The Growing Risks of Information Systems Success

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Abstract
This article describes the risks of information systems success achieved in the absence of appropriate regard for the potential impacts. A framework, developed from some general considerations of using technological change for competitive advantage, is proposed as a way of assessing the risks. Finally, some suggestions are made for management policies and procedures to insure that potentially high-risk projects receive the appropriate degree of attention before they are implemented.

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The use of information systems to gain competitive advantage is surely one of the major business stories of the 1980s. The news broke first in academic journals, then was picked up by the business and trade press. Managers can read about competitive uses of information systems (IS) in a wide variety of publications, hear about such applications in seminars, and hire consultants to search for them in the managers' own companies. A major hardware vendor is even rumored to be working on a videodisk version of the "IS for competitive advantage" story. The word is definitely out, and for the most part the news is good.

The strategically important information systems projects of the future are likely to be large, reflecting the growing complexity of the general business environment. Winning projects will often be the first in an application area, giving developers little previous structure to draw on. Many, perhaps most, of these vital, innovative systems will be based on new technology. These three dimensions — large size, low structure, and new technology — all suggest that high risk will accompany the potentially huge payoffs from information systems. Warren McFarlan writes, "If we proceed, we will sometimes fail." [1, p. 150]. In fact, he may be optimistic.

As important as the risks of project failure are, however, there may be a more insidious danger lurking for would-be developers of strategic information systems; not that a project will fail, but that it will succeed. The unintended and unanticipated organizational and competitive consequences of technical success could be catastrophic.

The Risks of Success
A number of frameworks for finding strategic applications have been proposed. Many of the frameworks rely, in one way or another, on the work of Michael Porter [4]. McFarlan [3], for example, uses Porter's "five forces" model to identify strategic business opportunities for use of competitive information systems:
1. Change the basis of competition
2. Raise entry barriers
3. Increase switching costs
4. Change the balance of power
5. Develop new products

Examining these opportunities is, without doubt, an effective way of stimulating thought about competitive uses of IS. In fact, as managers learn more about competitive uses, they tend to think of potential applications in every area of opportunity. Their focus then shifts to placing priorities on the ideas, often through some sort of cost/benefit analysis. Beyond the important, if difficult, question of cost/benefit, however, is the more troublesome issue of the potential negative strategic impact of "successful" systems.

Examples gathered from field work, the trade and business press, and consulting suggest that the catalogue of information systems victories includes at least the following entries:

Changing the Basis of Competition

Once information systems are used to gain competitive advantage in a given industry, their use may become obligatory for continued competitive viability. An organization that is not prepared to stay the course with continued investments in information systems may be better off not firing the first salvo — "If the other side has bigger guns, don't start a gunfight" is sound advice in locations outside the Old West.

This lesson was learned through experience by an American manufacturer of commercial appliances. Company A's products were typically purchased and installed by building contractors who worked from a set of technical specifications for size, capacity, etc. Historically, the company had offered contractors a mail-in consulting service that could translate specifications into products and instructions for the wiring, plumbing, and other site preparation work required.

In early 1981, company A built this consulting expertise into programs for a mainframe and an early-model microcomputer. Contractors could continue to send specifications by mail and the company would feed the requirements through the mainframe and mail back a neatly printed list of products and instructions. (As would be expected, most of the products were manufactured by the company itself.) The few contractors who owned the appropriate microcomputer could, using company-supplied software, enter their specifications onto a diskette and mail that instead of written data. The micro itself was not powerful enough to analyze the specifications, although it could check them for completeness and consistency.

Over time, the appliance market evolved, as did the microcomputer industry. The company, having achieved success with its initial development, reaped a harvest of increased market share but did no further development. One of its competitors, company B — larger, older, and equipped with a larger and more progressive information systems staff — developed a similar system. This system, however, ran on the more powerful and more readily available IBM Personal Computer. Software was provided to contractors at no charge, as were electronic connections to the company's mainframe. Analysis could be performed immediately, and the required products — made almost exclusively by the new system's owner — could be ordered at the push of a key.

