

Incidental Paper

**Knowledge As a Strategic
Business Resource**

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Knowledge As a Strategic Business Resource

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Executive Summary

The post-industrial enterprise is primarily a knowledge-based organization whose wealth creation relies in large measure on knowledge resources. Five knowledge resources common in the modern enterprise are examined: business concept(s); enterprise know-how; organizational design; knowledge workers; and knowledge mediated with information technology.

Management of these knowledge resources requires practices that differ from those of the industrial age. Then, command-and-control management was deemed necessary to implement a wealth-creating economic formula that emphasized the efficient allocation of land, labor, and capital resources, while lesser emphasis was placed on the effective management of knowledge resources. For the five knowledge resources, suggestions are made on how each can more effectively be managed.

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One

Introduction

Knowledge and business have long been linked with each other. Benjamin Franklin once said: "An investment in knowledge pays the best interest." Fundamentally, general managers of business enterprises, as well as their staffs and workers, strive to successfully integrate three basic resources. They combine knowledge with materials and energy to produce goods and services.

Achieving the right mix of these resources depends in part on the price and performance of each of the resources at a particular time and in a particular market. Relatively inexpensive and abundant sources of energy, for example, have enabled industrial age managers to produce goods on a mass basis that had not previously been possible.

In the Information Age, energy as well as materials remain vitally important, but knowledge is the basic resource that has been gaining renewed attention. During the 1990s, major management consulting firms have created knowledge practices, a number of large business organizations have appointed Chief Knowledge or Chief Learning Officers, knowledge conferences were popular, and business journals regularly published articles on various aspects of the topic.

This paper first presents an overview of knowledge as a strategic business resource, and then, drawing on a survey of contemporary scholarly writings, presents five categories of knowledge resources that are common to all firms. It suggests how each of these resources can be effectively managed.

A disclaimer is offered at the outset. This paper does not attempt to distinguish between information and knowledge. What a front-line worker may "know" is often "information" or even just "data" to corporate staff, yet the substance is the same. Philosophers, dating back to Aristotle and Plato, have engaged the definition question, and no lasting consensus has emerged. What may be said is that every firm has a set of intangible, intellectual assets that comprise a basic resource which this paper refers to as knowledge resources.

Two

Knowledge Resources

Daniel Bell identified knowledge-based organizations as the leading type of enterprise in postindustrial societies.¹ They are distinct from industrial age organizations, Bell said, in that they rely principally on the intangible intellectual capital of their employees, not on the manual efforts of semi-skilled workers. They rely as well on advanced information technologies to modernize their business processes. And their orientation is to the future, with emphasis on models, simulations, and system analysis. The modern firm, Bell said, no longer is the product of a “talented tinkerer” like Thomas Edison but is an enterprise in which “*knowledge and information become the strategic and transforming resources*”² [emphasis added].

It is obvious that knowledge is a strategic resource for industries like software engineering that rely on intellectual property for their prosperity. But as Walter B. Wriston has observed, even a traditional industry, like steel, can benefit from improved management of its intangible resources: “A piece of steel, whether raw or as part of a new automobile or skyscraper, is very different today from what it was a generation ago. It still contains a lot of iron mixed with other metals, but it contains a great deal more information.”³

Has knowledge become what management expert Peter F. Drucker terms “the basic economic resource?”⁴

Favorable results flowing from total quality management, reengineering, self-directed teams, and the creation of learning organizations provide anecdotal evidence in support of Drucker’s thesis.

However, economic theories are few.

Among those pursuing an economic theory is Paul Romer. A proponent of “New Growth Theory,” he contends that the emerging economy is based on ideas more than objects and that there is “enormous scope for discovering new ideas.”⁵ If enterprises keep finding new ideas, keep innovating, keep discovering, then there are no limits to growth. New Growth Theory holds that

¹See Daniel Bell, *The Coming of the Post-Industrial Society* (New York: Basic Books, 1968).

²Daniel Bell, “Communications Technology for Better or for Worse,” *Harvard Business Review* (May–June 1979).

³Walter B. Wriston, *The Twilight of Sovereignty: How the Information Revolution Is Transforming Our World* (New York: Scribner’s, 1992).

⁴Peter F. Drucker, *The Post-Capitalist Society* (New York: HarperCollins, 1993).

⁵See interview with Paul Romer, *Forbes ASAP*, June 15, 1995.

the process of creating ideas and innovative techniques will fuel long-run improvements and sustain an ever improving standard of firm competitiveness.

That idea deviates from classic economic theory in which wealth-creation is the result of the efficient allocation of scarce resources—financial capital, land, and labor. Moreover, it contradicts *The Principles of Scientific Management*,⁶ the treatise published in 1911 by Frederick Winslow Taylor. Efficient industrial organization, Taylor argued, came with the “substitution of a science for the individual judgment of the workman.” By separating the planning of work from the actual work itself, Taylor believed that managers could analyze all the parts of the process and then decide on the “one best method” that workers should employ in order to maximize efficiency.

Romer offers an illustration that challenges Taylor’s central concept of “one best method.” He cites the “simple manufacturing process that requires you to attach 20 different parts to a frame.”⁷ When added together, he calculates, there are practically an infinite number of different possible sequences. Where U.S. car manufacturers once thought they had figured out just about all you needed to know about assembly line production, Japanese competitors achieved advantages by empowering their workers to experiment—after all, the possibilities were practically limitless.⁸

If “Taylorism” has informed earlier generations of managers, what are the principles that are to inform today’s generation? One commentator writes that “the majority of new managerial ideas—like cross-functional teams, self-managed work groups, and the networked organization—are either direct or indirect responses to the inadequacies of Taylor’s original model. Yet,” this commentator finds, “for all the proliferation of specific techniques, the fundamental principles of a new managerial paradigm are far from clear.”⁹

What is clear, however, is that a new balance is increasingly possible—a balance between the efficient use of physical resources and the effective use of intangible resources. To the extent that land, labor, and capital resources are scarce, managers should strive to allocate those resources efficiently. To the extent that knowledge and information resources are unlimited, managers should strive to create and apply those resources effectively.

⁶Frederick Winslow Taylor, *The Principles of Scientific Management* (New York: Harper, 1911).

⁷Ibid.

