

The Value of Strategic IS Planning: Understanding Consistency, Validity, and IS Markets

By: John C. Henderson
Massachusetts Institute of
Technology
Sloan School of Management
30 Wadsworth Street
E53-316
Cambridge, MA 02139

John G. Sifonis
Arthur Young & Co.
Strategic Management Consulting
Services
277 Park Avenue
New York, NY 10172

Abstract

The impact of IS technologies on the competitive capability of the firm has increased the need for effective strategic IS planning. This paper argues that an effective strategic IS planning process must provide for (1) definition of key markets (within the firm) for IS products and services; (2) internal consistency, particularly between the strategic business plan and strategic IS plan; and (3) a means to assess the validity of the planning process. The need to establish validity is seen as critical in today's highly turbulent business environment. Results of an actual planning process are used to illustrate how assumption surfacing can be used as one means to address the validity issue.

Keywords: Strategic planning, strategic IS planning, critical success factors, assumptions surfacing

ACM Category: H.0

Introduction

The potential for using information technology to affect the competitive position of the firm (Cash and Konsynski, 1985; Rockart, 1979) has served to highlight the importance of effective information systems planning. As the criticality of effectively linking the strategic IS plan to the strategic business plan has increased, the need to better understand the nature of strategic planning, in general, and strategic IS planning, in particular, has also increased. It is now particularly relevant to ask how strategic IS planning adds value to efforts to devise a strategic business plan. A better understanding is required of both the types of products produced by a strategic IS plan as well as the impact on the overall planning process.

Venkatraman (1986) argues that the intersection of interest between IS planning and strategic planning stems not only from a common critical assumption, i.e., a belief that planning positively affects the performance of the firm, but also from the similarity in the research questions and methodological issues that have been pursued. Strategic planning is often approached from a systems view of planning and design. A system can be viewed as a theory of objects, relationships between objects, and performance (Churchman, 1971). Just as Alexander (1964) suggests that a house is a reflection of an architect's theory of how people live, strategic planning can be viewed as a process of building a theory of the firm. That is, planning is an attempt to prescribe sets of objects and relationships so that desirable performance is achieved.

When viewed from this systems perspective, the commonalities between strategic IS planning and strategic business planning are apparent. Researchers in both disciplines have struggled with at least three major systems issues:

1. ways to represent the levels of abstraction inherent in the planning and design process;
2. separability (decomposition) and its implications for creating a narrow planning context or frame; and
3. the need for cooperative behavior among experts.

Each of these issues is resolved explicitly or implicitly by any given planning methodology. These planning techniques offer the potential to

strengthen the link between IS planning and strategic business planning. This article explores these issues in the context of both IS and strategic planning. The next section provides a brief overview. Following is a planning approach that focuses on the consistency between levels of abstraction and the validity of a planning context as two major concepts that strengthen the linkage between IS and business planning. While this approach also calls for a value-based business modeling approach as another method for improving linkage, this aspect receives limited attention. This is followed by an example planning exercise, which further illustrates the concept of assessing the validity of a planning context. The final section summarizes the major concepts found in the proposed approach and suggests areas for future research.

Strategic Business and IS Planning

Each of the three planning issues identified in the introduction has long been a subject of research. At the core of planning and design is the recognition that this process requires the participant to move between multiple levels of abstraction (Henderson, 1986; Kottemann and Konsynski, 1984). For example, strategic planning is often envisioned as having three levels: corporate, business, and functional (Hofer and Schendel, 1978). Each level reflects varying sets of stakeholders that are affected by or can affect the plan, the extent to which forces external to the firm are explicitly addressed, the extent to which organizational boundaries within the firm are viewed as constraints, and so on. In essence, the planning process addresses the overwhelming complexity of a large system by decomposing it into dimensions such as resources, function, time, space, and so on.

