IMPLEMENTING STRATEGIC INFORMATION SYSTEMS

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ABSTRACT

This paper presents a framework for the implementation of strategic information systems. The framework draws on past research on implementation and takes into account the unique circumstances of strategic applications. The framework is illustrated with a case study of a money-center bank's cash management system based on a microcomputer. The microcomputer provides a powerful front end to the bank's traditional transactions processing system for a corporate treasurer who is a client of the bank. The impact of the system appears to be positive and the framework offers one model for viewing the implementation of strategic systems.

INTRODUCTION

A 1982 paper proposed a classification of information systems into three different categories: those which support the business, applications which support strategic planning and *systems which are a part of a firm's strategy* (Lucas and Turner, 1982). This third type of system has received a great deal of attention in the past five years. Books and papers by Wiseman (1985), Parsons (1983), Ives and Learmonth (1984), McFarlan (1984) and Krcmar (1986) have all discussed

various aspects of the strategic use of information technology. The purpose of this paper is to present a framework for the implementation of strategic applications and to discuss a case study of a competitive system.

The design and implementation of strategic systems presents a significant challenge for a number of reasons:

1. The organization first must determine its strategy and decide how technology contributes to strategy.
2. The firm must successfully develop and manage the application which may involve innovative uses of technology.
3. The strategic system is likely to involve use by individuals outside of the organization (e.g. customers or suppliers).
4. The system may have to be marketed to external organizations.

A large number of strategic applications have been cited in the literature (See Wiseman 1985); these systems appear to fall into two broad categories (Krcmar, 1986). The first is evolutionary in which modifications to an existing application enable it to be used strategically. Examples of evolutionary implementation include American Hospital Supply's order entry system and various airline reservations systems. A different type of implementation problem exists when a strategic application is totally new and innovative. Merrill Lynch's Cash Management Account is

frequently cited as an example of the use of technology to create a new product or service.

Based on the examples cited earlier and the case presented below, it appears that there are two paths to the discovery of a strategic system. First top management engages in top-down scanning. Managers scan the environment looking for competitive threats and opportunities; such a scan may suggest a new strategy for the firm, a strategy which relies on information technology and its use.

Another route to the strategic use of the technology is bottom-up inventing. An individual who is not part of senior management develops a system to meet a perceived need. The focus here may not be strategic or competitive until someone else points out the potential of the invention. Many firms have found strategic products through a senior manager searching the organization to find a bottom-up invention.

AN IMPLEMENTATION FRAMEWORK

One purpose opf this paper is to present a framework for the implementation of strategic applications. The implementation framework presented in this section is suitable for both evolutionary and totally new applications. The variables in the framework, however, will take on different values for these two different design approaches.

Past Research

There is a significant body of implementation research to guide the development of a model for implementing strategic systems. This research is characterized by two streams: factor studies and process models (Lucas, 1981). Factor models describe variables which are hypothesized to be associated with some measure of implementation success. Process research tends to be more case-oriented and focuses on the relationship between the implementer and users during the process of developing a system.

Strategic Systems

Figure 1 shows the factors hypothesized to be associated with the implementation of strategic applications. The figure presents four major variables: the organization in question, its competitors, its customers or suppliers and information technology.