⁸“If you calculate all the possible different sequences for attaching those 20 parts, you get 10(18),” according to Romer. “That number is about the same as the number of seconds since the big bang. So you get these amazingly large number of possibilities out of even extremely simple systems.” *Forbes ASAP*, June 15, 1995.

⁹David H. Freedman, “Is Management Still a Science?” *Harvard Business Review* (November–December 1992).

In practice, the efficient management of physical resources and the effective management of intangible resources are not exclusive, but, rather, they differ in degree and are proportionate to each other, depending on the business situation. The trick for managers is to decide which is strategic under what circumstances and then to apply good management practices.

Bell argued that knowledge resources have been on the rise. Drucker suggested that in the United States this rise began after World War II with enactment of the GI Bill, which opened higher education to millions of Americans. Whatever the cause, the increase in knowledge and information resources has led to significant consequences. Entry barriers are broken down. Costs go down. New things become possible. The priesthood of suppliers and experts is undermined. Power moves to customers, consumers, and users. The perception of uncertainty grows, and a sense takes hold of being on the threshold of an unpredictable future.¹⁰

In these conditions, the effective management of knowledge resources becomes essential. The purpose of this paper is twofold: to identify a set of knowledge resources that are common to business enterprises, and to suggest how these resources can more effectively be managed. Knowledge resources that are common to all enterprises can be categorized:

- Business concept(s)
- Enterprise know-how
- Organizational design
- Knowledge workers
- Knowledge mediated with information technology.

Because knowledge resources can be key wealth-creating assets, and because high-value knowledge is hard to accumulate in organizations—and even harder to organize and effectively deploy—managers will want to learn how to master a process of knowledge management. They will want to become innovators in knowledge resources in order to achieve competitive advantage.

Typically, managers begin this process by trying to better understand new information and communications technologies. That is, they start with the “tools.” Information technology (IT) tools have been experiencing and continue to experience soaring performance and plunging cost as IT improves by about an order of magnitude every five years.

But IT tools are just a part of the story.

Alan M. Webber, whose magazine *Fast Company* focuses on the new economy, explains it this way:

¹⁰See, e.g., John C. B. LeGates, *The Sound, the Fury, and the Significance* (Cambridge, Mass.: Program on Information Resources Policy, Harvard University, I-95-2, January 1995).

The revolution in information and communications technologies makes knowledge the new competitive resource. But knowledge only flows through the technology; it actually resides in people—in knowledge workers and the organizations they inhabit.¹¹

All this suggests that managers need a new set of guideposts, a framework for thinking and acting with regard to knowledge resources (see **Table 1**, Growth Models for Managers).

Table 1
Growth Models for Managers

	Industrial	Post Industrial
Wealth	Primary managerial	Primary managerial
Creation	Activity is to allocate scarce resources efficiently (land, labor, financial capital)	Activity is to create and apply knowledge effectively (ideas, discovery, inventiveness, innovation)
Firm	Hierarchical	Flat organization
Structure	Organization with command and control	Around the flow of information
Workforce	Supervised subordinates	Teams of knowledge workers
Nature of Work	Tasks are planned and executed separately for mass production	Projects are integrated and outputs customized

¹¹Alan M. Webber, “What’s So New About the New Economy?” *Harvard Business Review* (January–February 1993).

Three

Categories of Knowledge Resources

3.1 Business Concept(s)

In the industrial age, business progress was born of experimentation. The results shaped an organization's behavior, informed decisions about what to do and what not to do, and produced a set of assumptions about what worked and what didn't. What evolved was what Drucker has termed a company's *theory of the business*.¹² Often it took years for such a theory to emerge, but when it did it could produce wondrous results.

General Motors's seventy years of prosperity, and a near equal number of years for AT&T, attest to this. GM's knowledge of the car buying market and efficient manufacturing process, and AT&T's monopoly network-building capability were powerful and long-lasting formulas for success. But eventually they, like other business theories, became obsolete. And when that occurs, there can be a costly mismatch between what a company knows how to do and what it should do. While "how-to" tools abound, the "what to do" issue can be devilishly difficult to address. And, if anything, the longevity of any *theory of the business* seems to be lessening. Arguably, the proliferation of all the many new major management techniques, of all the "how-to" tools, is a response to the quest for winning theories on "what to do."

In the 1980s and '90s this divide between "how" and "what" has been dramatized in corporate battles between such firms as GM and Toyota, CBS and CNN, Pan Am and British Airways, RCA and Sony. As Gary Hamel and C. K. Prahalad point out, "competitiveness is born in the gap between a company's resources and its manager's goals."¹³ GM, CBS, Pan Am, and RCA all had greater tangible resources for their managers to allocate efficiently, but Toyota, CNN, British Airways, and Sony all had superior strength in using their intangible, intellectual resources effectively to conceptualize the future of their respective businesses.

Hamel and Prahalad believe managers must acquire "frames of reference"¹⁴—the assumptions, premises, and accepted wisdom that bound or "frame" a company's understanding of itself and its industry.

They must, in short, conceptualize the business. And they must conceptualize it in a way that leads to initiative and trust among their employees. In head-to-head competition, Hamel and

¹²Peter F. Drucker, "The Theory of the Business," *Harvard Business Review* (September–October 1994).

¹³Gary Hamel and C. K. Prahalad, "Strategy as Stretch and Leverage," *Harvard Business Review* (March–April 1993).

¹⁴*Ibid.*

Prahalad write, “competition is not just product versus product, company versus company, or trading block versus trading block. It is mind-set versus mind-set, managerial frame versus managerial frame.”¹⁵ In this sphere of competition, individual initiative is critical, and trust is crucial to achieving the participation of every individual in the organization. President Kennedy embraced these requirements when he declared that America would “put a man on the moon by the end of the decade” and thereby accelerated a technology and knowledge race, with immense implications. Komatsu’s goal of “encircling Caterpillar” triggered a similar competition, as did Ted Turner’s launching of CNN.

Because concepts count, managers are faced with the challenging job of thinking ahead. Intellectual energy is needed to provide *conceptual answers* to such questions as What new products or services should we pioneer? How should we shape the future of our industry? What competencies must we build or acquire?

For every business, there are particular individuals who strive to answer such questions. In startups, the answers usually come from an entrepreneur, often using intuition and a personal sense of commitment. In large organizations, the CEO, with the help of a planning staff, holds the responsibility. In times of crisis, or chaos, a “czar” sometimes arrives to take command. In each case, a “point of view” gets expressed, and the organization operates on this premise.