In IS planning, the concepts of top-down planning and structured analysis emphasize the need to systematically decompose a complex system into smaller and more concrete representations. The notion of a design transform has been used to describe this process (Gane and Sarson, 1979; Kotteman and Konsynski, 1984). A design transform is a conceptual or physical change in the design artifact or target system. The systems design life cycle (Bostrom and Heinen, 1977; Gane and Sarson, 1979; McLean and Soden, 1977) describes the IS design process as a sequence of transformations that

moves the designer from an abstract statement of need to a concrete reality of a system that affects the behavior of individuals within the firm. While the IS life cycle has been used primarily to conceptualize design, there is recognition that this activity must be linked to a predesign or planning process.

It has not been particularly useful to focus research on the possibility that a specific number of transformations that best describe the planning process exists. IS planning has been described as having as many as fourteen levels (Pyburn, 1983). More relevant are two basic issues that must be addressed regardless of the granularity of the levels used to describe the planning and design process: external validity and internal consistency.

External validity refers to the appropriateness of the resulting planning. Mitroff and Featheringham (1974) suggest that "errors of the third kind", i.e., good solutions to the wrong problems, are particularly prevalent in ill-structured and messy problem settings. The planner faced with an ill-structured environment must be concerned with the validity of the planning process as well as its consistency.

Internal consistency refers to the need to ensure that actions envisioned at one level are correctly operationalized at lower levels. As Churchman (1971) suggests, planning and design are, at the extreme, attempts to prescribe a complete and consistent causal model for a system. While planners would not be so bold as to claim they have a complete and consistent causal model of the firm, they nevertheless strive to attain high internal consistency across multiple levels of planning.

King (1983) includes validity and consistency as two critical components of any systematic evaluation of a strategic planning process. His proposed framework uses the concept of external standards as a basis for a comparative assessment of validity. King assesses consistency in terms of the extent to which the strategic elements of a plan are internally consistent.

External validity

The planning methodologies require the participants to establish a planning context or frame of reference. For example, business systems planning (IBM, 1984) calls for developing a global

business model to serve as the planning context for a strategic IS plan. Research ranging from individual decision making (Carroll, Thomas, and Miller, 1978; Thomas and Carroll, 1979) to general theories of inquiry (Churchman, 1971) recognizes a dilemma introduced by any given planning context in that in order to cope with the complexity of a system, the planner must define boundaries. But doing so clearly limits the scope of the planning effort and may not incorporate all relevant co-producers of performance. If this is the case, the planner risks prescribing a system that is flawed. Stated differently, the planner risks committing an error of the third kind (Mitroff and Featheringham, 1974), that is, defining a system that solves the wrong problem.

How does the planner validate a given context or frame? If one creates a model of the business, surfaces assumptions, and generates an internally consistent set of beliefs and behavior, is there not still a risk of a significant methods bias? That is, might everyone involved in the planning process systematically ignore something that is critical to the success of the strategy? This fundamental issue is addressed to varying degrees in the strategic planning and IS planning literature (Venkatraman, 1986; Schendel and Hofer, 1979). Efforts to insure correctness of the planning process may be thought of as attempts to achieve external validity.

Mason and Mitroff (1973) use the concept of alternative inquiring systems to emphasize the need for the IS planner to explicitly consider the mechanisms for guaranteeing validity of a plan or design. The use of dialectics in strategic planning (Churchman, 1971; Mason and Mitroff, 1973; Mason and Mitroff, 1981) is an example of an attempt to increase the likelihood that the chosen strategy is robust and valid. Strategic planning and IS planning processes often rely on an implicit strategy of using agreement among domain experts (a Lockean consensus approach) to assess validity (Mason and Mitroff, 1973). The limitations of a Lockean approach, discussed by Churchman (1971), Mason & Mitroff (1973) and others, suggest a need to establish an alternative mechanism to examine the external validity. We argue that the ability to explore the external validity of the plan is as critical to performance as achieving internal consistency with the planning process. Further, as the planning environment becomes more turbulent, the issue of external validity becomes more criti-

cal as well as more problematic. This issue is an important component of this article and will be illustrated in the planning example discussion.

