

Firms must build and leverage three assets – a strong IT staff, a reusable technology base, and a partnership between IT and business management – to generate sustainable competitive advantage through information technology.

Develop Long-Term Competitiveness through IT Assets

Jeanne W. Ross • Cynthia Mathis Beath • Dale L. Goodhue

Assessing the value of information technology (IT) has never been easy. Delayed benefits, unintended uses, business changes, and hidden support costs inhibit meaningful evaluation of individual IT investments. This was true when most investments were focused on the support of a single business process or functional area. It is even more true as business executives ponder implementations of shared technologies like data warehouses and networks, replacement of large legacy systems, and reskilling of the IT staff. Although firms introduce some systems to reduce costs and can evaluate them in terms of their success in doing so, they want many IT initiatives to support a firm's strategic objectives. The value of these initiatives rests in their contribution to a firm's competitiveness, which is often nonquantifiable and uncertain.

How can firms apply IT to enhance competitiveness? We believe the answer lies in the development of an especially effective IT capability: the ability to control IT-related costs, deliver systems when needed, and effect business objectives through IT implementations. This capability derives from careful management of three key IT assets: (1) a highly competent IT *human* resource, (2) a reusable *technology* base, and (3) a strong partnering *relationship* between IT and business management. The results of a two-year study of IT management practices suggest that the quality of these assets dictates the quality of IT planning, delivery, and support processes.¹ And the quality of those processes influences a firm's ability to deploy IT to meet strategic objectives. In this paper, we describe the

three IT assets and their characteristics and explain how the assets are converted into business value. We then offer strategies for building IT assets in a firm.

IT and Competitive Advantage

In the early 1980s, high-profile information systems like American Airlines' SABRE system and American Hospital Supply's ASAP system suggested that IT applications offered the potential for competitive advantage.² Over time, however, it became clear that competing firms could eventually copy most IT applications and that the competitive advantage from any particular application would be short-lived.³ Nevertheless, firms like Wal-Mart and Federal Express have demonstrated that the capability to apply IT to business opportunities (as opposed to any specific IT application) can indeed enhance competitiveness.⁴ The resource-based view of a firm argues that firms compete on the basis of their unique resources. A resource becomes a source of competitive advantage when it is both strategically valuable and difficult for competitors to imitate.⁵ The current challenge of implementing IT-dependent strategic initiatives like business process reengineering, customer intimacy, organizational learning, and even organizational transformations makes an

Jeanne W. Ross is a research associate, Center for Information Systems Research, MIT Sloan School of Management. Cynthia Mathis Beath is associate professor at the Cox School of Business, Southern Methodist University. Dale L. Goodhue is assistant professor of MIS at the University of Georgia, on leave from the University of Minnesota.

IT capability very valuable in meeting business goals.⁶ In addition, the underlying resources, or IT management assets, can be difficult for competitors to imitate. Thus an IT capability has the potential for delivering long-term competitive advantage.

Building IT Capability for Competitive Advantage

When the U.S. trucking industry was deregulated in 1980, top management at Schneider National, Inc., a large truckload carrier, recognized that IT support of operations would be critical for maximizing utilization of its tractors and trailers. While only a few trucking companies identified the strategic potential of IT in a deregulated environment, Schneider quickly developed freight modeling software and provided a management interface to the data that enabled the firm to offer more reliable customer service with a lower cost base than most competitors. The industry became intensely competitive following deregulation, and almost 12,000 trucking firms declared bankruptcy in the 1980s, but Schneider, due in large part to its

Schneider National is successful because it has developed a capability for applying IT to ever-changing business opportunities.

efficiency in asset utilization and high levels of customer service, emerged in the 1990s as one of only two billion-dollar truckload carriers.

Eventually, Schneider's modeling software became an industry standard, no longer serving as a source of competitive advantage. But, by then, Schneider had used its IT capabilities to seize other customer-focused IT initiatives, including aggressive development of electronic linkages with customers through electronic data interchange (EDI), as well as a highly efficient, centralized processing architecture intended to meet customer needs at the lowest possible cost. In 1988, despite its culture of cost consciousness, Schneider spent millions of dollars to become the first large carrier to equip its trucks with satellite dishes and onboard terminals. Focused on a strategy of customer service and cost-

effective operations, Schneider's CEO saw in satellite technology an opportunity to significantly improve the firm's capability to track customer loads and reduce the amount of unproductive (i.e., nondriving) time that drivers spent communicating about load assignments. Schneider again leveraged its IT capabilities and achieved the benefits it sought, but, as expected, other firms followed suit, and satellite technology became a prerequisite for doing business as a large trucking firm.

Because other trucking firms were able to duplicate Schneider's use of satellites, the technology itself did not provide sustainable competitive advantage. So Schneider leveraged its IT capability by incorporating satellite data into customer communications and load-scheduling processes. Schneider continues to apply its IT capability as it moves into logistics outsourcing. Logistics is an entirely different business from trucking but one that is similarly dependent on fast, cost-effective, strategic implementations of IT. Relying on its IT competence, Schneider has been able to transform itself from a trucking company to an "asset-based logistics company."

