

A CORPORATE STRATEGY FOR THE CONTROL
OF INFORMATION PROCESSING

Henry C. Lucas, Jr.

and

Jon A. Turner

Center for Research on Information Systems
Computer Applications and Information Systems Area
Graduate School of Business Administration
New York University

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Henry C. Lucas Jr. and Jon A. Turner
New York University

How can information technology contribute to the development of corporate strategy? How should top management control information processing in their organizations?

It seems that many managers have difficulty answering these questions. The President of a medium sized manufacturing company remarked that, "I receive about the same information today as was provided thirty years ago before our computers. Only now I spend millions to get it." The Chairman of a three billion dollar conglomerate has commented repeatedly, "I get nothing from our computers."

The focus of many top managers is on the problems created by computers and growing budget requests rather than on ways in which the firm's strategic objectives can make use of this technology. We have also observed a general feeling by many top executives that existing information processing activities are not well managed. If managers believe that they are unable to control the quality of information services provided within the firm, they are unlikely to rely on these services in meeting critical corporate goals.

INFORMATION PROCESSING TECHNOLOGY AND CORPORATE STRATEGY

It is probably safe to say that the average general manager knows more about all the other functional areas of his company than he does about information processing. The CEO who came up through the sales organization is also likely to understand accounting, finance, and production because all of these specialties are involved in bringing a product to the market place. Does the CEO have an equivalent knowledge of information processing? The answer in most cases is "no." To be successful in the next decade, executives must learn to deal equally well with information processing technology. The executive does not have to become a computer expert, but he or she does have to apply accepted managerial techniques to information processing. In addition, top management must devote time to information processing activities if they are to be successful.

The purpose of this paper is to 1) demonstrate how some firms have incorporated information processing technology with corporate strategy and 2) to present a framework for top management direction and control of information processing.

A key task of top management is formulating corporate strategy. What does the corporation do well? How do we apply our resources to achieve corporate goals? What opportunities for new directions are available? What are competitors doing? A firm can continue its present course, maintaining momentum where it is doing well. Alternatively, the corporation can change its strategy dramatically by choosing a new direction for development.

As an example, a single product, single market firm might try a diversification strategy to reduce both cyclical fluctuations in product demand and the impact of major change in consumer buying patterns. A large energy company decides to enter a new market by purchasing a number of high-technology firms and integrating them into a new subsidiary in order to cope with the uncertainties in its primary petroleum market.

How does information processing technology impact corporate strategy? We have observed three types of relationships between information processing technology and corporate strategy as shown in Table 1. In the first case, we find independent information systems which help the firm implement strategy by creating greater operational efficiencies. These systems are not directly linked to the strategy formulation process or integrated with a strategic plan. The need for such a system is usually perceived by an operational unit and its primary objective is to improve efficiency. Most existing information systems fall into this category; they process routine transactions, produce output that goes to customers, and provide exception reports.

A more direct contribution to strategy comes from policy support systems designed to aid the planning process. In this second case the system helps in formulating the plan, but is not a part of it. That is, the system is not part of an end product or service produced by the firm. A good example of one of these policy support systems can be found in Hamilton and Moses (1974). The forecasting data needed by a large conglomerate are contained in a common data base accessible through a computer. A set of analytic tools including a large mathematical programming routine, econometric and risk analysis models

are used iteratively to generate different courses of action over a multiyear planning horizon and to test assumptions during the planning process. In this case the computer is used as an administrative device to interface the various components of the planning system and to actually execute the models.

The most exciting possibilities exist when the technology itself becomes a part of strategy; it expands the range of strategic alternatives considered by the firm. As Kantrow (1980) notes "technology should be viewed as a central part of business thinking at all levels and not as a kind of a line phenomenon to be held at arm's length by all but R and D engineers." At this third level, technology bears an integral relation to a company's strategic thinking by helping to define the range of possibilities. At the same time, it provides a good portion of the means by which the strategy, once chosen, is to be implemented. Several examples may help to illustrate this type of integration between technology and strategy.