Internal consistency

The issue of internal consistency has been addressed in two major ways. The dominant focus of most IS planning methodologies is the creation of an internally consistent behavioral or process model of the firm. The planning process can be viewed as defining a series of means/ends chains that move from abstract concepts of the firm's behavior to realization of particular systems and products that affect the behavior of individuals in (hopefully) predictable ways. A major contribution of the critical success factor planning methodology is the introduction of a means-end relationship between the goals of individuals and their needs for information (Rockart, 1984; Boynton and Zmud, 1984). CSF planning does not ask what information you desire to meet your goals, but instead first establishes those factors (abstract processes) that will most affect your ability to succeed (goal attainment) and then asks how these behaviors induce desires for information. This means-end linkage has served to create an intermediate design transformation that has proven valuable to the overall IS planning and design process.

The IS planning literature clearly reflects this emphasis on internal consistency of means/ends relationships (behavior). Business system planning (IBM, 1984) and structured analysis (Gane and Sarson), to name a few approaches, attempt to systematically guide the IS planner through the process of creating these interlinked behaviors that range from abstract representation of the firm to rule-based procedures for producing information in a purposeful manner. A quite similar tradition is found in strategic planning as reflected by the flow from corporate to business to function planning (King, 1978; Schendel and Hofer, 1979). It is interesting to note that Porter (1980) describes strategic planning in a similar fashion by emphasizing the concept that a strategic plan provides policies (means) to achieve goals (ends).

More recently, the need to achieve consistency in beliefs and assumptions of individuals as well as in their behaviors has been recognized by strategic planners. In the strategic planning literature, consistency of beliefs has been ad-

dressed by research on issues such as corporate culture (Schein, 1985), the concept of organizations enacting their environment (Daft and Weick, 1984), and perhaps more indirectly, methodologies emphasizing participatory planning and design (Boland, 1978; Bostrom and Heinen, 1977; De Greene, 1973). Mason and Mitroff (1981) formalized the means to explicitly surface underlying assumptions or beliefs in their strategic assumption surfacing technique. In part, this approach argues that attempts to gain shared assumptions, or at least to clarify and perhaps reduce conflict that revolves around uncertain assumptions, are fundamental to the creation of a corporate strategy. While many of the means/ends (behavior-oriented) methodologies attempt to incorporate a discussion of assumptions, the strategic assumption surfacing technique methodology is an example of a strategic planning approach that centers on understanding and attaining consistency in beliefs.

Henderson et al. (1984) combined assumption surfacing and critical success factor analysis to provide a more comprehensive IS planning approach. Mason and Mitroff (1981) and others have applied assumption surfacing or variations on this methodology in an IS planning context. Konsynski et al. (1985) have incorporated the techniques of assumption surfacing and analysis into a generalized IS planning support system. In essence, the IS planning field is recognizing, as is the strategic planning field, that the lack of consistency with respect to critical beliefs or assumptions could create a fundamental instability in a plan and must be explicitly addressed.

Cooperative behavior

A third major issue addressed in the planning literature centers on the need for cooperative behavior in the planning process. The need to tap many sources of expertise and gain a shared commitment is related to the issues of internal consistency and external validity, and while not the focus of this article, the need to gain cooperation among experts is a major component of most theories of planning and design. The IS planning literature has borrowed heavily from research on change management (Keen and Gerson, 1977; Keen and Scott Morton, 1978), participatory decision making (Boland, 1978; Bostrom and Heinen, 1977; Leonard-Barton, 1983) and political science (Barrieff and Galbraith, 1978;

Markus and Pfeffer, 1983) as a basis for prescribing approaches to design. Strategic planning has recognized both the need to access multiple experts for their knowledge base as well as to incorporate key stakeholders in order to achieve consistency and commitment (Bostrom and Heinen, 1977; Mason and Mitroff, 1973; McLean and Soden, 1977; Pyburn, 1983).