Schneider National is successful not because of any particular leading-edge IT application, but because it has developed a capability for applying IT to ever-changing business opportunities. This capability grew from the persistent development of: (1) an IT staff that was trained to provide rapid solutions to the most pressing business needs, (2) a cost-effective, well-managed IT infrastructure that complemented organizational information needs, and (3) an effective IT-business relationship led by a proactive CEO. As Schneider demonstrates, strategic assets are created and enhanced through organizational experiences, and they provide competitive advantage precisely because neither the experiences nor the assets can be reproduced by other firms.

The Three IT Assets

In the initial stage of our research, we asked top IT executives at fifty firms highly regarded for their IT management what their objectives were for their IT management practices. They responded that they focused on: (1) better aligning IT products and services with the firm's strategic objectives, (2) delivering solutions faster, and (3) providing high-quality, cost-effective

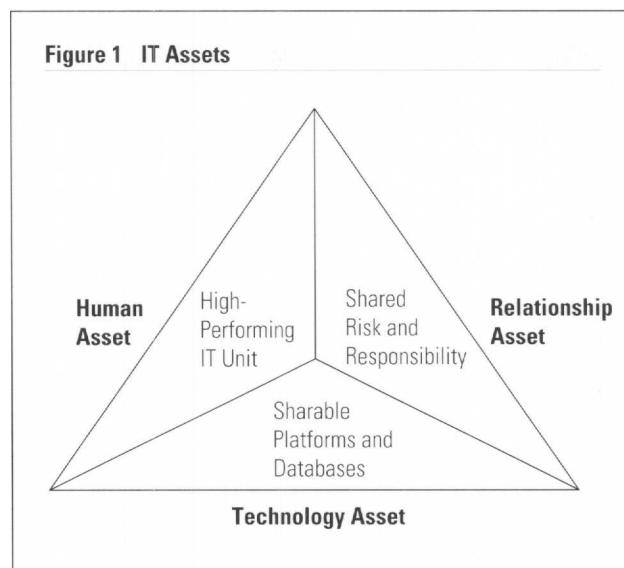
support. In effect, these executives were attempting to build an IT capability that would consistently allow them to identify and implement opportunities to apply IT to strategic needs better, faster, or cheaper than their competitors. By examining the impact and nature of this IT capability at seven firms during a two-year period, we concluded that the value and inimitability of a firm's IT capability depended on the status of their human, technology, and relationship assets (see Figure 1). We based the following descriptions of these assets on our observations of the development of the IT capability at the seven firms as well as discussions with IT executives at other leading organizations.

The Human Asset

The defining characteristic of a valuable human asset is an IT staff that consistently solves business problems and addresses business opportunities through information technology. With a combination of formal training, on-the-job experience, and focused leadership, these IT staffs accumulate firm-relevant IT knowledge and competence. Our research identified three dimensions to this asset: technical skills, business understanding, and a problem-solving orientation.

Rapidly changing technologies that are powerful but immature have generated a renewed emphasis on the technical qualifications of IT staff. The IT managers in our study were applying their staff's *technical skills* to build bridges between old systems and new, to deliver data across locations and applications, and to recognize opportunities to apply new technologies as they become available. Most of the IT managers in our study acknowledged that they were challenged to keep people interested in supporting old technologies — not in generating enthusiasm or capability to move to new technologies. Their staffs viewed increased technical knowledge and the opportunity to address new technical challenges as a primary motivating force in their jobs.

Business understanding results from frequent interaction with clients. To achieve this, all the IT units in our study had collocated some IT staff with individual business units. Some had assigned high-level IT staff as account managers or relationship managers to work closely with line managers in defining IT requirements and leading IT initiatives. At one firm, IT professionals spent time at external customer sites to



adapt systems to customer needs. Regardless of how they were achieved, close working relationships allowed IT staff to observe business processes in action and accumulate experience in solving business problems. In addition to better understanding business needs, staff who worked very closely with clients, and who therefore saw clearly and sometimes dramatically the benefits from their efforts, tended to be highly motivated.

Firms with a valuable human asset distribute responsibility for *solving business problems* to every member of the IT staff. This differs from more traditional IT organizations in which staff members are responsible only for completion of well-defined tasks. One CIO in our study observed, "I had recruited lots of smart people, but I didn't expect most of them to think." He reorganized his unit around the concept of empowered teams, which, he noted, resulted in more people thinking and more creative solutions. Like managers at other team-based IT organizations, managers at his firm are working to define organizational objectives and constraints that act as boundaries for team decisions.⁸ Within these boundaries, empowered teams learn to work closely with their customers to develop implementable solutions, leading to increased communications between IT and business staff.

The Technology Asset

The technology asset consists of sharable technical platforms and databases. A valuable technology asset

is essential for integrating systems and making IT applications cost effective in their operation and support. Two distinguishing characteristics of the technology asset are: (1) *a well-defined technology architecture* and (2) *data and platform standards*.

As IT becomes distributed throughout firms and even beyond their boundaries, IT managers and their business partners need a clear vision of where to locate individual technology components and responsibility for those components. Firms with a valuable technology asset are developing *architectures* that elaborate rules for distributing hardware, software, and support — independent of individual applications. These rules specify what kinds of data to share and how to store them, where to locate servers, and how to support applications and technologies. Each new application, then, moves the firm closer to the IT capabilities and management approaches defined by the architecture.