As IBM began to dominate business microcomputer use, company B recaptured its lost market share and more. By introducing customers — and competitors — to the use of information systems, then failing to track or adapt to changes in the technology, company A turned an initial IS success into a competitive failure.

Entry Barriers

It is clear that information systems can be used to maintain and raise barriers to entry in many industries. In some situations extensive hardware and software has become necessary for all participants, increasing the investment required for entry. In other circumstances information systems have been used to capture distribution channels, again increasing the cost and difficulty of entry.

On the other hand, by making information systems the major vehicle for producing, self-
ing, distributing, or servicing its product, a company may, in fact, become vulnerable to established organizations with underutilized IS resources.

A major seller of health and casualty insurance faced this type of decision about the increased use of information systems. The majority of business is done on a payroll deduction basis with very small employers who do not offer insurance as a fringe benefit. These employers often do their payrolls by hand, making bookkeepers a major audience for the insurer's sales pitch. Competition is not so much from other insurers as from the bookkeeper's lack of time and unwillingness to be involved with handling another deduction.

To help overcome this obstacle, the insurer considered offering a computerized payroll preparation package for small companies. The development of such software was considered to be well within the capabilities of the information systems group, and the sales force was already in contact with many potential customers for the new service. Pricing was to be designed to provide some profit, but the main intent was to create tighter links to small insurance customers.

Before much work had been done on the new payroll system, the vice president for IS recognized a danger. Although it might be possible to convince customers to do their payrolls by computer, there was a chance that the payroll business would go, not to the insurer, but to one of the large, experienced firms that dominate the payroll field. Any of these organizations could, if they chose, offer health and casualty insurance as well through a relationship with an Insurer. The link to customers might well be tighter, but it was not clear who would be at the other end! The idea of offering payroll service was postponed until such time as the insurer's small customers began to show some interest in doing their payroll by computer. To continue the project would, in the company's opinion, have risked opening its primary line of business to new competitors.

They achieve their initial objectives and then continue to grow in size and effectiveness, eventually giving rise to claims of unfair competition and cries for government regulation. Forced divestiture of the system or an agreement to share it with competitors are possible outcomes.

The airline reservation systems used by travel agents are a clear example of this danger. Two carriers, United and American, have installed their systems in the offices of nearly 80% of U.S. travel agents. Some of the carriers' competitors have claimed that this level of penetration allows the two big airlines to raise travel agent switching costs to the point that American and United effectively control the industry's channels of distribution. The outcomes of such alleged domination include biased display of data, close monitoring and control of travel agents, inaccurate data on competitors' flights, and so on.

After a lengthy investigation of these claims, the Civil Aeronautics Board (CAB) ordered changes in the operation and pricing of computerized airline reservations systems. Nevertheless, United and American were sued by 11 competitors who demanded that the two carriers spin off their reservations systems into separate subsidiaries. United and American opposed the suit but did agree, along with TWA, to provide unbiased displays.

Although they deny unfair practices, United and American have never denied using their reservation systems to gain competitive advantage. Indeed, the two airlines claim that the systems are not economically viable on the basis of usage fee income alone — they were intended to generate increased sales. United and American may, in fact, already have recovered their investments in the reservation systems. The precedent of government intervention suggests, however, that some future developers of competitively effective systems may find their returns limited by law or regulation.

**Increasing Switching Costs**

These systems are in the category of things that can work too well for their own good.

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**Balance of Power**

Strengthening relationships with customers and suppliers is one of the areas in which in-
formation systems have been used most effectively. IS has improved service, lowered shipping costs, shortened delivery cycles, and made the technologically advanced company an integral part of business for the final consumer.

In some circumstances, however, companies appear to be giving their customers or suppliers the tools and expertise to get along without them. This may be inevitable over the long run, but there is no reason to hasten its onset.