Finally, the issue of the organizational impact of the information systems planning process must be highlighted. King (1983) suggests that systematic assessment of the performance impact of a plan requires understanding the planning process in terms of a variety of dimensions, including adaptiveness, effectiveness, and so on. Clearly, to define planning as a purposeful activity requires the planner to consider the relationship of the recommended systems to a notion of organizational performance. Strategic IS planning often assumes that the organizational goals that provide the basis for defining benefits have been passed down via the more abstract process of strategic business planning. The methodology proposed in this article directly links strategic business goals to the IS strategy. An evaluation of the internal consistency of the planning process is one way to assess the effectiveness of this linkage. To the extent that this linkage is effective, the opportunities or markets for IS products and services (including investment in a data infrastructure) will have a high positive impact on the firm. Ensuring a valid and consistent linkage between the business plan and the IS plan is a necessary condition for rational investment in IS.

The following section describes a strategic IS planning approach and its relationship to a strategic business planning process. While the issues of internal consistency and external validity are the main focus, the need for an impact orientation is also discussed.

A Strategic IS Planning Approach

Strategic business plan

Figure 1 depicts the proposed planning methodology. This planning process is an attempt to create an internally consistent and externally valid IS plan, consisting of three phases: (1) business strategy formulation; (2) strategic IS for-

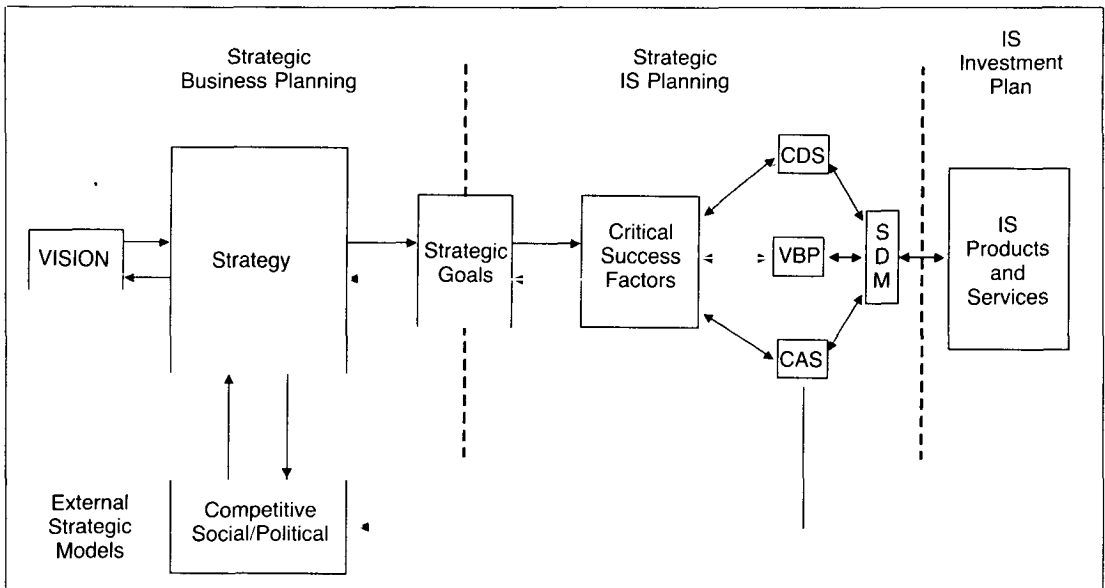


Figure 1. The IS Planning Process

mulation; and (3) action plan and resource allocation. This overall view is consistent with research that calls for a strategic linkage between business strategy and IS strategy. To the extent that the business strategy calls for significant use of IS resources, the linkage between these stages is critical. As will be discussed, this linkage is achieved both by using common concepts and through iteration between phases.

The strategic IS planning process assumes the existence of a *vision* and of a *business strategy* relationship. The vision is analogous to the traditional business planning concept of mission. It is a futuristic picture of the organization and its environmental surroundings. The business strategy used to achieve this vision is a macro-level articulation that reflects the direction and magnitude of efforts in particular markets and the criticality of various organizational resources to these efforts. In this context, it is assumed that the strategic business planning process produces a set of strategic goals and, at least, an implicit set of assumptions underlying these goals.