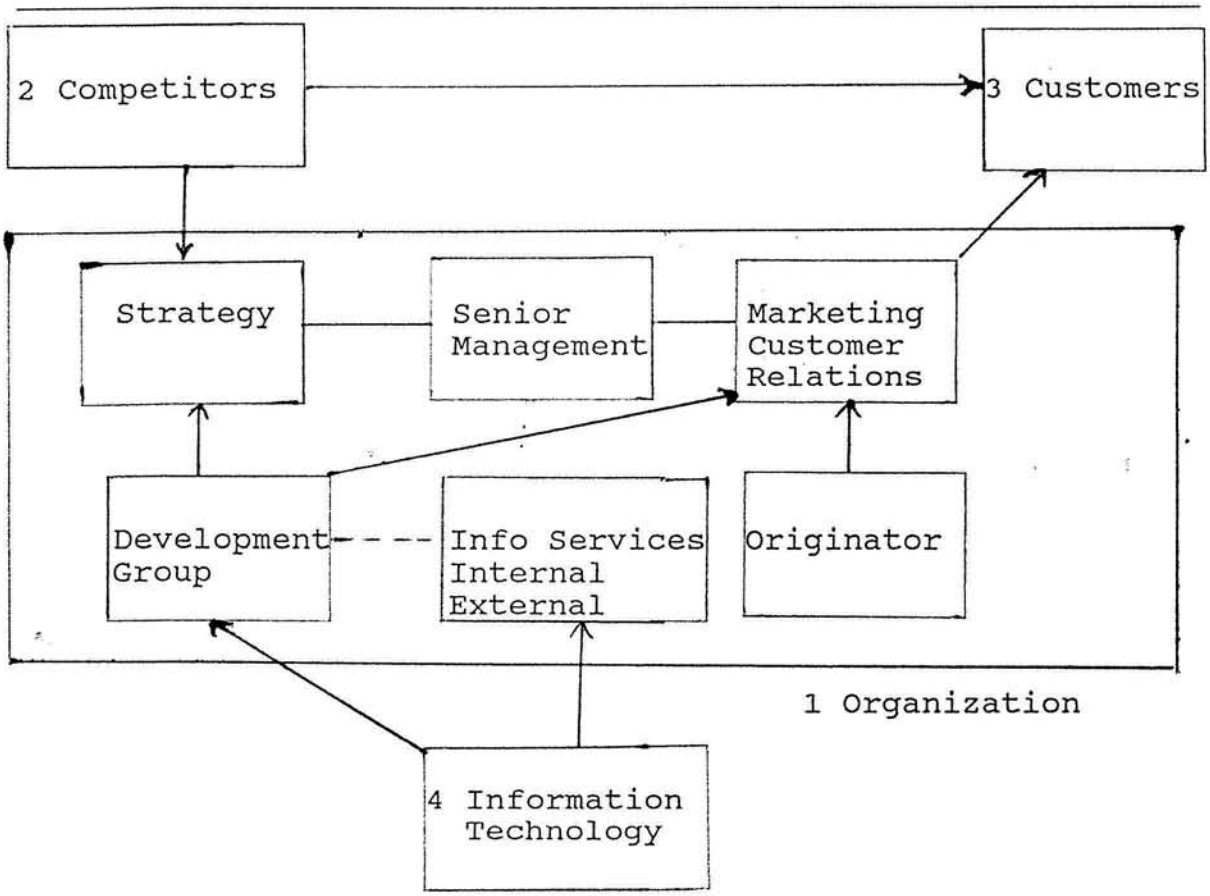

Figure 1
A Factor Model of Implementation
For Strategic Applications

Within the box organization, there are a number of variables, which are interdependent. Through some mechanism, the firm determines its strategy, possibly including the implementation of a strategic application. The strategy may originate through top-down scanning or bottom-up invention. In the former case, it is senior management who develops strategy; bottom-up invention comes from an originator of an application in the organization.

Competition (2) may be the stimulus for the strategic use of the technology; it will certainly influence the development of strategy. For example, competition can force the firm into a defensive strategy; several brokerage firms have developed the equivalent of Merrill's Cash Management Account. Because external actors are involved, a marketing or customer relations group in the firm is included in the model. Its task is to provide market data as a point of reference for bottom up inventing.

The originator of the strategic application will usually have access to some type of development group. The development group will make use of available or envisioned information processing technology. The system may involve considerable innovation, a straightforward extension to an existing system, or both. Particularly when the system is innovative, a development group is likely to be formed outside of the traditional information services department. The technology (4) may push the developer in a particular direction or it may limit the options available. The group draws on an internal information services department or on external consultants or services.