In the knowledge-based organization, a different model is suggested, in part because the organization’s strength lies in its intangible assets, and in part because people of intellect tend to do their best work when they are intellectually motivated—and involved. This does not mean that top management should avoid a unilateral conceptual statement. When Jack Welch, the CEO of General Electric, said that every GE division should be number one or two in its industry, he clearly conceptualized the performance he expected. At the same time, he signaled his managers that he believed they were smart enough to achieve that goal and now had the mandate to sustain or achieve it.

One of the best illustrations of conceptualizing the business comes from Electronic Data Systems (EDS), which revisited its assumptions and direction by involving 150 key managers who, through an enormous and thoughtful effort, restated EDS’s strategy in these words: “globalize, informationalize, and individualize.”¹⁶

The EDS experience is reminiscent of efforts by successful Japanese companies. NEC’s concept of “Computers and Communications” seeks synergy between industries, while “Optoelectronics” helps Sharp define new technologies and markets.

¹⁵Ibid.

¹⁶See also Gary Hamel and C. K. Prahalad, *Competing for the Future* (Boston.: Harvard Business School Press, 1994).

In his study of “The Knowledge-Creating Company,” Ikujiro Nonaka argues that “the best Japanese companies offer a guide to organizational roles, structures, and practices that produce continuous innovation”¹⁷ by successfully managing the creation of new knowledge.

At the top, he found that management provides a framework. The framework may address one or more critical questions: What are we trying to learn? What do we need to know? Where should we be going? Who are we? Answers provide conceptual umbrellas (“Computers and Communications” and “Optoelectronics”) or perhaps a more equivocal statement to give employees freedom of opportunity (Honda executives launched a new car initiative with the phrase “Let’s gamble”).

Front-line workers, Nonaka reports, are full of tacit knowledge—expertise at the fingertips. And they are constantly encouraged to share that knowledge by making it explicit to others in the company. The role of the middle manager is to facilitate or mediate between a company’s grand concept, like Matsushita’s “Human Electronics,” and the efforts of front-line workers. These managers frequently use figurative language to bridge the worlds of “what should be” and “what is.” When senior Honda management said, “Let’s gamble,” the project team leader responded with the “Theory of Automobile Evolution,” thus challenging his colleagues to ask, if a car were an organism how would it evolve. Some time later, this concept gave birth to the term “Tall Boy,” which in turn eventually led to the Honda City, a distinctive new urban car.

There is a risk here that “Let’s gamble,” “Tall Boy,” and “Theory of Automobile Evolution” will ring of “sound-bite” solutions to the challenge of managerial responsibility. Clearly, more is involved. But no firm can long be successful without having a successful concept, or theory, of its business. And that concept will have to be communicated in a way that its workforce of knowledge employees can respond to with initiative—and respond positively, because they trust that management has done its homework in this critical realm. A lack of trust can incur a negative response if employees perceive that response as a phony, even destabilizing initiative.

Drucker instructs senior management periodically to “abandon” every organizational assumption, to study noncustomers for early signs of problems, to recognize when a firm has outgrown its theory, and to change theories before there is a crisis.¹⁸ Drucker says: “To establish, maintain, and restore a theory does not require a Genghis Khan in the executive suite. It requires hard work.”¹⁹

¹⁷Ikujiro Nonaka, “The Knowledge-Creating Company,” *The Harvard Business Review* (November–December 1991).

¹⁸Drucker, *op. cit.* 16.

¹⁹*Ibid.*

The effort at conceptualizing the business looks first at the industry and the environment in which it does—and will—operate. Next, it looks at what the firm is attempting, or should be attempting, to do. And, finally, it examines the issue of firm know-how. All must fit together, and all must pass a “reality” test, that is, all must yield what Drucker terms “a *valid* theory of the business.”²⁰

Of equal importance, concepts about how to run the business must be constantly evaluated, so that the business has the ability to change itself. When conceptual change is lacking, corporate culture—“the way we do things around here”—turns from being a strength to an impediment to acquiring those new competencies needed to reinvent a firm that has outlived its original concept of the business. Symptoms of having outlived an original, and successful, concept appear in the form of arrogance and excessive bureaucracy, and too often the treatment is a combination of defensive action and “fixes.” These seldom work for long, as General Motors, among others, has learned so painfully.

Conceptualizing is akin to the work of inventors: great inventors, it is said, achieve their greatness with 10 percent inspiration and 90 percent perspiration. Business theories for great knowledge-based organizations require similar efforts of conceptualization and articulation.

3.2 Enterprise Know-How

“In a world of increasingly global competition...the basis of competition has shifted more and more to the creation and assimilation of knowledge,” according to Michael E. Porter, a leading theorist on business competition.²¹ “Companies achieve competitive advantage,” says Porter, “through acts of innovation [which] always involve investments in skill and knowledge, as well as in physical assets and brand reputation.”

When firms view their knowledge investments narrowly, focusing mainly on proprietary intellectual assets for which they can obtain governmental protection through patents, copyrights, and trade marks they may either miss other opportunities or incur unforeseen risks. This is not to imply that intellectual property is unimportant; to the contrary, it can be commercially valuable. And the task of managers is to use these assets wisely, deciding, for instance, when to engage in licensing agreements and under what terms.

Intellectual property is a form of what may be called “migratory knowledge”²²—knowledge that can be packaged and distributed. Unless protected, this type of knowledge cannot be relied

²⁰Ibid.

²¹Michael E. Porter, “The Competitive Advantage of Nations,” *Harvard Business Review* (March–April 1991).

²²For a discussion of “migratory knowledge,” see Chapter Two in Joseph L. Badaracco, Jr., *The Knowledge Link* (Boston: Harvard Business School, 1991).

upon for sustainable competitive advantage. Competitors can engage in intelligence-gathering practices, reverse-engineering exercises, and hiring away key personnel in order to access this type of knowledge.

When innovation rests on this kind of knowledge, a firm must constantly strive to upgrade itself, lest competitors first catch up and then bypass it. When knowledge can be packaged and distributed, it is easily transferable and can diffuse rapidly, thus yielding only temporal advantage. Relentless upgrading is the only remedy to this challenge.