There are many planning processes commonly used to create a strategic business plan (Hofer and Schendel, 1978; Lorange and Vancil, 1977; Porter, 1980; Schendel and Hofer, 1974). For the purposes of this discussion, the mechanism

used to generate this business plan is not addressed other than the emphasis that will be placed on understanding the consistency between beliefs and behaviors that underlie the IS plan and the business plan. For this reason, an explicit assessment of assumptions is warranted. The reader should review the assumptions surfacing methodology developed by Mason and Mitroff (1981) for an example of an existing technique for assumption definition and analysis. It should also be recognized that various techniques including value-added flow models (Porter, 1980), critical success factors (Rockart and Scott Morton, 1979), and others, have been used to help define the key processes or behaviors involved in the strategies developed as part of the strategic business plan. Both these abstract behaviors and the underlying assumptions can be used as a basis to establish consistency between the IS and business plan.

Strategic IS plan

As indicated in Figure 1, a consequence of identifying the key processes or behaviors and assumptions at the business strategy level is the formation of strategic goals that will be acted on by the organization. The vision/strategy (means-ends) relationship thus provides the context or frame of reference for a subsequent and

more specific means-ends relationship. This phenomenon has been recognized by users of the critical success factor methodology. Rockart (1979), Boynton and Zmud (1985), and others point out the hierarchical relationships that emerge in an organizational CSF planning process. That is, the CSFs for the executive management team often become specific goals for organizational subunits. Henderson, Rockart, and Sifonis (1984) note, however, that while consistency between levels of means-end relationships is one requirement for internal consistency for the planning process, internal consistency must also exist among the critical beliefs or assumptions. As will be discussed, the proposed methodology builds upon the need to establish consistency for both behavior and beliefs as one mechanism to ensure that the strategic information systems plan is appropriately linked to the strategic business plan.

The proposed strategic IS planning process uses the goals established in the strategic business planning process to provide a direct linkage to the IS plan. These goals serve the equivalent role in the IS planning process as the vision did in the business planning process. The critical success factor method is used to develop a means/ends relationship that serves to focus the IS strategy on areas that are critical to meeting these strategic goals. As discussed in the previous section, the CSF method links the goals of individuals or organizations to a set of critical information requirements (Boynton and Heinen, 1985; Henderson, Rockart and Sifonis, 1984; Munro and Wheeler, 1980; Rockart, 1979). In general, the CSF approach involves a three step process: (1) interviews with relevant managers and key staff; (2) focus group sessions to evaluate and characterize the relevant CSF; and (3) feedback, critique and adoption of these CSFs to provide a final CSF statement.

Many alternative techniques can be used to generate and validate the CSFs. For example, Henderson, Rockart and Sifonis (1984) describe the use of structured group processes in a strategic IS planning process that could be incorporated into the general CSF approach. In general, the specific techniques used to generate and validate the CSF require a tradeoff between the perceived benefits of defining a comprehensive set of CSFs and the cost, both financial and psychological, of any given technique. The reader should refer to Henderson and Nutt (1978) for a review of this cost/benefit tradeoff.

The CSF method does have limitations. Davis (1979, 1980) has suggested three possible areas of concern. The first concern is the dependence on skilled analysts.

As Boynton and Zmud (1984) note, this concern is common to most, if not all, strategic planning methodologies. Second is the risk of analyst bias introduced in the interview process. However, Munro and Wheeler (1980) indicate that the CSF process produces consistent results, and, thus, the issue of bias appears to be of less concern. Boynton and Zmud (1984) support this finding. Further, as suggested above, this risk can also be addressed through the use of appropriate group and survey techniques that augment the standard CSF approach.