An overnight delivery company, for example, has recently begun offering very fast delivery of messages transmitted electronically between its offices. The original is picked up from the sender and put through a facsimile machine at a nearby office; the transmitted image is received at an office near the recipient and delivered by hand. Although the new service has not yet made money, its usage continues to grow. Recently, the delivery company has announced that it will place facsimile machines on customer premises and act as a switch among the installed machines. Delivery promises to be even quicker, since there will be no need to take the original copy to the sending office or to deliver the received copy. One must question, however, how much value the delivery company can add to off-the-shelf facsimile technology. There would seem to be little to prevent its customers from installing similar equipment directly. Indeed, the manufacturer of the facsimile machines advertises its products prominently as the ones supporting the delivery company's system. The era when customers would view new technology as a black box supported for a fee by an outside supplier appears to be over.

A somewhat similar risk is created by systems that unintentionally lower switching costs in an attempt to make the customer's life easier. American Hospital Supply Corporation provides an interesting example of steps taken to avoid this danger. American's ASAP system, installed in over 3,000 U.S. hospitals, allows online ordering of medical and surgical supplies from American's extensive product line. Substitutes are suggested for out-of-stock items, and the hospital can specify several options for delivery time, depending on how urgently each item is needed. Some of American's competitors have developed similar systems of their own, but have found it difficult to overcome American's lead; hospitals, like travel agents, are generally reluctant to install more than one online system. ASAP has made American the largest company in its field.

The extensive use of computerized order entry systems might, however, offer another sort of competitive opportunity. Why not develop a master system that would take data from hospitals and pass it to suppliers' systems? The hospitals could retain advantages of a single system, and might get lower prices as well since the master system could shop among suppliers for the best price.

If American had not continued to develop and enhance ASAP, this danger might be very real today. In fact, the company has taken the system well beyond the order entry stage. Later versions of ASAP allow the hospital to order based on its own stock numbers, as well as American's; to create and store files of frequently ordered items; and in other ways to personalize ASAP to the hospital's own environment. It would be extremely difficult for any master system to keep up with these ongoing developments. By continually adapting ASAP to its customers' needs, American has preserved the competitive advantages of the system and minimized the risk of being bypassed.

Finally, it is worth noting that by increasing the strategic importance of information systems, companies are increasing the relative strength of some large and already powerful suppliers of hardware, software, and telecommunications. Although the inputs of these suppliers may not show up explicitly in the final product, their pricing, support, and development policies can have a critical effect on the success of companies that are strategically dependent on IS. (The dramatic and continued downward trend in the cost of computer hardware should not obscure the overall increase in information systems expenses at most firms.) The question of adding another important supplier should not be taken lightly; vendor selection and management is a policy issue.
New Product Development

The most obvious danger posed by the development of new IS-based products is the diversion of money and management attention from the company's main line of business. Many organizations have found that documenting, marketing, and supporting an applications software package is far more trouble than the potential revenue is worth. Selling excess processing time or communications bandwidth may be similarly problematic. The popular notion that successful companies "stick to their knitting" is worth considering with respect to new IS-based products.

A more subtle problem may arise from the impact of products that allow customers or suppliers to view their relationship with the company in a different way. The new product itself may sell well precisely because of a cost savings to the customer that reduces the company's revenues! A major New York City bank faced this problem after it released a new "relationship product." Based on many programmer-years of worth, the new product connected the bank's separate files for each type of account in order to allow customers to see all their accounts with the bank on a single report. The account balances could then be combined and considered as a single NOW account. Since other banks of similar size and complexity were not able to produce such a report, the new product was regarded as a competitive advantage. And indeed, soon after it was announced the new type of account received a good deal of customer interest.

When the bank analyzed use of the new product, however, it saw that it had managed to reduce its fee income and increase its interest expense at the same time. Customers who saw that they had, say, a 5 1/2% savings account and a relatively small checking account would combine their accounts into a NOW account. Since other banks of similar size and complexity were not able to produce such a report, the new product was regarded as a competitive advantage. And indeed, soon after it was announced the new type of account received a good deal of customer interest.