Data Resources, Incorporated, now a subsidiary of McGraw-Hill, was founded by Professor Otto Eckstein of Harvard. The firm began by offering forecasts developed from Eckstein's econometric model of the U.S. economy. While such models were theoretically possible before the advent of electronic computers, computational requirements made them infeasible to solve. The development of information technology made it possible to create the kind of model which forms the nucleus of DRI's business. Furthermore, DRI offers a variety of services in which the customer accesses a DRI computer, services made possible only because of the options provided by new technology.

In another example, a major brokerage firm with a goal of becoming one of the leading financial institutions in the U.S. is offering a service in which a customer's cash in a brokerage account is automatically invested in the brokerage firm's liquid assets fund when the cash is not invested in securities. Thus as positions are liquidated or dividends paid, the cash immediately begins earning the highest interest available to the customer. Through an arrangement with a commercial bank the customer can write checks of any amount against the balance. The firm has expanded its brokerage market share and increased revenues to the extent that new business offsets the lost interest to the brokerage firm from no longer being able to invest customers' idle cash for its own benefit.

On a smaller scale, information processing technology made it possible for a new market research firm to offer a service that could not be obtained from its competitors (Business Week, 1980). Information Resources, Inc., developed a corporate strategy which is intertwined with information technology. The firm has purchased grocery store point of sale scanning equipment and given it free to 15 supermarkets in two towns selected on the basis of their demographic makeup. There are 2000 households in each of the two test markets using the scanning equipment; their purchases are recorded on an Information Resources computer in Chicago. Since each product is marked by the universal product code, researchers can pinpoint a family's purchases by price, brand, and size and then correlate the purchase information with any promotions such as coupons, free samples, price adjustments, advertising and store displays.

This technology means that the company can conduct economical scientific tests of marketing strategies to determine what is the most effective approach for its customers. For example, through cooperation with a cable TV network, the firm can target different TV spots to selected households and analyze the resulting purchases. The imaginative use of the technology has allowed the firm to gain a competitive lead over much larger, better established market research firms.

These examples illustrate how the integration of information processing technology with strategy formulation expanded the opportunities for each firm. At DRI the technology allowed the firm first to create an econometric model and then to use time-sharing services to market its product directly to the customer. Technology created the opportunity for a new form of business and later helped to increase revenues through new services. In the brokerage firm, the technology made it possible to offer a new service which probably expanded the market share of the firm and increased the size of its liquid assets fund. Technology helped the market research firm gain a competitive edge and set a new standard for service in the industry.

Capitalizing on Information Technology

How does the firm take advantage of information technology and achieve a high level of integration between technology and strategy? There are three steps to be followed by top management:

1. Look for ways to incorporate technology in a product or service. Does information processing provide an opportunity for a new approach to business? Does the technology make it possible to differentiate your product and services from the competition? Technology can help open new markets or increase existing market share. Note this suggestion means that information processing expenditures will have to be viewed as an investment as well as an expense!

2. To integrate technology with planning, the firm needs information about likely future technological developments. To conduct a technology assessment, the organization must invest resources in R and D. The company can collect information from a number of sources to estimate technological trends. The firm can invest selectively in university programs to keep up on research and can sponsor or subscribe to studies conducted by consulting firms.

3. Exert control over information processing in the firm. As we have mentioned one of the greatest impediments to using information technology for strategic purposes has been an inability on the part of top management to successfully control the information systems function. In the next section of the paper, we present a framework to help manage information processing in the organization.

Accomplishing the first two tasks set out above is difficult, particularly for someone who is currently an employee of the organization. We recommend the creation of a new position, the technological strategist, reporting to a high enough level in the firm to have real influence. The technological strategist needs to have as

a primary talent an understanding of information processing technology and its likely development during the next two decades.

This individual also must become knowledgeable about the mission of the organization and its products and services. The technological strategist must be given resources and the freedom to make unusual and possibly outrageous suggestions. Management then evaluates the ideas and chooses suggestions that make a contribution to overall corporate strategy.

The technological strategist can be evaluated on the quality of ideas generated and on whether the suggestions are implemented. The final evaluation, however, will be whether technology makes a contribution to achieving the overall strategy of the corporation.