Firms without well-defined architectures have dealt with the challenges of distributed computing by first delivering systems and then thinking about how to support and connect them. The result is that the systems are either poorly supported or expensive to operate or both. In firms with a well-defined architecture, integration requirements and support considerations drive system design so that new systems not only meet business needs but are also cost effective.

Standards are the second distinguishing characteristic of the technology asset. They are one mechanism by which the firm achieves its architectural vision. Standards limit the range of technologies that IT staff must support, enabling them to provide faster, more cost-effective support.¹⁰ IT managers who have developed a valuable technology asset view standards as important for minimizing costs, maintaining quality support, and simplifying systems integration efforts in order to speed the delivery process, but they work to ensure that the standards do not handcuff business units with unique IT requirements. Consequently, these firms are trying to develop both formal and informal processes for identifying occasions when nonstandard technologies are appropriate.

At one firm with infrastructure standards that specified a single application development environment, a business unit was concerned with very fast delivery of a system that would support new EDI linkages with

key customers. An empowered IT team chose a nonstandard development tool because an outside contractor responsible for important technical work had experience with it and could deliver the system faster. When top IT managers learned of the decision to use nonstandard technology in the development of the system, they decided that the business should acquire external support for the system rather than require existing IT staff to learn another development environment. In doing so, they exposed the cost of not conforming to standards, which allowed business managers to make an informed assessment of whether the urgency of the business need justified premium ongoing support costs. In this case, business managers felt the benefits of fast delivery outweighed the additional support costs, and they are delighted with both the system and the speed with which it was delivered. In the long term, the system can be rewritten to stan-

To ensure that limited resources are invested wisely, top management must be involved in establishing IT priorities.

dard, or the standard can be reassessed and revised. This process of segregating support costs for nonstandard technologies promotes IT-business unit communication that identifies outdated standards and establishes priorities for new standards.

The Relationship Asset

In a valuable relationship asset, IT and business unit management share the risk and responsibility for the effective application of IT in the firm.¹⁰ *Shared risk and responsibility* require trust and mutual respect between IT and clients, and an ability to communicate, coordinate, or negotiate quickly and effectively.¹¹ Evidence of a strong relationship asset includes: (1) business partner ownership of, and accountability for, all IT projects, and (2) top management leadership in establishing IT priorities.

Gillette, a global consumer products manufacturing firm in which most major new IT projects are implemented across divisions or functions, provides

an example of business partner ownership of IT projects. Aware of the inherent implementation hazards, the IT unit undertakes only projects championed by a senior business manager who has cross-functional or cross-divisional responsibility. Gillette's divisions have historically had a great deal of autonomy in their IT decisions, so the senior business management leadership has proved invaluable to implementing cross-divisional systems. When the firm decided to implement a common human resource system across its North American business units, a top business executive fought business unit resistance by communicating the benefits to each business head, solicited cooperation from pilot sites, monitored system design initiatives and their relative costs and benefits, and tracked implementation efforts. IT management observed that the business sponsor's role generated commitment and enthusiasm from business unit managers who had initially thought the common system concept had no merit.

To ensure that limited resources are invested wisely, top management must be involved in *establishing IT priorities*. For this reason, a number of firms have established committees of senior managers to act as IT steering committees, which articulate organizational strategies at either the corporate or business-unit level and specify how IT should support them. Proactive CIOs who identify opportunities for IT-enabled strategic processes help focus steering committee discussions.¹² While the steering committees set the tone of the IT-business relationship at the top of these organizations, valuable relationship assets grow from accumulated experiences in planning, developing, and using information technology at all levels. We found that the more IT staff people and clients worked together, the more they communicated, coordinated, negotiated, laughed, and cried together, up and down the hierarchy, the stronger the partnership became and the more effective *both* were at planning, developing new applications, and using their current information technology.



The three IT assets, while quite distinct, are highly interdependent. For example, the relationship asset is heavily dependent on mutual respect, which means that business partners must view the IT staff as com-

petent (human asset), which is partly dependent on the quality and cost of the existing technology base (technology asset). At the same time, competent IT staff members can develop a strong technology infrastructure only if business partners accept some accountability for IT projects (relationship asset) and top management provides sufficient investment for constant reskilling of the IT staff (human asset). The architecture is valuable only if it supports business needs, as articulated by senior business managers (relationship asset), and is effectively and efficiently managed by competent IT staff (human asset).

In other words, the assets are mutually reinforcing. For example, the Travelers, a U.S. insurance company, built its IT unit by recruiting top technical graduates and providing them with both classroom and on-the-job training. The staff spent years developing a highly cost-effective technology infrastructure. Nonetheless, the CIO felt that limited communication between IT staff and business managers resulted in less creative applications of IT than the company was able to produce. He distributed IT professionals to business units and found that regular interaction with the business gradually convinced business management of the IT unit's competence and the value of a strong infrastructure. As trust and mutual respect developed between the two departments, they were able to engage in more productive planning processes. Thus, by leveraging the valuable human and technology assets, Travelers enhanced the relationship asset, which significantly improved the firm's ability to implement valuable IT applications.

Conversely, a large distributor that had, over time, built a strong technology asset had a human asset with a very narrow range of technical skills focused primarily on mainframe technologies and machine programming languages. Systems development in this environment did not require regular interaction with business people, so the staff's business knowledge was limited, which contributed to a poor working relationship between IT and business. The limitations in both the human and relationship assets led to the deterioration of the technology asset. All three assets, as well as the firm's general IT competence, have entered a downward spiral. The reinforcing nature of the assets suggests that they are normally at near equilibrium. Improvements in one can bolster the other two.