In contrast to traditional, operational systems, a strategic application needs to be part of corporate strategy and it will be either offensive or defensive in nature. Many strategic systems involve customers or suppliers; all require strong support from senior management.

The model in Figure 1 attempts to identify the key variables and actors in the implementation of a strategic system. It needs to be extended to capture the process of design, the steps of the design process and the relationship among individuals involved in design.

A Process Model

Figure 2 presents a process model for the implementation of strategic information systems; the model is an adaptation of the Kolb-Frohman model of information systems implementation (Lucas, 1981).

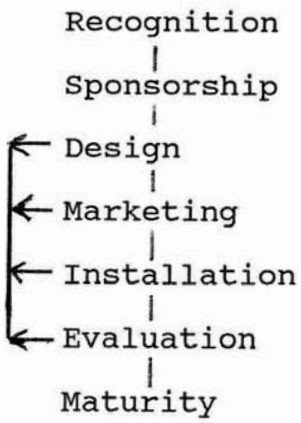

Figure 2
A Process Model of Implementation
For Strategic Applications

During the recognition stage, someone in the organization determines that a strategic system is needed or that an opportunity exists for such a system. This individual is at a high enough level in the firm in the case

of top-down scanning to become the sponsor. In the case of bottom-up invention, the originator must find a sponsor to fund and protect the project.

During the design stage a development group builds the application. Because the strategic system is very important and since it is likely to involve external actors, traditional design techniques are not recommended. Instead, one would expect to find an extremely user-oriented design process. A firm can force employees to use a poorly designed internal system; it is much more difficult to force a poorly designed system on customers.

For these reasons, design should be characterized by an attitude of extreme responsiveness to users. For example, using a prototyping approach, the design group can respond quickly to the user and can make modifications until the user is satisfied with the system. The prototype may become the finished system, or it may become a very clear set of specifications for final programming of the application. The prototype can even become the "front end" for some other, large transactions processing system.

Since the system is likely to involve external actors, a group in the developing firm must consider how to market the application. Marketing includes convincing others to adopt the system as well as training and supporting users. This marketing of information systems is new for most organizations which do not already sell software as a part

of their business. The system must be installed, debugged and usually serviced in the locations where it will be used.

Since the application has been designed with some strategic purpose in mind, it is important to evaluate its contribution to the firm's strategy. In the final stage, maturity, the system expands and is modified to fit changing business requirements.

As the arrows indicate, there are many possible feedback paths in the model. It is quite likely that even in maturity, a system will cycle back through design, marketing, installation and evaluation once again. Airlines have gained a tremendous competitive advantage with their computerized reservations systems, particularly those which are connected with travel agents' offices. United Airlines has announced plans to invest one billion dollars in extending its Apollo system by placing microcomputers with travel agents. Such a massive undertaking dwarfs the original $250 million investment in the Apollo system and requires extensive new design activity.

A Framework

The models in Figures 1 and 2 present different views of the implementation of strategic systems. Figure 1 describes important factors while Figure 2 depicts the stages in the implementation process. Table 1 is a framework for the implementation of strategic applications which combines the two models described above. The

framework shows that in each stage, the various factors have different impacts on the implementation process. All of the factors play a part, except for the available technology. During the development of a system, it is assumed that the technology is the same at each stage and that it is not a variable during the design process.

During the recognition stage, the originator of the system makes senior management aware of the opportunities for an information system to enhance strategy. He or she must show how the system can provide an advantage and contribute to the firm's strategy. Competitors may have a response which will need to be considered. The customer may actually suggest the system (as in the case which follows). The organization decides how to develop the strategic system, through the information services department or a separate development group.