There is, however, another form of knowledge that can diminish risk and enhance competitive advantage: I call it high-value enterprise know-how. High-value enterprise know-how should be a principal knowledge resource of every organization.

When a firm has high-value know-how, it has capabilities and competencies that are longer lasting and not easily replicated. Through investment and experience, Boeing has acquired high-value enterprise know-how about commercial jet aircraft, Toyota about the production of automobiles, and Microsoft about the writing of software.

High-value know-how can reside in individuals (a master violin maker), groups of individuals, or teams (the scientists of the Manhattan Project), and companies. A company, in fact, is usually a large team, or what one observer has termed “a confederation of teams, in which enormously complex skills and knowledge are embedded in the minds of its members and in the formal and informal social relationships that orchestrate their efforts.”

High-value enterprise know-how goes hand in hand with a good business concept. How does a firm, having a winning concept, acquire high-value know-how? Three possibilities can be considered: contracting with another organization, merging with or acquiring another organization, and building know-how internally.

Contracting is the least feasible method. To begin, this kind of knowledge is not easily packaged and distributed. Moreover, the idea of even trying to write a contract for a capability-creating relationship, with all its uncertainties and contingencies, would be exceedingly challenging, even to the most gifted attorney. Hiring a consultant might help, but in the end consultants can only advise or recommend courses of action. Put differently, you can contract for teaching, but not for learning.

Mergers and acquisitions seem more promising, although the record of such transactions presents a sobering picture.²³ Alliances—something less permanent and more focussed—were fashionable in the 1990s, especially when the firms involved were seeking know-how about

²³See, e.g., Michael E. Porter, “From Competitive Advantage to Corporate Strategy,” *Harvard Business Review* (May–June 1987), which examines a select record of corporate diversification.

supporting capabilities. As one executive advocate of alliances commented: “It’s a dangerous thing to think we know everything.”²⁴

The third option is to build high-value know-how internally, that is, within the enterprise. Intuitively, every manager probably embraces this option. It would be reckless to think and act otherwise. But the basic problem with autonomous efforts is that they are often too slow in a world that is too fast. This is particularly true for an established firm whose internal know-how is experiencing eroding value.

A number of techniques have been proposed and are in use to address this problem. They include “benchmarking,” sharing of “best practices,” and the use of new technologies like “groupware.” Xerox, Philip Morris, and Hughes are among the companies that have used such techniques and report favorable results.²⁵

As good as these new techniques may be, one wonders whether they will have long-lasting effects, that is, whether they will yield sustainable competitive advantages. My guess is that they will not, because most of the knowledge gained is migratory in nature and therefore is, or will quickly become, available to competitor companies.

In searching the literature for evidence of competitively sustainable high-value know-how that resides within an enterprise, I came across the research on the pharmaceutical industry by Rebecca Henderson and Iain Cockburn, in which they report:

the longevity of pharmaceutical companies attests to a unique managerial competency: the ability to foster a high level of specialized knowledge within an organization, while preventing that information from becoming embedded in such a way that it permanently fixes the organization in the past, unable to respond to an ever-changing competitive environment.²⁶

Henderson and Cockburn found that pharmaceutical companies both understand how to create high-value know-how—and, equally important, how to avoid becoming prisoners of eroding know-how. “The managers of these companies,” they report, “did all the things that business pundits recommend: they used sophisticated resource-allocation procedures, hired the best people, and encouraged cross-functional and cross-disciplinary communications. [Moreover,]

²⁴Jack Kuehler, president of IBM, quoted in Badaracco, *op. cit.*, at 107.

²⁵Presentations at “The Knowledge Imperative Symposium,” organized by Arthur Anderson and The American Productivity & Quality Center, Houston, Texas, September 1995.

²⁶Rebecca Henderson, “Managing Innovation in the Information Age,” *Harvard Business Review* (January–February 1994).

they focused on continuously refurbishing the innovative capabilities of the organization. They actively managed their companies' knowledge and resources."²⁷

What was their paradigm?

First, they “kept connected” to external knowledge sources, including their peers, because no one company can hope to master all of its knowledge environment. Second, they allocated financial resources in a contentious, intellectual process, foregoing last-year-plus-five-percent-thinking, and substituted stimulating debates that in turn stimulated the rapid transfer of information across the company. Finally, they actively managed the tension in choosing organizational design, with the most successful companies never being satisfied with any single answer. One senior manager is quoted as saying that, having tried every organizational model, we know “nothing works as well as being continually aware of the need to be both at the leading edge...and in total command of the important developments in other areas.”²⁸

High-value enterprise know-how means “how we do things in this company and achieve success.” To constantly maintain high-value know-how, to be in a position that enables the manager to say, “Yes, the way we do things around here gives use a competitive advantage!” requires a special managerial competency. One, management must reach out for knowledge, internally and externally. Two, management should sponsor intellectual exercises, in which ideas are debated and constructive confrontation produces both a flow of new information and support for projects based on that information flow. And, three, management should never accept an organizational design as perfect (more on this topic in the next section).

In combination, these steps can yield high-value enterprise know-how. They can produce a winning how-to formula, while lowering the risk that the formula becomes static and outmoded. With such a formula in place, a firm becomes a learning organization—“an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights.”²⁹

This definition, offered by David A. Garvin of the Harvard Business School, brings to mind such companies as Corning, General Electric, and Honda—each of which has learned how to translate new knowledge into new ways of behaving, which is to say, into acquiring high-value enterprise know-how that yields competitive advantage.

Garvin recommends a few simple steps a company can take to change itself.³⁰ One is to “foster an environment that is conducive to learning”—the intellectually driven budget planning

²⁷Ibid.

²⁸Ibid.

²⁹David A. Garvin, “Building a Learning Organization,” *Harvard Business Review* (July–August 1993).

³⁰Ibid.

of the pharmaceutical companies being an example. Another is to “open up boundaries and stimulate the exchange of ideas,” because, he says, boundaries not only inhibit the flow of information, they also isolate individuals and reinforce old assumptions (see the next section). He also suggests creating “learning forums”—programs or events designed with explicit learning goals in mind. Again, these are ideas long embraced by the successful pharmaceutical companies and championed by GE’s Welch, among others.