Similarly, neglect of any one is likely to have a negative impact on the others.

How the Three Assets Contribute to Business Value

IT assets lead to business value through their impact on a firm's IT planning, delivery, and operations and support processes. To the extent that these processes are strategically aligned, fast, and cost effective, they result in competitively important IT-enabled business processes. As shown in Figure 2, these three processes deploy existing IT assets while simultaneously changing the state of the assets. Thus the interplay between the three assets and the three IT processes determines how the firm is positioned to generate and sustain competitive advantage.

The Travelers' PC Claims unit's implementation of a state-of-the-art workers' compensation claims system illustrates this process.¹³ An existing positive relationship between IT and business management in the claims unit facilitated interactions between branch managers and IT specialists on a team charged with identifying out-of-the-box approaches to processing claims. After business representatives rejected early prototypes as insufficiently different from existing IT support, the IT director called in consultants to develop an object-oriented (OO) solution. While the OO solution generated great enthusiasm among the business managers, the IT director noted that it was a risky approach. OO technologies would support more highly distributed systems and enable faster maintenance, but the OO solution required immature technology with which Travelers had limited experience. Thus time and cost estimates would be unreliable. Business management, which had great confidence in the IT staff's technical skills, decided that the benefits exceeded the risks and authorized IT to develop an OO solution.

In developing the system, IT staff members worked with consultants to learn object-oriented programming languages and taught themselves principles of distributed databases, which helped build the human asset. They communicated regularly with business managers, who shared the risk for system success, thereby enhancing the relationship, as they encountered the anticipated technical problems. In the meantime,

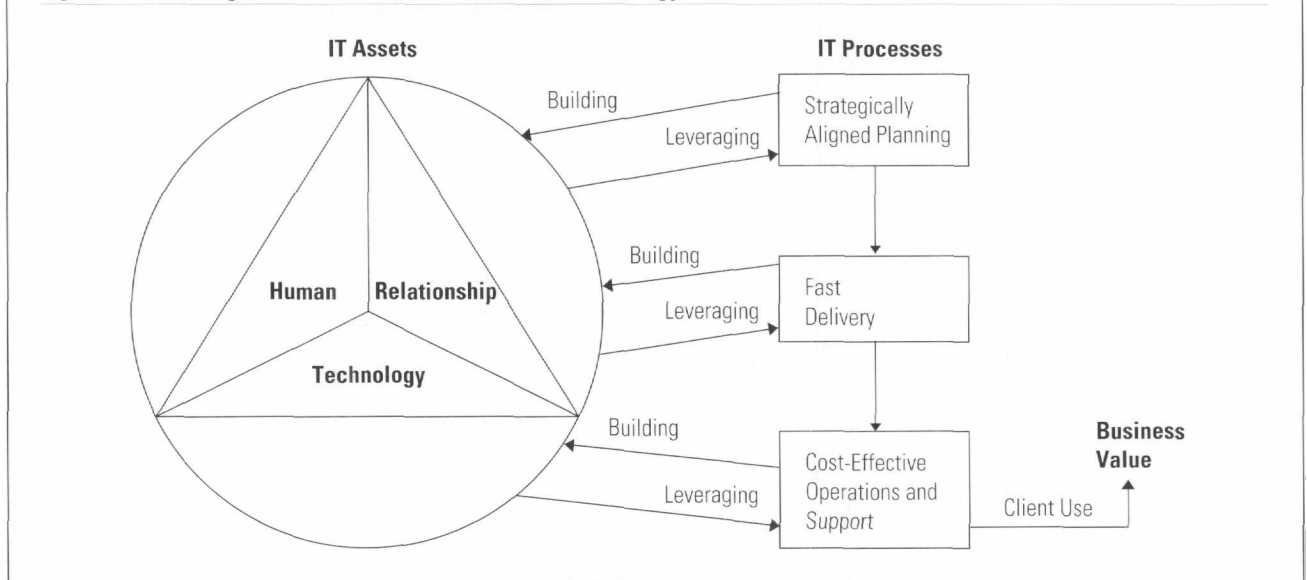
Travelers started building a client-server technology infrastructure that would centralize both technology and application support. Although the pilot was delivered a year late, well over budget, and with significant technical flaws, early users were enthusiastic about the system's potential.

Despite the technical problems, business management decided to immediately roll out the system to all fifty branch offices across the company so that individual claims managers could begin using it. Top business managers accepted responsibility for training and for setting priorities on system enhancements. Technical staff responded quickly to these priorities, and the centralized infrastructure enabled almost instantaneous dissemination of system changes. Each morning when desktop units were turned on, they automatically loaded all system improvements from the preceding day.

As anticipated, the system ultimately allowed the firm to acquire more customers at higher levels of service with no additional staff. More importantly, despite frustrations with early technical problems, the planning, implementation, and operation and support of this system not only leveraged the assets but also strengthened them. IT professionals, the human asset, benefited from significant experience with new technologies that were immediately reused in a subsequent project. The technology infrastructure was expanded to provide solid support of distributed systems with greater reliability and at lower cost than the industry average. And the relationship asset grew stronger as shared success increased mutual respect. The Travelers has leveraged these assets in subsequent systems development efforts. In the claim unit's most recent initiative, the project team will reuse objects from prior claims systems, place the system on the existing client-server infrastructure, and take advantage of its technical expertise and IT-business relationship. IT management has costed the project at only one-quarter of the cost it would have incurred for this project a few years ago.