	Factor			
Stage	Originator	Strategy	Competition	Sr. Mgt
Recognition	Inspired Observer	Define advantage	Response	Become aware
Sponsorship	Enlist sponsor	Convince sponsor	Motivation	Become sponsor
Design	Develop specifi-cations	Compare	Monitor	Review Provide re-sources
Marketing	Participate	Plan	Observe	Review Approve
Installation	Plan & Direct	Guide	Observe	Review Manage
Evaluation	Manage	Compare Extend	Examine position	Partic-ipate
Maturity	Manage or delegate	Reexamine	Monitor	Review strat-egy

Table 1
A Framework for Implementing
Strategic Systems

	Customer	Marketing group	Develop group	Info Service
Recognition	May suggest	May suggest	ISD? or other?	Facilitator / Inhibitor
Sponsorship	May suggest	May suggest or sponsor	"	"
Design	Requirements definition	Review	"	"
Marketing	Test	Review	"	"
Installation	Adopt	Assume responsibility	"	"
Evaluation	Provide input	Manage	"	"
Maturity	Provide ideas	Manage	Maintain Enhance	May assume responsibility for system

Table 1 (Continued)
A Framework for Implementing
Strategic Systems

The framework suggests a shift in originating ideas for SIS form the information services department to users, the competition, or models from other organizations. For the Information Services Department (ISD) to participate in the ongoing search process for strategic applications, it will need a thorough understanding of the business and its

strategy. ISD will also have to reach out to customers and suppliers while remaining aware of what the competition is doing with information technology.

Using the framework, one can sketch a scenario for developing strategic applications. In top-down scanning, an originator who is a part of senior management recognizes the opportunity for a strategic application, often due to a shift in corporate strategy. This individual is likely to be the sponsor for the system. The originator, as a senior manager, may turn to the information services department for development. The originator is likely to be involved in design and marketing and there may be limited evaluation since senior management "owns" the system.

In bottom-up invention, the originator is at a lower level in the organization and typically suggests a system to support existing strategy. He or she must find a sponsor; competitive pressures may be one motivation for the sponsor. The originator is likely to be heavily involved in the design of the system and will probably need help in marketing it. The sponsor and senior management are likely to request an evaluation of the application to determine if it should be continued.

AN EXAMPLE

The Application

The Framework in Table 1 can be applied to the development of a strategic system by a major, money-center

bank. The system is designed for the treasury function in a large corporation. Typically the treasurer is responsible for cash management in the firm; he or she may control multiple accounts in five to fifteen or more different banks. In the morning the treasury staff must determine the firm's cash position with all of its banks and accounts. By 1 PM the treasurer should make and execute today's decisions about whether to transfer funds among accounts, invest excess funds and/or borrow cash.

Before computers, personnel in the cash management area had to contact banks by phone and collect information on balances. In the 1970s a number of banks developed on-line or time-sharing applications; the bank computer posted a customer's balances in each account to the files of the on-line system. A customer using a terminal could access these files without having to phone an individual at the bank. The customer could obtain information more quickly and reliably and the bank earned a fee from the use of its computer systems.

With either a phone call or computer access, the cash manager had to work with a series of hand-written numbers on various forms representing balances in different accounts. There tended to be errors and mistakes which were aggravated by the time pressures involved.

The Cash Microstation

A major, money-center bank has developed a microcomputer system to assist the treasurer in making cash

management decisions. The microcomputer contains the login requirements and reporting formats for 80 to 100 different banks. Early in the morning, it automatically dials banks with whom a company does business and retrieves the firm's balances, placing them in a spreadsheet for analysis. The treasurer can then use the investment/debt module to decide on investments or borrowings. He or she can also connect to the money-center bank and make various wire transfers among accounts.

Table 2 describes the major modules of the system

In an industry survey, twelve customers of the bank in question had an average of 35 banks with whom they had accounts; the average number of total accounts was 354. Of these accounts typically only five to six at three different banks are actively managed on a daily basis. However, at times, the customer needs to be able to obtain information about all accounts. The system has a tremendous potential for improving cash management; the treasurer now has an electronic spreadsheet and timely, accurate data.