Garvin’s principal point, which is embraced here, is that “high philosophy and grand themes” are—by themselves—inadequate to the challenge. Managers must engage “the gritty details of practice.” Until they do, their organizations will muddle along in their “how we do it” world of yesterday, and not acquire the ability to create for themselves the unique know-how for competitive success they will need tomorrow.

3.3 Organizational Design

In *Through the Organizational Looking-Glass*, Charles Handy argued that “You can’t plan tomorrow’s organization with today’s assumptions.” Writing in 1980, he foresaw a period of discontinuous change where the assumptions we had been working with as a society and in organizations would no longer necessarily be true.³¹

Handy predicted that a new set of assumptions would take hold in which management viewed contractual organizations as the most efficient, that labor would be considered an asset, and organizations would evolve into communities.

The 1990s’ interest in *outsourcing* and *fees-for-work-done*, instead of *wages-for-time-spent*, was a sign that some managers do view contractual organizations as efficient. Although other managers still believe that their employees need them more than they need their employees, that style of thinking may in fact be yielding to the perception that knowledge workers are a firm’s most valuable resource—and retaining those resources is critical for success. In financial service firms, for instance, “star” money managers can be compensated more handsomely than top management. Perhaps the most important shift is to the concept of an organization as a community, which implies unit or team sizes in which everyone knows everyone else, all participants share a sense of ownership (whether financial or psychological), and authority stems from consent, not command-and-control.

Max Weber, the German social scientist and father of organizational theory, might not approve. At the turn of the twentieth century, Weber outlined and described the features of bureaucracy as the ideal form of organization. Drawing on the structures of the military and the church, Weber sought to make organizations rational and efficient using four prescriptions:

³¹Charles Handy, “Through the Organizational Looking-Glass,” *Harvard Business Review* (January–February 1980).

(1) differentiation of tasks, (2) coordination by a hierarchy of authority, (3) separation of planning and execution, and (4) the use of technical criteria for recruitment and promotion.³²

Weber's influence is still felt today, but it has come under attack as the need for organizational learning and faster decisionmaking have become competitive imperatives. As a consequence, decentralization has gained greater acceptance as a means to promote continuous self-improvement and innovation. All this has led to the evolution of teams that are assigned projects. Hence the requirement to organize, and reorganize, around information.

In determining what projects need to be undertaken, management needs to address the issue of information flow and decisionmaking. The issue is critical, because decisionmaking improves with the quality of information. "We are rebuilding organizations around information," according to Drucker,³³ and that means information becomes a structural element. One fallacy, he warns, is to rely on the Chief Information Officer to determine what information is required. To Drucker, CIOs are mere toolmakers.

In knowledge-based organizations, "everyone takes[s] information responsibility... everyone asks [or should ask, in Drucker's opinion], Who in this organization depends on me for what information? And on whom, in turn, do I depend?"³⁴ It should be the responsibility of every knowledge worker to do a personal information audit. And it should be the responsibility of every manager to act on the results of such audits.

Personal information audits can open an organization's eyes to the need to abandon the Weberian bureaucracy that has served as the foundation for traditional organizational structures (functional, divisional, and matrix). The concept of the knowledge-based organization, some say "networked" organization, differs from the traditional models in that workers with specialized know-how provide the building blocks of the organization. Cross-functional teams are assembled to address specific problems, opportunities, or needs. Autonomous work groups on assembly lines are relatively permanent. A Hollywood film production is a one-time project. Yet each is discrete with its own organizational mission. The role of top management primarily is that of strategic direction and oversight.

In this new type of organization, boundaries get blurred, both inner and outer boundaries. Everyone is expected to deal with the environment, for there is no core to seal off from the external world and thereby attempt to lessen uncertainty. Informality flourishes and expertise is valued. The main advantage of this organizational model is adaptability. And adaptability is

³²Max Weber, *The Theory of Social and Economic Organization*, edited by A. D. Henderson and Talcott Parsons, translated by A. M. Henderson and Talcott Parsons (Glencoe, Ill.: The Free Press, 1947).

³³Peter F. Drucker, "The Coming of the New Organization," *Harvard Business Review* (January–February 1988).

³⁴Ibid.

essential in an economy that places heightened value on innovation and entrepreneurship. In the knowledge-based organization, the individual who holds tactical and specialized knowledge will have to exercise a high degree of self-discipline as hierarchical authority, and therefore managerial accountability, is diminished. Moreover, the knowledge worker becomes responsible for communications and relationships within the context of projects, not traditional departments, since much of the firm's work will not be done there anymore.

Expected benefits of this new type of organization include the following: time efficiency goes up, responsiveness improves, adaptability becomes a competency, and innovation flourishes.³⁵ But to achieve these benefits management must recognize that the division of labor is no longer measured by inputs and outputs, but, rather, by knowledge; that coordination is a team responsibility, not one of hierarchical supervision; that decisionmaking is highly decentralized; that boundaries are porous and changing; and that the organizational structure is highly informal and that the basis of authority is knowledge, both knowledge of ends and knowledge of means.

Because all organizations exist to enable a group of people to coordinate their efforts and get things done, the shaping of a knowledge-based organization is a top priority of management. Executives need to focus on identifying what the informational requirements will be to achieve the objectives of the projects at hand—and then to organize around those requirements. In Hollywood and on Wall Street, in Japanese factories and in research universities, in consulting firms, and in many entrepreneurial firms, the concept of the knowledge-based organization, with its unifying flow of information, is the norm. Yet it is far from being widely accepted. There is some peril in this, for as Handy concluded when he peered through the “organizational looking-glass” more than a decade and a half ago, “Many traditional operators will wake up one morning to find themselves obsolete.”³⁶ That need not necessarily occur, however, once managers act to achieve a new balance between efficiency and effectiveness and then implement that balance with a redesigned organization.

3.4 Knowledge Workers

“The fact is, more and more jobs—no matter what the title—are taking on the contours of ‘knowledge work.’ People at all levels of the organization must combine the mastery of some highly specialized technical expertise with the ability to work effectively in teams, form productive relationships with clients and customers, and critically reflect on and then change their own organizational practices. And the nuts and bolts of management—whether of high-powered consultants or service representatives, senior managers or factory technicians—increasingly consists of guiding and integrating the autonomous but interconnected work of highly skilled

³⁵See “Note on Organization Structure,” *Harvard Business School Note*, 9-491-083, March 24, 1992, Exhibit 7, 19.