MANAGING INFORMATION PROCESSING

When we began work on this article, we thought that senior managers would not be interested in the framework which follows. Generally, the management of information processing is relegated to an immediate subordinate or even to middle level managers. However, our experience has convinced us that senior managers are, or at least should be, interested in guidelines for obtaining control over information processing. The delegation of responsibility for this activity has not been successful in many firms. The framework that follows, then, is intended to help the senior manager understand the key considerations in the management of information processing so that he or she can guide other managers and the information services staff.

If your organization suffers from one or more of the following problems, it is an indication that information processing is not under control.

1. Managers and other users are uncomfortable with the method by which new applications are chosen.
2. There appear to be no priorities for selecting new computer applications.
3. One or more new computer applications are experiencing significant cost and/or schedule overruns.
4. There are many complaints about the quality of information processing service.
5. There are escalating requests for computer staff and equipment.
6. There is no formal top management policy for information systems.

If an organization has a number of these symptoms, it may be depriving itself of the opportunity to gain a major competitive advantage through the creative use of technology.

Information processing technology differs from other types of technology partially because it is less visible. Certainly one can see terminals and computer equipment, but the process of systems analysis and design, and the nature of computer programs remain obscure to most individuals outside of the profession. One can

observe a numerically controlled machine tool at work; there is much less to see when a computer is functioning at high speeds.

As well as being more abstract, computing technology has a different impact from many other types of technology; the secondary effects of computing are often more important than its primary ones. As an example, consider a transaction processing system that is designed to automate an accounts receivable function. The primary objective of such a system might be to reduce errors in posting receivables and to maintain correct account balances. The secondary effect of this system, combined with a payments system, is that the firm now knows its exact cash position at the end of each day. By reducing uncertainty in the firm's cash position, the treasurer may have a significant new source of funds for short term investment. As a result of the abstraction problem above and its multiple impacts, the management of information processing is a difficult task.

Figure 1 presents a framework for viewing management decision areas involved in controlling information processing. Many of the points in this framework have been discussed in the literature in isolation, but Figure 1 links these management activities together and shows the interrelationships among them. It is our contention that positive management action is needed in all areas in the figure. If not, decisions will occur by default; management can and should control information processing.

Table 2 summarizes the actions for management in each of the areas discussed below. Where possible we offer recommendations for management policy. Where the recommendations depend on circumstances

unique to the firm, Table 2 lists some of the factors that should be taken into account in the development of a policy.

A Corporate Plan

- * See that 3 - 5 year MIS plan is developed.
- * Participate in the planning process.

A plan for information processing should be coordinated with corporate strategy. The plan will serve as a road map to show the direction of the systems development effort. It also furnishes the basis for later evaluation of the performance of the information processing function.

A corporate information systems plan should show how information systems technology will be used to meet corporate goals. The plan contains a statement of corporate goals and the specific information systems tasks that must be accomplished to meet these goals. A typical plan describes the breakdown in activities and resources required for the development of new applications and the operation of existing systems.

Many organizations in our experience agree that a plan is needed, but do not develop one. A frequent reason is that the 3 - 5 year information systems planning horizon is not compatible with the planning horizon of the organization. In other instances, the corporation does not have a plan at all. We feel that it is both possible and highly desirable to develop an information processing plan even without a formal corporate plan. The technology is too pervasive and fast moving for planning to occur by default or solely through decisions made by personnel in the information services

department. Leaving the plan to the computer staff tends to produce a document that reflects information services priorities rather than those of the corporation. We recommend that a special group be created with membership from corporate staff, user management, information services management, and key executives to generate the plan. A broad based composition tends to better reflect corporate-wide priorities.

A key task for the organization is to identify areas for new applications of technology. What are the applications areas with the highest return? What applications will most further the strategic goals of the corporation? What new opportunities does the technology provide?

Application systems have useful life spans of five to ten years. Due to rapid technological advances, computer hardware tends to have a shorter life than application systems. Application decisions made today restrict future options: for example, a decision to implement a particular application system acts to constrain future hardware choices to those that are compatible with the present equipment. Therefore it is important to carefully select applications areas since these decisions may shape the firm's information processing during the next decade.