The Microstation encourages the customer to conduct all of its business the bank through wire transfers and the investment/debt manager, an important result since banks are increasingly relying on fees from services like transactions processing for clients to generate revenue. A recent study indicates that banks have dramatically increased their fee-based business in the last five years. Using a 1980 price level of 130 index points, revenues from fees rose to 200 in

1984 and 225 in 1986 (Poje, 1986). Fees, themselves, rose 98% during the same period. This increase coincides with the 1980 Monitary Control Act requiring Federal Reserve Banks to charge for their services.

Balance and Transaction Reporting: Retrieval of previous day's balances and transaction information from all of a customer's banks.

Daily Cash Worksheet: An electronic spreadsheet with opening balances, money transfers, expected receipts and disbursements, investments maturities, debt payments and target balances.

Money Transfer: Execution of domestic or international money transfers over the bank's international network.

Accounting: Assign General Ledger accounts to cash transactions and a general ledger interface.

Cash Forecasting: System to project cash requirements on a daily, weekly and/or monthly basis.

Reconciliation: Offers proof and control for cash transactions.

Debt Portfolio Management: Monitoring and reporting of liabilities.

Investment Portfolio Management: Monitoring of an investment portfolio for tracking money market instruments; shows accruals and maturities.

Bank and Account Relationships: A database of information on banks and accounts for the customer.

Signatory Maintenance: Administration of records for signatories on accounts.

Letter of Credit: Module to generate forms required for letters of credit while maintaining administrative control over outstanding letters.

Table 3
The Microstation Modules

Implementation

The framework of Table 1 is applied to the implementation of the microstation in Table 3. Prior to the development of the micro system, the bank's time-sharing system offered cash balance information and wire transfers for customers. The service tended to be expensive, and of course, did not have information on the customer's relationship with other banks.

	Factor			
Stage	Originator	Strategy	Competitor	Exec. VP
Recognition	Cash mgt. product manager	Protect existing customers	Fears of plans	Unaware
Sponsorship	Cash mgt. product manager	Protect, extend base	Defense	Becoming aware
Design	In charge of development	Work closely with customers	Observe	Modest support
Marketing	Provide technical, managerial support	Keep & expand customers	Offering similar products	Aware & supportive
Installation	Training & support	Expand business defend position	Some active some failed	Becoming more visible
Evaluation	Expand & evaluate other prod. Shift to software house	Defense to offense	System well received by clients	Major commitment of funds
Maturation	Continue to expand	Offensive	Monitor	Senior management committed

	Customer	Marketing	Development	ISD
Recognition	Suggested by customer	Within cash management	Within time-sharing group	Bank ISD uninvolved
Sponsorship	Eager for a system	Cash mgt. in bank supports	Special group in time-sharing	Time-sharing computer staff helps
Design	Participation in requirements definition	Support	"	Micro to interface to time-sharing services
Marketing	Beta tests at customer	Account rep from cash mgt	"	Quality of transactions processing services
Installation	Acceptance, enthusiasm	Account rep	"	"
Evaluation	Remove from time-sharing	Become major tool for account reps & Cash Mgt.	Strategic alliance with software house	Phasing out except for transfers
Maturity	High satisfaction	Part of bank's services, strategy	Continued as group within Cash Mgt.	Phasing out

Table 3
Implementing the Cash Microstation

Several clients suggested to cash management personnel that a microcomputer might be able to help them in cash management; they encouraged the bank to look into the

development of such a system. A task force from cash management and the time-sharing group began to investigate the prospects for a microcomputer system .

The task force quickly became concerned over the possibility of other banks developing a similar system which could have an adverse impact on their own competitive position. At first, then, the bank's strategy can be characterized as defensive, to prevent the loss of customers to someone else's system.