³⁶Handy, *op. cit.*

people,” according to Chris Argyris, of the Harvard Graduate Schools of Business and Education.³⁷

How far different is today’s managerial challenge from that of the era of Frederick Winslow Taylor, the turn of the century expert on work, who considered workers nothing more than “dumb oxen.”

Of course, Taylor’s harsh judgment has been considerably modified over the years, first in the classic Hawthorne Experiments of Elton Mayo,³⁸ who concluded that worker output was affected not only by a job’s scientific design but also by social norms, and later by Frederick Herzberg’s pioneering research on motivation and job satisfaction.³⁹

If Mayo and Herzberg’s findings weakened the influence of the classic school, the sociotechnical systems theory that originated with a group of British researchers at the Tavistock Institute of Human Relations provided the breakthrough to new thinking about involving employees in the planning as well as the execution of work.⁴⁰ Early experiments of this theory were successfully conducted in the United States at plants in Topeka, Kansas, by General Foods, in Jamestown, New York, by Cummins Engine, and in Lima, Ohio, by Procter & Gamble.

As the “contours of *knowledge work*” theory was spreading to the factory floor, another phenomenon was also becoming evident: the professional worker was growing in numbers and occupations. What historically had been known as the “learned professions” (clergy, educators, lawyers, and physicians) now included proliferating numbers of accountants, brokers, consultants, data processors, engineers, financial analysts, and so on.

Workers who make and move things have been declining as a percentage of the workforce, while workers who talk on the phone, use computers, write reports, and attend meetings have been on the rise. A new balance was being struck in the workplace. For both industrial and knowledge workers, new and difficult questions are at hand. Both may agree that increased productivity would be beneficial, but measuring the productivity of a knowledge worker can be especially difficult. Is a surgeon to be judged on how many operations she performs in a month or how many patients recover to live long, useful lives? Quality of performance can be viewed as more important than quantity, effectiveness as more important than efficiency.

Even more challenging is that knowledge workers cannot easily be supervised, for by definition they possess specialized knowledge, that is, they know better than their “superiors”

³⁷Chris Argyris, “Teaching Smart People How to Learn,” *Harvard Business Review* (May–June 1991).

³⁸Elton Mayo, *The Human Problems of an Industrial Civilization* (New York: Viking Press, 1933).

³⁹Frederick Herzberg, et al., *The Motivation to Work* (New York: John Wiley, 1959).

⁴⁰Eric L. Trist, “The Sociotechnical Perspective,” in *Perspectives on Organization Design and Behavior*, edited by Andrew H. Van de Ven and William F. Joyce (New York: John Wiley, 1981).

how to do what they are most qualified to do—write a software program, trade futures, prepare a tax filing, create advertising copy, or repair a nuclear reactor. This undermines traditions of hierarchical authority and managerial control. Studies have shown that knowledge workers do not perceive themselves as “subordinates.” To the contrary, they highly value operational autonomy, their preferred option being to have freedom to work within a set of rules.⁴¹

How then is a manager to go about guiding and integrating the work of knowledge workers in ways that are beneficial to the firm’s successful performance? A set of suggestions is offered.

Focus the knowledge worker on doing what she or he does best—and eliminate the rest. Engineers who spend more time doing paperwork than at their workstations will underperform, and probably be less happy.

One technique to achieve *focus* is to use the “best work” method,⁴² in which the knowledge worker provides a periodic letter to management. The employee answers four questions: What was your best work of the last period? What was its objective? Why was this your best work? How could you have done better? The “best work” method is simply a technique to help insure that the knowledge worker stays focussed.

Establish a partnership between managers and knowledge workers, so that both parties have clear responsibilities. Ask knowledge workers, for example, to take responsibility for results, and managers in turn take responsibility for providing the knowledge worker with the information and tools she or he will need to do the job.

Having the right information is particularly important, as Benjamin M. Compaine and John F. McLaughlin report in their study, *Management Information: Back to Basics*.⁴³ In a new job, they write, “[you] should recognize the need to adjust the sources of information [you] are receiving from that which had been flowing to the previous holder of the job. The individual’s personal information system is determined in large measure by that person’s own knowledge, which is probably different from his predecessor’s.”

Team knowledge workers with colleagues who fit each particular project. This is important for two reasons. First, management’s job is to provide strategic direction. It has to say what needs to be done and what it needs its workers to accomplish. And why. When these questions are answered, the right kind of knowledge team can be assembled. Second, highly skilled knowledge

⁴¹See, e.g., Mahen Tampoe, “Motivating Knowledge Workers—The Challenge for the 1990s,” *Long-Range Planning* 26, 3 (1993).

⁴²B. Ray Helton, “The “Best Work” Method of Knowledge Worker Assessment,” *IM* (September–October 1988).

⁴³Benjamin M. Compaine and John F. McLaughlin, *Management Information: Back to Basics* (Cambridge, Mass.: Program on Information Resources Policy, Harvard University, P-86-9, July 1986).

workers value achievement and are more likely to remain committed to a firm where that value is fulfilled.

In building a team, management should be good at both managing individuals and at being able to combine different kinds of knowledge. The latter is important to create effective cross-functional teams; the former requires individual placement based on an individual's unique competencies, as opposed to just credentials. There can be a major difference in deciding a team placement between, say, two senior engineers with identical credentials but with different competencies (viz., one is decisive under pressure while the other tends to procrastinate).

Studies of team performance stress urgency and direction, skills over personalities, setting clear rules of behavior, paying particular attention to the kick-off phase, getting some early results, getting good feedback, and challenging the team with new information and fresh facts. When managed well, teams of knowledge workers can and do achieve high performance.⁴⁴

Provide training and educational opportunities so that every knowledge worker can maintain and improve her or his skills and competencies. Michael Hammer, coauthor of *Re-Engineering the Corporation*, advises companies to “quintuple their investment in education [because] everybody who works in a company needs to understand the business.”⁴⁵

Workers themselves understand the need for training and education. Indeed, one study found that personal growth was the highest motivation among knowledge workers. In recognition of this, companies like Motorola and Intel operate their own “universities” where employee knowledge workers often serve as instructors. Asking knowledge workers to teach others is an excellent idea, for teachers reap many rewards, not the least of which is that teaching compels them to deepen their own expertise.