The plan should outline and set priorities for applications areas, for example, marketing or production control, based on the expected corporate contribution. To establish these priorities, a high level planning group should make the trade-offs among functional areas. Using a management group insures that the decision on

priorities is a management decision rather than one controlled by a single operating unit or a choice left to the information services staff. A major purpose of a this component of the plan is to shift attention from equipment to applications which are the real payoff to the firm.

Organization Structure

- * Evaluate various patterns for providing computing services to choose the most effective alternative.

- * Develop a policy that balances coordination costs and local autonomy.

Existing information technology offers considerable flexibility in developing patterns for the structure of the information services function. The firm must identify possible processing patterns, evaluate them, and choose an alternative for implementation. Processing alternatives can be divided into three broad groups which represent points on a continuum. At one extreme is complete centralization. All systems analysis and design is performed by a central group and all equipment is operated centrally. All corporate data is also centrally located and controlled.

At the other extreme is complete decentralization; all equipment is resident at local sites and these sites have their own staff for analysis and design work. Data is also decentrally located and controlled. Distributed processing occurs when local sites are tied together in some type of communications network that permits resource sharing.

Management must trade-off the benefits perceived by users in having and controlling their own computer system resources against the need for overall coordination and standardization in the organization. Allowing the proliferation of small computers can lead to high costs if the organization decides to connect diverse equipment through a network. Also, the firm must ask if there are opportunities to develop common systems which can be used in multiple locations to prevent the duplication of development efforts.

New Applications

- * Develop a mechanism for selecting alternatives that obtains input from those who must interact with the system.

- * Be sure that a realistic number of alternatives are considered, including the 'status quo' or the 'no new systems' alternatives.

Rarely today are totally infeasible applications suggested by users. Instead, some type of feasible system can always be undertaken to improve information processing. The question is what is both feasible and desirable? A corporate group should have chosen applications areas as a part of developing a plan for information processing. Now, the task is to decide what type of system, if any, will be developed. Management must consider the existing portfolio of applications and provide guidance on the magnitude of the investment possible and the balance of the portfolio. For example, the firm will want to have some low risk/low payoff projects underway to offset projects with a high risk of failure.

Advances in package design have resulted in packages becoming usable alternatives to the internal development of custom system. In general, packages require somewhat less time and effort to implement than custom systems at the expense of higher operational costs and the possible omission of desirable features. Management should insure that alternatives to custom development are always considered.

We advocate a decision procedure in which the information services department involves users in the selection of alternatives for a new application. First, the users should agree with the information services department on the number of alternatives for a single application. An example of alternatives is the use of an applications package, an online system, a batch system, or maintaining the status quo. (See Lucas and Moore, 1976). The selection group then agrees on a series of criteria to be used to evaluate each of these alternatives. Finally, an alternative is selected from the several possible choices considered for this application.

All computer applications involve changes ranging from simple procedural change to major organizational alterations. It is important for change to be carefully implemented so that a system will be successful. Management should set the objective for a system and make any organizational changes desired independently of system implementation.

It is likely that the participants in the development process will not all have the same objectives so that conflicts are certain to arise. Liaison agents, joint user-system designer project teams and frequent review meetings help resolve conflict in a constructive

manner.

Systems analysis and design is an area that requires a great deal of management attention. Managers must demonstrate that they support the development of a new system and see that there is adequate user input in the design process. Often courses have been used to prepare the systems staff and users for the development of a new system. These courses are followed by frequent group review meetings during the design process. Top management participates in these meetings and makes clear that it supports the changes that are expected to come from the system.

Operations

- * Establish criteria for measuring the performance and service levels of computer operations.

- * Measure and evaluate the operations function regularly.

The concerns in the operation of existing systems are credibility and service levels. It is very difficult to gain enthusiasm or cooperation in the development of new systems if existing service levels are unsatisfactory. Management must be sure the information services department is providing effective service as perceived by its customers. Often when the measures used to evaluate service are created and evaluated in the information services department itself, they tend to have little meaning for users. However, management sees a report that describes the percentage of output reports processed on time and the availability of the computer, and assumes that adequate measurement is taking place.