A development group began to work with the time-sharing group and the Cash Management department of the bank to develop the microstation. The programming and detailed design were the responsibility of the time-sharing group. The design team included the originator and several customers who were cooperating with the specification of requirements. It should be noted that the bank had a successful set of applications for processing transactions on which to build a new interface.

The original plan was for the microcomputer to interface with existing time-sharing services and products. The first application was to connect to other banks and retrieve daily balance information for an electronic spreadsheet. One of the design team firms served as a pilot test site. Soon, the system was installed and made available as a product.

The major problem with this first system was the high fees to customers due to the connection with the time-

sharing operation. The time-sharing developers began to exhibit different priorities than the development group; they wanted to continue the interface through their time-sharing computers.

About two years after development work began, the originator was seeking an investment/debt package to round out the system. He located a suitable package and was impressed with the software house that had developed it. The software house was also offering a microstation for cash management, primarily to be adopted by banks and sold to their customers.

Given the frustration with the design goals of the time-sharing group, the originator and bank management made a critical decision to adopt and modify the software house's systems and to gradually drop the time-sharing connection. In Wiseman's terms, the cash management development group formed a strategic alliance with the software house.

In this process, the Executive Vice President in charge of Cash Management (and other functions) agreed to a major commitment of funding and staff positions to market the microstation. At this point, the microstation completed the transition from a defensive system to an offensive one.

Analysis

The microstation is well received by customers and appears to be equal or better than competitors' systems. It is a significant, new interface to the bank's existing, high quality transactions processing systems. A cash management

marketing representative described the system as "a window on the client, a chance to see what the client is doing and to try and provide additional bank services.." The system ties the customer more closely to the bank since it is easiest to use the bank for making money transfers and to handle debts and investments. A bank account representative said, "competition in the financial industry is not just based on cost, but also on service." The microstation is a major advantage for the bank in providing a service.

It is very difficult to cost justify strategic applications in advance; sometimes one can evaluate them after implementation. For the bank's Fortune 100 customers, the following is an estimate of business increase during 1985:

Overall increase	11.0%
Firms with no cash micros	9.8%
Firms with bank's micro	13.6%
With other vendor's micro	19.9%
With other bank's micro	3.9%

It appears that the use of any microstation except one offered by another bank is associated with an increase in business with the bank in this study. The bank has little control over other vendors' systems (other vendors are non-bank firms offering neutral workstations). The major competitive problem, then, comes from microstations offered by and tied to other banks.

These numbers support the investment in the microstation, but one cannot conclude from them that the system is necessarily justified on a cost basis. (The microstation group more than breaks even without overhead allocations.) Instead, one must turn to the reactions of bank relationship officers who feel that the microstation helps them provide services that will keep clients more closely tied to the bank.

It is interesting to observe that the microstation began as a bottom-up invention. As it became successful, it obtained support and funding from senior management of the bank. The developers saw the system as strategic, but it was not until the microstation had proven itself and competitors were offering similar products that senior management began to appreciate its potential.

Fortunately the development of the microstation coincided with a strategic change for the bank as a whole, a consistent shift toward becoming an electronic bank as evidenced by a series of advertisements in the financial press. To some extent the shift is characteristic of the entire banking industry. The microstation was available and visible to senior management when they realized that the bank should become more electronic. This shift in bank strategy also helped the microstation development to change from bottom-up inventing to top-down development.

DISCUSSION

What are the keys to success in the implementation of a strategic system? The first key is to recognize an opportunity or a threat. The suggestion for the microstation came from a customer; further study of the potential for the system revealed a threat to the bank from its competition.

Many strategic applications will involve customers and other actors external to the organization. Taking the customers' view is another key to success. A beta test site manager stated that "other workstation vendors wanted to look at cash management from the bank's point of view; the microstation is built around our view, the view of the customer."

