquired Bay State in 1994.
34. For a good discussion, see Davenport and Prusak, op. cit.; M.H. Zack, "An Architecture for Managing Explicated Knowledge," *Sloan Management Review* (forthcoming).