The firm can conduct user surveys of service levels to supplement measures of on-time performance or computer up-time supplied by the computer operations group. These surveys can be treated statistically to extract key factors (combinations of items on the survey) which serve as a measure of performance. Over time the survey is repeated, the factors computed and the progress of the operations function evaluated. Such a technique provides a measurement and evaluation which includes criteria important to users as well as indicators from the operations group.

Need for Resources

- * Review equipment recommendations.
- * Authorize adequate staffing levels.

The need of the organization to operate existing systems and the resources required to develop new applications determine staff and equipment needs. One of the by-products of the planning process is the identification of needed resources; requirements are compared with available resources to determine what incremental equipment and staff is required. Top management must make the decision of what action to take when there is a discrepancy between the resources needed to accomplish the plan and the resources available.

Management must examine the alternatives available for processing including the use of outside services, facilities management contractor, internal computers, etc. Also the firm must forecast changes in the technology to balance costs versus the risk of obsolescence.

There are a large number of options for equipment and management must help develop criteria for comparing alternatives. One important issue today is the extent to which compatibility among different vendors is stressed. If many incompatible systems are acquired the organization will be unable to take advantage of common software.

For the staff, the obvious way to expand resources is to hire more individuals. However, there is a limit to the number of people who can be absorbed productively into the organization. Another alternative is to use more packaged programs to improve staff productivity. Outside contractors can be employed to develop systems or to supply staff.

All trends in the future point to the conclusion that hardware costs will continue to decline and that there will be an insufficient number of computer professionals to develop systems. These observations suggest that the organization will have to give more responsibility to users for systems. The firm should acquire higher-higher level languages like report generators and encourage users to retrieve their own data and design reports. Invest in a data base management system and query language to extend the computer to the end user.

Charging

- * Determine the objectives of a charging policy.
- * Design and implement the policy.

There are a number of advantages and disadvantages to charging for information processing services. Management should realize that a changing policy will influence user behavior and choose accordingly. A full charge out scheme is advocated to allocate computer resources using a pricing mechanism. For this approach to work, the user group has to be fairly knowledgeable and have an interest in the budget. The user must know how his behavior can influence charges for services.

Overhead charging is advocated for organizations that are trying to encourage use of the computer. Here, it is assumed that users are more naive and reluctant to make use of the computer resource. By making the computer a free good its use is encouraged. Partial charging schemes feature overhead charging for systems analysis and design or for corporate-wide systems and charge back schemes for operating expenses. Operating costs are easier to determine and fluctuate less than charges for developing new applications, so this dual approach creates more certainty for users and means that the corporation absorbs some of the budgetary risk for new systems development. For further details of these plans, see Dearden and Nolan (1973).

Control

- * Evaluate the contribution of information systems to corporate goals and strategy.

- * Evaluate information services performance with respect to the plan.

- * Take the needed corrective action to achieve the plan, e.g.

add resources modify schedules.

Management control is concerned with the broad question of whether information technology is making a contribution to corporate strategy. From our earlier discussions, this contribution could be in the form of independent systems, policy support systems for planning, or through a close linkage between technology and strategy formulation. While we discuss specific control mechanisms below, one way to gain control over information processing is to participate in the decisions mentioned above and to be knowledgeable about information processing activities in the organization.

For design activities the firm can conduct a postimplementation audit and compare achievements with original goals, budgets and specifications. On an operational level, one control mechanism is to compare actual results with the information processing plan. On a more frequent basis, user reactions to service levels can be measured and reported and progress on individual systems development projects monitored. Management should establish performance criteria and the information services department should report on them.

One major management problem is what action to take when it appears that some part or all of the information processing function is out of control. A common solution, though not necessarily the best, is to replace the manager of the information services department. Instead, top management should take a careful look at how it is contributing to controlling information processing. The framework in Figure 1 is one starting point for such an examination. Has management helped develop a plan for information processing? Is

management involved in the selection of applications and the determination of priorities? Do top managers set the objectives for new systems and participate in their design?