In contrast, a manufacturing firm with a strong asset base undertook a project that had the opposite effect. Committed IT and business team members were highly enthusiastic early on about a state-of-the-art system intended to support global purchasing agents. The relationship benefited from productive interaction between IT and purchasing agents,

Figure 2 Delivering Business Value from Information Technology



and the staff developed expertise in newer client-server technologies. However, as the system neared final implementation and the developers sought to hand over responsibility for support to central IT staff, no one was prepared, technically or organizationally, to support it.

Midway through the project, the firm had decided that client-server projects would be on a single platform (Windows), which meant the purchasing system was built on a nonstandard technology (OS/2). Recognizing that their OS/2 skills would be less valuable to the company in future development efforts, most of the developers left, taking with them not only their technical skills but also their business understanding and working relationships, thereby depleting the IT staff. Their loss made it difficult to resolve persistent technical problems, and business partners grew frustrated, which diminished the relationship asset. And the firm had a system in its portfolio that did not meet standards, leading to higher than average incremental infrastructure support costs. Although recent projects have enabled the firm to recover substantially from this unsuccessful effort, the example illustrates how every experience either builds or erodes the assets.

Accumulating Valuable IT Assets

Obviously, senior executives can choose from a wide range of competencies in deciding which capabilities

they will develop to gain a competitive edge.¹⁴ Not every firm will choose to make IT a strategic asset. However, every firm that finds itself information-dependent — and that includes most firms — is likely to encounter situations in which competitors develop IT applications that become competitive necessities.¹⁵ And any firm that needs to implement IT applications to remain competitive will require an IT capability to deliver and support those applications quickly and cost effectively.

For these firms, our study suggests that IT executives, with their business counterparts, should constantly assess the status of the three IT assets and develop strategies to attack weaknesses and leverage strengths. First, they should assess their firms by answering the questions in the sidebar, "Assessing IT Assets." A high percentage of affirmative responses from both IT management and important internal customers suggests that assets are strong. Second, IT managers should develop specific goals for each asset and an action plan for achieving those goals. They can then measure the unit on its progress. Finally, IT units must understand the status of their assets relative to their competitors. Only assets comparable to those of competitors will enable effective response to competitive threats, and only competitively superior assets will consistently generate competitive advantage for the firm.

Assessing IT assets should be combined with an as-

Assessing IT Assets

IT Human Resources Asset

A strong staff is highly motivated and knows how to solve business problems with information technology. A human resource plan should specify both the breadth of required knowledge — including technical, change management, and business knowledge — and the pace at which new skills must be acquired. Some questions for assessing IT human resources are:

- Does IT staff have technical capabilities that match the technology plan?
- Is there a plan for infusing or acquiring skills in new technology?
- Is IT staff expected by both IT and business management to solve business problems?
- Is IT staff close enough to the business to understand and predict business problems?
- Does IT staff regularly invest in technical, business, and interpersonal training?
- Is IT staff in the habit of learning?
- Does IT staff have negotiating, coaching, and counseling skills? Do projects meet deadlines?
- Are development costs lower than those of our competitors?

Technology Asset

A strong technology asset is appropriate for the business and reasonably consistent across the firm both within and beyond the IT-owned and IT-operated boundary. Some questions for assessing the technology asset are:

- Have IT and business management defined a technology plan based on strategic business principles?
- Have IT and business management agreed on the nature and role of technology standards in that plan?
- Do IT and business management understand the costs and benefits of noncompliance with standards?
- Are business managers complying with the plan and with the standards?
- Are standards hamstringing efforts to address business needs?
- Is there a plan for bringing nonstandard systems into compliance?
- Is there a process for identifying and changing inappropriate standards?
- Are data and information available to decision makers when they need it?
- Are system availability, system response times, and IT support costs better than those of our competitors?

Relationship Asset

A strong IT-business relationship is characterized by high levels of respect between IT and clients; excellence in communication, coordination, and negotiation on both sides of the relationship; and significant shared knowledge about the capabilities of information technology and the needs of the business. The relationship blueprint will specify IT and business unit responsibilities for planning, technology ownership, systems development, implementation, and support; expected communication channels; and expected modes of coordination. Some questions for assessing the IT relationship asset are:

- Do IT and business executives share a vision for how IT will support the business?
- Do IT and business managers have overlapping, frequently used, formal, and informal channels of communication at many levels of the firm?
- Do IT and business managers consult with each other regularly on business and technical decisions?
- Do all large development projects have active business executive sponsorship and leadership?
- Do IT and business managers have a mutual understanding of each other's responsibilities for planning, developing, and supporting systems?
- Are IT and business managers satisfied with their abilities to communicate and negotiate with each other?
- Do clients have realistic expectations for IT services?
- Do IT and business partners negotiate priorities for cycle time, cost, and flexibility?

assessment of whether the firm faces immediate competitive threats or whether it dominates its competition (see Table 1). The market assessment that accompanies the asset assessment will help a firm understand its time line for developing IT assets. Table 1 identifies an appropriate action plan for each of the four positions that specifies management interventions to address weaknesses in a firm's assets.