Strategic information systems pose more risk factors than traditional systems. Several competitors made poor business and/or technical decisions that seriously hampered their workstation efforts. For example, one vendor chose an "off-brand" micro; the product did not achieve customer acceptance. Another major bank bought an outside system, but did not invest heavily in modifications or making the system a strategic product of the bank. A third bank bought a system from an outside vendor who went bankrupt; the bank had not developed the ability to maintain and modify the source code for the application while the vendor was still in business.

It also appears that all banks underestimated the ongoing service component of cash workstations. The banks tended to look at these systems as a manufactured product which could be sold to the customer. This kind of thinking led to a profit center approach to the cash workstation units in the banks. Extensive requirements for consulting, training and service caused a profit center approach to workstations to fail, and the banks had to find other ways to justify their investments in this technology.

During the implementation process, the banks' perceptions of competition has changed. At first, banks were competing with workstations. However, they began to recognize that the workstation was a part of a much larger application, the banks' traditional transactions processing systems running on large mainframe computers. A bank without good transactions processing systems was at a tremendous disadvantage in trying to offer a cash management workstation. The microstation is a vital part of the bank's total offering of services encompassing existing transactions systems and the microcomputer's "front end."

It is also clear that the development of strategic systems will have to be well managed; broad technical and managerial competence is a prerequisite for success. During the development of the microstation, bank management made a number of key decisions which have helped the system succeed.

Traditional information systems are not usually marketed in any way nor do they face competition during installation. For strategic systems involving customers, one must market to the customer and hope that the system brings customers closer to the firm. The same approach applies to suppliers and other external actors affected by a strategic system.

Sponsorship and support are also very important. Strategic systems are likely to remain ideas if they have to be cost justified. The microstation cost "several" million dollars to develop; the bank will not see a direct return. The system is sold at a nominal price; the returns come from the additional business that the microstation is believed to generate. The system should draw customers closer to the bank and should increase fee-generating transactions from users of the microstation.

Another way to look at justification is that the system was probably necessary to avoid losing customers to other banks offering similar products. Even now it is difficult to attribute a specific amount of revenue to the microstation; it would have been virtually impossible to do so when the system was being planned.

It may be that SIS are justifiable to the extent that strategy itself is justified. It will be difficult to show a direct monetary link from strategic technology to profitability in most cases. The microstation is a long-term, relationship building complement to other new

financial products. The microstation becomes embedded in the customer's operational procedures and encourages frequent contact between the bank and the client.

Since the competition moves quickly and the development of a system like the cash microstation has to meet a schedule imposed by competitors, the feasibility and justification stages associated with traditional systems development may be replaced by a quick analysis and intuitive decision to proceed.

Conventional information services departments risk becoming isolated from strategic applications, at least those that are not innovative. Information services is held in low esteem in many organizations; the department has a reputation for being unwilling or unable to innovate. Information services departments are too focused on traditional, cost-justified systems. If information services wants to develop strategic systems, it usually has no slack resources and little information on the strategic plans of the firm. To participate in the development of SIS, information services management will have to demonstrate the ability to understand and support strategy.

SUMMARY

Implementation is an important issue with strategic systems just as it is with traditional applications. Strategic systems present more challenges than conventional applications because they require that the firm to develop

the right strategy and they often involve external actors who are not a part of the organization. One is also faced with competition and with difficulty in justifying a strategic system.

The stages of development for these highly visible strategic applications also differ from the traditional development process. The framework in this paper combines the key factors in the development of strategic systems and the stages of development; it is intended to help guide the implementation of these applications. At each stage in development, the relevant factors need to be considered by designers and senior management.

Successful strategic systems are not accidents or a matter of luck. Even an evolutionary system that seems to be a minor, incremental change in an existing computer application requires attention to the process of design and factors like the needs of the customer, marketing, and the competition.

Firms that succeed in the future will systematically incorporate technology as a part of their strategy. Managers need to engage in top-down scanning and encourage bottom-up invention to create an atmosphere where strategic uses of technology will emerge. To succeed in the future will require learning how to implement strategic applications to obtain the advantages that modern technology has to offer.

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