Once it realized what was happening, the bank modified its new product so that it no longer automatically produced a list of all a customer's accounts at the bank. Customers who want to combine their accounts now have to specify which accounts should be included. The ability to gather and report the data still set the bank apart from its rivals, and fewer customers switched to higher-interest accounts.

One could always argue that customers will eventually move to other accounts anyway. However, the bank's new product significantly increased the switching rate with no apparent benefit to the bank. The revised product is still attractive to customers in its technologically less advanced form, which is a good deal more attractive to the bank. Some preliminary analysis of how customers were likely to use the new product might have avoided the false steps and lost profits. The issue with this new IS-based product was not technical success, which was clearly achieved, but rather bottom-line impact, which was decidedly negative.

As these examples indicate, the new era of strategically important information systems has brought with it a new type and level of risk. Project development risks still exist, perhaps even in greater measure, as projects become larger, less structured, and more reliant on new hardware and software technology. Beyond these risks lie new and potentially more important dangers arising from the unanticipated competitive consequences of technical success.

Assessing Risk

As in all such situations, understanding risks is the first step to managing them. Understanding is a two-phase process: describing the company- and industry-level changes that may be brought about by the development and implementation of a given information system, and then determining the potential impact of these changes. Although these views of the future are likely to be cloudy, and their probabilities are likely to be rough estimates, they must be considered with estimates or project costs and benefits before a decision is made whether to proceed.
The increasing use of information systems seems often to be viewed as inevitable, a phenomenon with enough momentum of its own to sweep through entire industries. Certainly there are situations in which firms must invest in, and adapt to, the use of IS in order to remain viable. Yet there are some technological advances that have remained in an embryonic stage for years. Home banking and home shopping are but two examples. Sometimes these developments are waiting for improvements in the cost or capability of the technology. Other changes are held back by a lack of support from established industry participants. Rather than uniformly criticizing these firms for technological backwardness, we should consider the possibility that they understand the technology completely, are prepared to utilize it when that becomes necessary, but are unwilling to precipitate an unfavorable change in their competitive environment. As Porter and Millar note [5], "For many firms, the nature and pace of change in their industry structure is partly in their hands."

A simple framework for considering whether to attempt a new and potentially important information system arises from considering both the current use and the future importance of IS. This framework is similar to the strategic grid of McFarlan, McKenney, and Pyburn [2], which considers the strategic importance of IS applications and of the IS development portfolio to a single firm or industry. By mixing present and future, firm and industry, the framework is intended to motivate consideration of the options open to the firm and the potential outcomes of each choice under various scenarios.

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<th>Future Competitive Importance of IS to Industry</th>
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The current impact of information systems considers how essential IS is to the firm as well as the spread and sophistication of use. Future importance should be estimated under several scenarios, in particular one in which the proposed new system is technically successful and one in which it is not attempted. (Obviously, competitors’ behavior must be considered as well.)

The upper left-hand area poses particular dangers for firms of limited technological capacity. Consider such firms currently at the spot marked x. Potential future positions are estimated to be at spots a and b. If the move to a is felt to be inevitable, the firm must either build up their strength or consider disinvestment. Firms unwilling or unable to make sustained investments in information systems should be extremely cautious about projects that may precipitate a change in the importance of IS. Few developments confer enough rewards on the pioneer to make up for an overall increase in the competitive importance of an area in which a firm is relatively weak. If such a firm felt that developing a new system would move it from x to a, while without the system it would drift only from x to b, then not developing might well be the best choice, because it would thereby not increase the importance of IS in its industry.

If there is a choice about the use of information systems, the wise competitor will consider not only its own IS resources but also those of organizations who may wish to enter its market. IS-rich potential competitors may lack the reputation or industry knowledge to sustain an initial entry, but once an established company has shown the way, competitors may follow on the strength of their information systems capability.

Firms on the right side of the grid must also consider their strategic IS moves. A company at position y has generally made IS an important part of its strategy and is investing to keep up with technological change. It must remain alert to possible industry shifts toward position c, at which point the industry is looking outside of IS for sources of competitive advantage. On the other hand, a new system that moves the firm from c to d may subject it to legislative or governmental action if the system is truly proprietary and powerful.