If Sinking, Start Bailing

Firms with weak IT assets that face immediate competitive threats are, in nautical terms, sinking. These firms need to turn their assets around quickly before IT becomes a competitive liability, if that is not already the case. Situations such as these require risky, often expensive moves to speed up a process that is evolutionary in nature. Such moves might include hiring top technical talent, restructuring so that IT reports to a committed, proactive business executive, or refocusing the IT unit on a few high-priority projects. In short, the strategy for firms with weak IT assets in a threatening environment requires a sudden influx of business confidence in IT where little existed before and where IT skills may be insufficient to substantially enhance a presumably weak IT infrastructure. Top management should recognize that investments of both money and top management time are needed to create a valuable IT capability, and even these cannot ensure success.

One large firm that had operated at a loss for several years and had trouble responding to competitors' IT-based initiatives tried to turn around by bringing in a new CIO. The new CIO focused first on the relationship

Table 1 Assessment Grid for IT Assets

State of Assets	The Competitive Environment	
	Immediate Threat	No Immediate Crisis
Weak	Sinking <i>Start bailing</i> Rapid, risky change	Drifting <i>Set a course</i> Relationship building
Strong	Luffing <i>Trim the sails</i> Focused response	Cruising <i>Go full speed ahead</i> Adaptive learning

with business partners, assigning a high-level IT manager to each business division to identify strategic IT needs and then oversee their delivery. The relationship building soon improved alignment between IS resource allocation and business needs, but it could not quickly build IT skills or transform a weak technology infrastructure. Consequently, the firm entered a major outsourcing agreement to more quickly train, tool, and augment the IT staff.

It is not clear whether these changes will turn the IT assets around fast enough to help the firm. Outsourcing generally hands over existing assets to a third party, thus only unloading control over weak assets, not eliminating their impact or readily changing their status. Improving weak assets requires strong results-oriented management, from inside or outside the firm. It also requires time — something that firms in the sinking quadrant have little of.

If Drifting, Set a Course

Firms that have weak IT assets but do not face immediate competitive threats have more time to recover, but their weak assets can easily pose a threat to the firm's competitiveness. In nautical terms, we think of these IT units as drifting; they need to decide where they are headed and identify which way the wind is blowing. Similarly, when a firm is in the drifting quadrant, IT management must work with business management to determine strategic priorities and how IT can enable them. These firms need to build all three assets almost in parallel, but they should start by building the relationship asset. Strategies for aligning more closely with business partners include creation of top management steering committees, increased

empowerment of client teams, establishment of account manager or relationship manager positions, and delivery of quick-hit applications that can build IT-business unit trust.

The strategy for firms with weak assets in non-threatening environments is similar to that of firms in the sinking quadrant, but it can be more deliberate, working to build and then leverage the relationship asset. A global manufacturing firm whose technology infrastructure and IT skills had become outdated exemplifies a firm in the drifting quadrant. The firm brought in a CIO from the business to increase management focus on the value of IT. When he had clarified IT objectives, the CIO returned to his business position and hired a CIO with a strong technology background to meet management's new expectations for IT. The new CIO targeted for immediate action those concerns for which he could find a top-level project champion and that could be implemented quickly. He then allocated resources to these projects to ensure successful delivery. IT and business managers broadcast the success of early applications to others in the firm, which built momentum for more ambitious projects.

Although these management actions targeted the relationship asset most directly, they had positive impacts on all three assets. In fact, developing only a single asset is a recipe for failure. One CIO dispatched

Improving weak assets requires strong results-oriented management, from inside or outside the firm.

empowered teams to focus intensely on the specific IT needs of individual business units. By ignoring the need to develop IT skills and build a well-designed infrastructure, the mutual trust and respect he was able to engender dissipated over time when business managers sensed that the firm was making no progress in applying IT.

If Luffing, Trim the Sails

Firms with strong IT assets can encounter competi-

itive threats, much as sailors suddenly encounter shifting winds. IT units in businesses that face competitive threats need to focus their capabilities to address the threat, much as sailors “trim the sails” to take advantage of the wind. Strategies for building and leveraging assets for firms in the luffing quadrant focus on building strategically important systems in ways that continue to contribute to the assets. Management actions might include increased reliance on high-performance teams that take responsibility for solving business problems, dynamic assignment of IT staff to address high-priority system requirements, and partnering with contractors who help deliver systems as they transfer knowledge about new technologies.

A large financial services firm that faced intense cost pressures had built up a great deal of distributed technical competence and had strong IT-business partnerships in many divisions. When top management responded to the competitive threat by mandating severe cost cutting across the board, IT man-

Firms with strong assets facing competitive threats need to be creative in their problem solving, and thus will rely heavily on the competencies of their staff people.

agement eliminated, in most cases, two or more layers of middle management and adopted a team-based structure. The teams allied closely with business managers so that they could focus on the firm's priorities. This enabled the IT unit to apply its limited resources to the highest value applications and support. Despite the bumps associated with the introduction of an entirely new organizational structure, the IT unit was able to respond to the cuts by becoming, in the minds of both IT and business partners, more responsive to strategic needs.