In some instances changes in personnel may be appropriate when the operation is out of control. However, in others the best action is to provide additional resources. Possibly processing schedules are not being met because of a lack of manpower or computer power. The design of new systems is a research and development activity; there can be high uncertainty. If a high risk or a complex system is experiencing delays and yet it appears to be managed well, then the appropriate action may be to add resources or extend the schedule.

In summary, the first step in exerting control is knowing what to measure and conducting the evaluation. The second step is determining what action is most likely to improve the situation if part of the operation is out of control.

SUMMARY

This paper has described relationships between information processing and corporate strategy. We argue that most organizations have developed systems that are basically independent of the firm's strategy; they help achieve some objective through greater efficiency or better management. Policy support systems contribute to the planning process directly. However, the greatest benefits come when information technology is merged with strategy formulation; technology serves to expand the range and number of strategic opportunities considered by the firm. In the future information

technology will be an increasingly important component of corporate strategy.

The second part of the paper presents a framework for top management control of information processing activities in the organization. If information technology is to make a contribution to strategy formulation and to the operation of the firm, management must become more adept at coping with information processing activities in the organization. The framework for control stresses the importance of the planning process, the development of organizational structures for information processing, the identification and development of new applications, the operation of existing systems, the identification of equipment and staff needs, charging for services and monitoring information processing performance. The purpose of the framework is to assist top management in determining the key issues for concern and action in managing the information processing resource.

By including considerations of information technology in the development of corporate strategy and by effectively managing information processing activities in the organization, this technology will make its maximum contribution to the organization. Managers will no longer have to ask "What am I getting from information technology." Instead they will be able to point out the nature and extent of the contribution technology makes to the organization.

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Level of Integration with strategy formulation	Primary Objective	Secondary Effect
Independent	Operational efficiency	Managerial information
Policy support	Aid repetitive decision making	Better understanding of problem dynamics
Fully integrated	Open new products, markets, directions	Change the decision making process, alterna- tives considered, evalu- ation criteria

TABLE 1

INFORMATION TECHNOLOGY AND CORPORATE STRATEGY

A CORPORATE PLAN

Issue	Recommendation
Mechanism	Operational plan of 1 year Longer term plan 3 - 5 years Technology assessment Link to organization plan Separate IS planning officer
Involvement	User and management input
Contents and format	Applications needs Operations needs Implications for staff and equipment
Priorities	Steering committee to choose application areas
Reporting	Annual report of ISD tied to plan

ORGANIZATION STRUCTURE

Issue	Alternatives
Type	Centralized, distributed, decentralized for operations and analysis/design
Evaluation	Criteria: service levels, cost responsiveness, flexibility, history of organization
Control	Balance local autonomy with corporate needs

NEW APPLICATIONS

Issue
-----Recommendation

Generate new ideas

From plan, also procedures for requests

Package

Evaluate; functional fit to needs

Selection

See Lucas and Moore (1976).

Development

Extensive user input, management involvement setting goals, reviewing system

Change

Preparing the organization to manage and cope with change

Conflict

Ways to use conflict constructively

OPERATIONS

Issues
-----Recommendations

Measurement

Develop user-oriented measures

Evaluation

Administer regular evaluations including a variety of measures

EQUIPMENT/STAFF NEEDS

Issues

Recommendations

 Evaluation and choice criteria

Develop evaluation methodology

Compatibility among vendors

Establish vendor compatibility policy

Technological assessment

Factor likely technology changes into decisions

CHARGING

Issues

Alternatives

 To charge
Yes or no-advantages and disadvantage
Dearon and Nolan, HBR (Nov., Dec., 1973)

Charging mechanism

Full or partial charge out; accounting techniques

CONTROL

Issue

Recommendations

 Overall evaluation

Compare results to plan

Frequent feedback

Monitor progress on systems development projects, conduct user surveys as discussed under "Operations."

Figure 1

A FRAMEWORK FOR MANAGING
INFORMATION PROCESSING