Understand that knowledge work is different from the work of management. When firms fail to recognize the difference and make the mistake of promoting a good knowledge worker into the ranks of management, they sometimes find that he or she is not cut out for it. Knowledge workers have specialized expertise, which usually is very different from the skills required of a good manager. Of course, some individuals possess both—but not all.

The problem arises with the traditional promotion system, when climbing the corporate ladder is the only means to get ahead. The risk is real that a knowledge worker will be promoted beyond his or her competence. To deal with this issue, firms should adopt pay policies based on

⁴⁴Jon R. Katzenbach and Douglas K. Smith, *The Wisdom of Teams* (Boston: Harvard Business School Press, 1993).

⁴⁵*The Wall Street Journal*, Jan. 24, 1995, B1.

knowledge or skill, not just on the number of people supervised or level of corporate responsibility.⁴⁶

For their part, knowledge workers will have to understand that “a successful career will no longer be about promotion.” Says Hammer: “It will be about mastery.”⁴⁷

Each of these techniques—focus the knowledge worker on what she or he does best, establish partnerships in which each party accepts responsibility, form teams that fit the task, provide learning opportunities, and understand that knowledge workers do not necessarily have managerial skills—will enable the knowledge worker and the firm to collectively work smarter and thereby enhance the value of the firm through strategic management of knowledge resources.

3.5 Knowledge Mediated with Information Technology

“Over the past 30 years, the design and management of IT resources concentrated on the ‘T’—technology—and largely ignored the ‘I’—information. This approach reflects the roots of IT architecture and management in the mainframe era, when technology processed ‘data’ and people processed ‘information’ and ‘knowledge,’” according to Lynda M. Applegate, of the Harvard Business School.⁴⁸

As information technology has evolved and continues to evolve, it has two significant implications for management of knowledge resources. One, IT can be used as a resource to transform the nature of work. Two, IT can be used to create value through the effective management of organizational knowledge. Work transformation and organizational knowledge can come together as illustrated by the following excerpt from *The New York Times*:

Workers like John A. Cruz are the great hope for old corporate center cities like Hartford, and perhaps their greatest threat as well: He’s been liberated from his office. Rootless, mobile, armed with 120 megabytes in his briefcase, Mr. Cruz—a 32-year-old account executive at Travelers Insurance—is one of the new breed of high-tech nomads who are changing the face and the culture of many companies.... They specialize in being anywhere and nowhere. Mr. Cruz has done computer insurance audits in parking lots and at restaurant counters. His laptop computer is actually used on his lap.... Under fierce pressure to cut costs, insurance executives say that two important insights make the mobile workforce irresistible.

⁴⁶See, e.g., Earl Ingram, “The Advantage of Knowledge-Based Pay,” *Personnel Journal* (April 1990); Michael White, “Linking Compensation to Knowledge Will Pay Off in the 1990s,” *Planning Review* (November–December 1991).

⁴⁷*The Wall Street Journal*, op. cit. 47.

⁴⁸Lynda M. Applegate, “Designing and Managing the Information Age IT Architecture,” *Harvard Business School Note*, 9-196-005, Sept. 26, 1995.

First, insurance is essentially a disembodied product anyway, ideally suited to being electronically blipped, faxed and phoned from one place to another, without regard to place. The second is that all the apparatus of modern telecommunications—laptops, modems, cellular phones, voice mail, electronic mail and beepers—keeps everyone in touch all the time and lets managers tract non-office workers and their performance even more closely than people sitting just down the hall.⁴⁹

A lesson here is that every organization has storehouses of knowledge resources, the kind of stuff that lets John Cruz do insurance audits by tapping into a remote company database. Besides financial data, a typical database might hold valuable information on a firm's best customers and their buying habits. Employees themselves can be valuable storehouses of knowledge on what works and what doesn't. Information technology can help "mine" the first and facilitate the timely transfer of the second.

One illustration is the American Express program to build customer loyalty. The company "mines" its "data warehouses" and learns that among its best customers, Joe Smith regularly dines at fine French restaurants. In Joe's next bill, he receives a "thank you" coupon from American Express good for a complimentary dinner at one of his favorite French bistros.

Another example can be found at McKinsey & Company, which has over 12,000 documents in its computerized Practice Development Network, PDNet. When a McKinsey director in Sydney needed to quickly start up an engagement for an important new consulting client, PDNet yielded 179 relevant documents that put at his fingertips valuable knowledge and information from more than 60 of the firm's consulting professionals worldwide.

In 1958, a year when large companies were installing their first computers to automate routine tasks, Harold J. Leavitt and Thomas L. Whisler made some predictions about what corporate life with the computer would be like in the future. Their article, "Management in the 1980s,"⁵⁰ foresaw that the role and scope of middle managers would change and that top management would take on more responsibility for innovating, planning, and creating. Leavitt and Whisler, in retrospect, were pretty good at predictions.

Looking ahead, what can be expected about corporate life and information technologies in the 21st Century? On the basis of what we know of the dimensions of the knowledge-based organization discussed here, we can expect that IT will serve to focus corporate energies on

⁴⁹"High-Tech Mobile Workers Transform Face of the Culture of Companies," *The New York Times*, Feb, 8, 1994, C19.

⁵⁰Harold J. Leavitt and Thomas L. Whisler, "Management in the 1980s," *Harvard Business Review* (November–December 1958).

projects, not tasks, on processes, not procedures. We can expect that IT will contribute to innovation and to the redefinition of how work is done.

One group of experts expects that “companies of the future will closely resemble professional service firms today. The most successful firms attract and retain employees by providing an environment that is intellectually engaging. The work is challenging, the projects diverse, and the relationships with clients fairly independent.”⁵¹

In the course I teach at Georgia Tech on Knowledge Management, one of the first cases my students read is Mutual Benefit Life, the country’s eighteenth largest life insurance company, which abandoned its rigid, sequential applications process and substituted a case-manager system. Instead of the old multistep process involving credit checking, quoting, rating, underwriting, and so on, Mutual Benefit created a new position, a single individual to handle all these matters with the support of powerful PC-based workstations that run an expert system and connect to a range of automated systems on a mainframe.

The result: these knowledge workers, called case managers at Mutual Benefit, can complete an application in hours, not weeks; they handle twice the volume of new applications the company previously could process; and the company was able to eliminate a hundred field office positions.