Firms with strong assets facing competitive threats need to be creative in their problem solving, and thus will rely heavily on the competencies of their staff people. They will also benefit from a standardized

technology architecture that facilitates fast solutions and from an IT-business relationship that helps focus resources on top priorities. Firms in this quadrant should emerge from competitive threats with a stronger asset base as a result of the experiences they accumulate in addressing the threat.

If Cruising, Go Full Speed Ahead

When assets are strong, firms can find themselves cruising. In this case, they will want to maintain their course and speed as they incrementally build assets to stay ahead of the competition and prepare to react quickly to competitors' moves. Firms positioned in the cruising quadrant can focus on identifying new opportunities to sustain their competitive positions and build their assets. Strategies that provide incremental improvements to strong assets include experimenting with new, immature technologies to learn whether they offer unique opportunities to the business, replacing outdated legacy systems, redesigning inefficient processes, training IT staff in negotiation, interpersonal, or problem-solving skills, and introducing measurement systems to monitor their own progress.

Schneider and Travelers are examples of firms in the cruising quadrant. Travelers implemented its workers' compensation claim system because business management recognized that eventually the marketplace would not allow the firm to charge a premium for its highly skilled workforce. Before this changing business environment became a crisis, Travelers developed a system that would make it cost competitive by increasing productivity while enhancing customer service. Similarly, Schneider took advantage of its investment in satellite technology because it had the human, technology, and relationship assets that allowed it to convert additional data into information that improved asset utilization and customer service. IT and business staff continuously look for ways to present satellite data that can change existing processes.

Firms with valuable assets that do not face immediate competitive threats should focus on organizational learning as a means to continuously strengthen their assets and ward off competition. These firms must work to consistently improve their assets, focusing even more closely on strategic priorities, making short delivery cycles even faster, and looking for ways to make their operations more cost effective. If they fail

to continue to develop their assets, they will weaken them.

Conclusion

Effective IT management is just one critical competency required for successful implementation of strategic business processes. As communications and information become ever more important business tools, however, the ability to support new strategies with fast, cost-effective information technology will become increasingly important for anticipating and reacting to changing market conditions. Unless and until a firm does it well, information technology management can represent either a distinctive competency or a competitive liability.

Increasingly, firms buy the same software packages, hire similar contractors, and outsource to the same major vendors. Nonetheless, some firms generate significant business value from IT, while others do not. The difference is not in the reproducible technologies and skills they acquire or even in the implementation processes in which they deploy those technologies, but in their ability to build and leverage inimitable IT management assets. These assets, when consistently focused on identifying strategic applications of IT and delivering and supporting those applications quickly and cost effectively, can generate sustainable competitive advantage for a firm.

Consequently, evaluation of individual IT investments should consider not only their immediate costs and benefits but also their impact on the IT assets. A firm's asset base is precariously balanced. Any weakness can undermine all three assets. For example, inattention to technology standards can reduce the time that IT professionals spend acquiring expertise on dominant technologies and can lead to business partner dissatisfaction with the cost and quality of IT support. Similarly, a boost to one asset will typically reverberate through the others. For example, enhancing the IT unit's technical skills can lead to a more state-of-the-art infrastructure and greater respect from business partners. The impact of individual IT initiatives on the assets is often not quantifiable. Investing in the assets requires judgments by senior business and IT management as to their value and the costs required to generate that value.

As noted above, there are a number of strategies for developing and leveraging IT assets. The vigilance of senior IT and business management in constantly assessing the status of the assets and introducing management practices to further develop them is vital to this effort. Building and leveraging IT assets is an organizationwide responsibility and requires persistent effort. ♦

References

The Advanced Practices Council of the Society for Information Management, International, and the MIT Sloan School of Management Center for Information Systems Research sponsored this research. The authors wish to thank Bob Benjamin, Debra Hofman, Judith Quillard, Jack Rockart, Dan Ross, Mike Vitale, Madeline Weiss, Mitch Weisberg, and Bob Zmud for helpful comments on earlier drafts of this paper. We are indebted to the individuals at our research sites who so generously contributed their time and insights to this research.

1. This study of IT management practices had three phases. Phase 1: In late 1992, we obtained nominations of respected firms from twenty-eight consultants, academics, and practitioners, and referred to the 1992 peer ratings of top IS organizations from *Information Week*, *Datamation*, and *Computerworld*. Combined, these sources yielded 259 nominations of 149 different firms. We contacted the 60 firms that received 2 or more nominations. Top IT executives at 50 of the 60 firms agreed to a half-hour telephone interview to describe their new management practices and the objectives of those practices. Phase 2: Between January and April 1993, we visited 12 of the original 50 firms. Six of those firms were aggressively building client-server applications and infrastructures, and 6 were implementing new team-based structures. This allowed us to observe implementations of both technical and organizational changes. We interviewed IT and business managers at each of these firms and then selected 7 of the most interesting firms for additional research. Phase 3: The 7 sites were divided among the researchers and visited 3 times over an 18-month period. We analyzed findings both within and across cases and validated our findings by sharing them with liaisons at case sites and with project sponsors.
2. For a history of the development of the SABRE system, see: D.G. Copeland and J.L. McKenney, "Airline Reservation Systems: Lessons from History," *MIS Quarterly*, volume 12, September 1988, pp. 353-370. Background on American Hospital Supply's ASAP system is included in: J.E. Short and N. Venkatraman, "Beyond Business Processes Redesign: Redefining Baxter's Business Network," *Sloan Management Review*, volume 34, Fall 1992, pp. 7-21. For other examples of how IT applications were identified as a source of competitiveness, see: B. Ives and G.P. Learmonth, "The Information System as a Competitive Weapon," *Communications of the ACM*, volume 27, December 1984, pp. 1193-1201; F.W. McFarlan, "Information Technology Changes the Way You Compete," *Harvard Business Review*, volume 62, May-June 1984, pp. 98-103; and J.I. Cash and B.R. Konsynski, "IS Redraws Competitive Boundaries," *Harvard Business Review*, volume 63, March-April 1985, pp. 134-142.
3. M.R. Vitale, "The Growing Risks of Information Systems Success," *MIS Quarterly*, volume 10, December 1986, pp. 327-334.