The logical place to start in considering the potential impact of a new strategic use of in-
formation systems is with the motivation for the new system. The outcome, over time, will be a change in the competitive forces affecting the industry. It is tempting but dangerous to consider these forces as impacting only current industry participants — suppliers, buyers, and competitors. Increased use of Information systems can, in fact, open up an industry to new and potentially dominant players.

A firm considering a new investment in strategic Information systems must decide whether it will obtain any sustainable competitive advantage, or whether the more likely outcome is an extension of the current competitive situation at an increased level of cost. IS applications purchased from a nonexclusive source are unlikely to confer lasting advantage. Likewise, skilled IS personnel may take key ideas with them when they leave a leading company for its competitors. In these and other ways, leading-edge developments may soon be diffused to competitors, leaving the pioneering firm no better off than before. In the absence of strong first-mover advantages, investments in information systems may simply not pay off competitively.

Managing Risks

How can the risks of information systems success be managed? A clear view of the company's long-range strategy and an in-depth understanding of its financial and technical resources are obviously important. The long-term commitment of top management must be obtained before firing the first shot on the IS battlefield. The resources and capabilities of competitors, both current and potential, should be considered carefully.

Perhaps the most crucial issue is the ability to recognize the likely long-term consequences of a new system. Initial development cost is not an accurate indicator of the potential effects. One positive control is an "impact statement" that lays out the competitive changes expected to result from a new information system. Substantial benefits accruing from an improved competitive situation should alert the organization to the possibility of considerable risk as well.

A particularly challenging question is how to assess and manage the risks arising from user-generated applications, which are often developed and installed without the knowledge of the central IS group. In the same way that most companies control product announcements, advertising, and other elements of their marketing mix in order to assure conformity with corporate strategy, so too must organizations create and promote policies to align information systems with strategy, whether those systems are developed centrally or by users. Such policies should require approval by upper management before anyone outside the company is given access to software, systems, or data, as well as before any customer-visible activities are replaced or augmented with information technology. It should be the responsibility of the central IS staff to spread awareness of such policies, along with awareness of end-user systems and tools.

The key to managing risk is the organization's ability to learn from its experience in controlling the development process so that it can continue to roll out strategic IS applications as they become appropriate and necessary. There must be a common understanding among general managers and senior information systems executives about which pieces of software should be considered "directional," that is, likely to have a major effect on the organization's future competitive position. A thorough review of the potential impacts should be carried out before such systems are developed, and again before they are installed.

Summary

The first half of this decade has seen an enormous expansion in the contribution of information systems to the success, and indeed the survival, of major organizations. The remainder of the century offers even greater possibilities for success. There is no question that all firms must consider these new opportunities for enhanced products, expanded markets, and improved competitive position. No organization can afford to be caught napping or to become a technological laggard.
without considering the consequences. In many industries the successful firms will be those that learn best how to recognize and exploit good ideas for the increased competitive use of information systems.

Along with these rewards, however, come risks — the risks of project failure, amplified by the large size, low structure, and new technology that characterize many high-yield systems, and the potential risks of strategic disadvantage arising from unanticipated effects on industry structure and competitive positioning. To be truly successful, developers of strategic information systems have to look beyond technical issues to arrive at a deeper understanding of both risks and rewards before proceeding.

References


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Michael R. Vitale, Assistant Professor of Business Administration at the Harvard Business School, teaches in the school’s M.B.A. program as well as in executive seminars and company-sponsored programs. As a member of Harvard’s computer-based systems group, he is actively engaged in research on the strategic use of information systems. Together with a colleague, he designed the microcomputer software used as part of the first year accounting course required of all M.B.A. students. Prior to joining the Harvard faculty, Vitale worked for Skidmore College, Dartmouth College, and the computer software and services subsidiary of Metropolitan Life Insurance Company. He is a graduate of Oakland University (B.A.), Dartmouth College (Ph.D.), and Harvard University (M.B.A.).