Mutual Benefit Life is an example of how work can be transformed using information technology. But it is also clear from this case, as well as others, that technology is only a tool—a piece of infrastructure that enables (some prefer “empowers”) knowledge workers to attain high performance results.

Michael Hammer, a theorist and advisor on reengineering work, recognizes the value of IT as a tool. His reengineering principles include having the organization that produces information also process it; having the classic conflict between centralization and decentralization reconciled using on-line databases, telecommunications networks, and standardized processing systems to get the benefits of scale and coordination while maintaining the benefits of flexibility and service; and having workers become self-managing and self-controlling by using IT that has built-in monitors and controls.⁵²

All this suggests the potency of IT in the knowledge-based organization, but it should not suggest that *technology* alone will become the 21st Century “silver bullet” of competitive advantage. Indeed, the paradox of IT is that while technology becomes ever more important, it

⁵¹Lynda M. Applegate, James I. Cash, Jr., and D. Quinn Mills, “Information Technology and Tomorrow’s Manager,” *Harvard Business Review* (November–December 1988).

⁵²Michael Hammer, “Reengineering Work: Don’t Automate, Obliterate,” *Harvard Business Review* (July–August 1990).

cannot become, as one observer concludes, “management’s primary solution.”⁵³ The reason is straightforward: technology is “every competitor’s potential solution,” as well. This is especially true as the technology rapidly diffuses as a consequence of continuous scientific advancement.

On the other hand, knowledge resources that are associated with technology can create significant value for the post-industrial firm, even competitive advantage. Examples include information-based products and services, such as financial derivatives and database publishing.

In their research on “Managing in the Marketplace,” J. F. Rayport and J. J. Sviokla⁵⁴ offer the example of “newspapers” not printed on paper but delivered as an electronic service. The disaggregated content of the “newspaper”—the newspaper’s knowledge resources—when distributed by an intermediary like America Online presents a different value proposition, because IT has changed the way in which the “newspaper” is processed and formatted.

Clearly, managing in marketplace will require new thinking and a better understanding of what is possible by managers. Anthony G. Oettinger’s study of the “information evolution,” “Building Blocks and Bursting Bundles,”⁵⁵ finds that changing technology offers new possibilities in business for different “bundles” of information (e.g., printed versus electronic news delivery) and that decisionmakers will need to focus carefully on the basic information “building blocks” of substance, process, and format as they seek to create new conventions that provide information value.

In sum, information technology and knowledge resources are vital to modern business organizations, and the two are more and more closely associated. From a technological perspective, opportunities are at hand to transform the way individual and organizational work can be more effectively and efficiently accomplished. From the perspective of knowledge resources, the challenge for managers is to increase firm value through effective management of their intangible, intellectual resources using information technology.

⁵³Kim B. Clark, “What Strategy Can Do for Technology,” *Harvard Business Review* (November–December 1989).

⁵⁴J. F. Rayport and J. J. Sviokla, “Managing in the Marketplace,” *Harvard Business Review* (November–December 1994).

⁵⁵Anthony G. Oettinger, “Building Blocks and Bursting Bundles” in *Mastering the Changing Information World*, edited by Martin L. Ernst (Norwood, N.J.: Ablex Pub. Corp., 1993).

Four

A Final Word

For traditional industrial organizations there exists a set of well-defined metrics to measure firm performance. Accounting and financial measures have been developed in considerable detail, are well understood, and are widely applied. For knowledge resources, metrics are at best emerging.

Important work in this regard has been underway at Georgia Tech by my colleague, Dr. Gary Tjaden.⁵⁶ Elsewhere, an interim approach, called the “balanced scorecard,”⁵⁷ has been developed by Robert S. Kaplan and David P. Norton.

The “scorecard” recognizes that while financial measures worked well in the industrial era, by themselves they are insufficient tools for providing effectiveness feedback in the post-industrial era. “They are out of step,” Kaplan and Norton say, “with the skills and competencies companies are trying to master today.” Their solution is to marry financial measures with operational data on customer satisfaction, on internal processes, and on the firm’s innovative and improvement activities. This kind of scorecard, they find, “tracks the key elements of a company’s strategy—from continuous improvement and partnerships to teamwork and global scale.”⁵⁸

Without fully developed new measuring tools, those who prefer to manage by the numbers (“If you can’t count it, you can’t manage it!”) may be frustrated.

Still, new-found commitments to innovation, creativity, and entrepreneurship were underpinning a quiet revolution that in the 1990s was taking place in many firms. Quietly, the command-and-control organization is giving way to the knowledge-based organization. Managers have been rebalancing their resource portfolios to increase the effective use of intangible knowledge while still keeping an eye on the efficient use of scarce, tangible resources.

For those who wish to become more active managers of knowledge resources, **Table 2** presents a Managers’ Checklist.

⁵⁶Director, The Center for Enterprise Systems, Georgia Institute of Technology.

⁵⁷Robert S. Kaplan and David P. Norton, “The Balanced Scorecard—Measures That Drive Performance,” *Harvard Business Review* (January–February 1992).

⁵⁸*Ibid.*

Table 2
Managers' Checklist

Knowledge Resources	Ask	Act
Business Concept	Is my part of the business conceptually sound?	Form an "A Team" to evaluate the current business concept; form a "B Team" to propose alternate business concept(s).
Know-How	Does my part of the business have know-how that is competitively sustainable?	Have "A Team" evaluate; have "B Team" propose alternatives.
Organizational Design	Does the flow of information in my business foster or hinder innovation?	Make two lists. List the innovations in your part of the organization during the last year. Make a second list of innovations you wish your organization had achieved during the year. Now, ask again the question about the flow of information.
Knowledge Workers	Do I supervise subordinates, or do I manage a team of individuals who have specialized knowledge?	If you "supervise," learn how to manage. As a manager, on both the team and the personal growth of each team member.
Information Technology	Is our IT used only to process data? Or is our It also used to manage knowledge?	In the next IT budget, commit to funding knowledge-management IT application(s).

Acronyms

CIO	chief information officer
COO	chief operating officer
CNN	Cable News Network
EDS	Electronic Data systems
GE	General Electric
GM	General Motors
IT	information technology
PDNet	Practice Development Network
U.S.	United States