4. For a discussion of how a management capability provides competitive advantage, see:
 I. Dierickx and K. Cool, "Asset Stock Accumulation and Sustainability of Competitive Advantage," *Management Science*, volume 35, number 12, 1989, pp. 1504-1514.

5. For a discussion of the resource-based view of the firm, see:
 D.J. Collis and C.A. Montgomery, "Competing on Resources: Strategy in the 1990s," *Harvard Business Review*, volume 73, July-August 1995, pp. 118-129;
 K.R. Conner, "A Historical Comparison of Resource-Based Theory and Five Schools of Thought within Industrial Organization Economics: Do We Have a New Theory of the Firm?," *Journal of Management*, volume 17, number 1, 1991, pp. 121-154; and
 J.B. Barney, "Firm Resources and Sustained Competitive Advantage," *Journal of Management*, volume 17, number 1, 1991, pp. 99-120.

6. Literature on current management strategies often refers to information or IT requirements. For a discussion of the role of IT in BPR initiatives, see:
 T.H. Davenport, *Process Innovation: Reengineering Work through Information Technology* (Boston: Harvard Business School Press, 1993).
 For a discussion of IT and customer intimacy, see:
 M. Treacy and F. Wiersema, *The Discipline of Market Leaders* (Reading: Massachusetts: Addison-Wesley, 1995).

Organizational learning is concerned with information and knowledge sharing. For one example, see:
 P.M. Senge, *The Fifth Discipline* (New York: Doubleday, 1990).

For an introduction to the role of IT in organizational transformation, see:
 L.M. Applegate, "Managing in an Information Age: Transforming the Organization for the 1990s," in R. Baskerville et al., eds., *Transforming Organizations with Information Technology* (North Holland, New York: Proceedings of the IFIP 8.2 Working Conferences on Information Technology and New Emergent Forms of Organizations, Ann Arbor, Michigan, 11-13 August 1994), pp. 15-94.

7. J.W. Ross, "Schneider National, Inc.: Building Networks to Add Customer Value" (Cambridge, Massachusetts: MIT Sloan School of Management Center for Information Systems Research, working paper 285, 1995).

8. Effective empowerment requires the power to make decisions within the defined decision arena, information as to what customers need and how those needs are related to corporate objectives, and knowl-

edge, particularly interpersonal skills to learn how to probe and analyze customer needs. For a fuller description of empowerment concepts, see:
 D.E. Bowen and E.E. Lawler III, "Empowering Service Employees," *Sloan Management Review*, volume 36, Summer 1995, pp. 73-84.

9. A variety of sources describe the role and value of IT standards. See, for example:
 J.C. Henderson and N. Venkatraman, "Strategic Alignment: Leveraging Information Technology for Transforming Organizations," *IBM Systems Journal*, volume 32, number 1, 1993, pp. 4-16;
 R. Rada, "Standards: The Language for Success," *Communications of the ACM*, volume 36, December 1993, pp. 17-18;
 P. Weill, "The Role and Value of Information Technology Infrastructure: Some Empirical Observations," in R.D. Banker et al., eds., *Strategic Information Technology Management: Perspectives on Organizational Growth and Competitive Advantage* (Harristown, Pennsylvania: Idea Group Publishing, 1993), pp. 547-572.

10. J.F. Rockart, "The Line Takes the Leadership — IS Management in a Wired Society," *Sloan Management Review*, volume 29, Summer 1988, pp. 57-64.

11. J.C. Henderson, "Plugging into Strategic Partnerships: The Critical IS Connection," *Sloan Management Review*, volume 31, Spring 1990, pp. 7-18.

12. M.J. Earl and D.F. Feeny, "Is Your CIO Adding Value?," *Sloan Management Review*, volume 35, Spring 1994, pp. 11-20.

13. For a full description of the development of the workers' compensation claims workstation, see:
 J.W. Ross, "Travelers Insurance: Process Support through Distributed Technologies" (Cambridge, Massachusetts: MIT Sloan School of Management Center for Information Systems Research, working paper 282, 1995).

14. C.K. Prahalad and G. Hamel, "The Core Competence of the Corporation," *Harvard Business Review*, volume 68, May-June 1990, pp. 79-91.

15. P.F. Drucker, "The Coming of the New Organization," *Harvard Business Review*, volume 66, January-February 1988, pp. 45-53; and
 E.K. Clemons and M. Row, "McKesson Drug Company: A Case Study of Economost — A Strategic Information System," *Journal of Management Information Systems*, volume 5, Summer 1988, pp. 36-50.

Reprint 3813