The third concern is the possibility that CSFs overemphasize current concerns and crises and thus may not address the full range of organizational needs, focusing on narrow and perhaps inappropriate factors. Rockart (1979) suggests a corollary to this: CSFs are time-dependent. Thus, even if the appropriate factors are identified, events may alter the criticality of these factors. One major contribution of the approach proposed herein is to provide a direct means to validate the proposed CSFs and to provide an "early warning" mechanism to alert management to key changes. It is also argued that this assessment process will strengthen the linkage between the strategic IS plan and the strategic business plan.

The ability to specify an effective planning process, apart from selection of a particular interview or structured group technique, requires the planner to define the specific products or deliverables that will be generated. Further, the planner must consider how the validity of the planning process will be addressed. The means to address these two issues are discussed in detail in the following sections.

IS planning products

The CSF process provides the foundation for developing four object sets: (1) critical assumption sets; (2) critical decision sets; (3) value-based processes; and (4) strategic data models. (See Figure 1.) These sets of objects along with the CSFs are viewed as the primary products of a strategic IS planning effort. From a procedural viewpoint, the method calls for (1) generating the CSF; (2) using each CSF as a frame or question to generate the four object sets; and

(3) evaluating the benefits of investments in IS to affect elements of each set. As discussed earlier, the specific techniques used to generate and validate the CSFs and each object set are important operational decisions made by the planner. However, a key criteria for this choice is that any given technique must address the need for feedback to and debate among the primary source of the CSF, i.e., key managers. While structured techniques may improve the efficiency and perhaps lower the risk of omitting an important issue, CSFs are fundamentally a value statement by management. They are a direction or a focus. Thus, the method must provide for iteration and evaluation by those key managers that will ultimately "own" the direction or focus that is taken.

As will be discussed later, this iterative evaluation involves refining the statements of elements within a particular object set, mapping these elements to the CSFs and other external models, and using those mappings to evaluate the internal consistency and external validity of the planning process. Again, a variety of techniques can be used to implement this evaluation. In the example discussed later, judgements of independent experts are used to map elements of the critical assumption set to Porter's strategic competitive forces model. This approach allows the planner to use the consistency of judgements across experts to assess reliability of the mapping process.

An important point in this approach is that CSFs are elicited from managers charged with attaining specific strategic goals. In this sense, they represent a more concrete specification of processes than the broader organizational policies or behaviors generated during the strategic business planning effort. The consistency between these two abstract behaviors is a traditional measure of the internal consistency of a plan.

The four object sets linked directly to the CSFs are (1) the critical decision set; (2) value-based processes; (3) the critical assumption set; and (4) the strategic data model. Each of these sets defines an important market to which the IS organization can provide products and services. That is, the sets do not specify directly an IS systems application or service. Rather, they identify a market for IS products and services that should have strategic value to the firm.

Critical Decision Sets. The CSFs are used as a planning context to help ensure that the ele-

ments in each of these sets are value-focused. Specifically, the critical decision set contains decision processes that will most affect one or more CSFs. For example, if a CSF is "to retain highly skilled employees," a critical decision set may be the promotion decision, hiring decision, or perhaps the job assignment decision. The objective is to identify a subset of critical decisions from the set of all possible decision processes in the firm. This effort serves to qualify the DSS market and to suggest high impact DSS products or services for investment. Further, it provides a decision-making view of the data resource that can help identify those data that are strategically important to the firm.

Value-Based Processes. The value-based processes set recognizes that achievement of the CSFs will ultimately rely on the efficient and effective performance of critical business processes. Rockart (1979) has likened the CSF methodology to a quick-and-dirty business systems planning process (Keen and Scott Morton, 1978). That is, CSF methodology provides a way to focus a business-modeling process on processes that are critical to the firm. Thus, while recognizing the need to understand processes and their relationship to the data resource, CSF methodology uses value-based processes to emphasize a value-focused process model that captures the strategically important processes and their interrelationships.

This concept is similar to the notion of value-added processes described by Porter (1980). However, value-based processes do not necessarily include a cumulative or value-added flow, but rather a recognition that each function or process is tightly linked to a CSF; therefore, effective management of these processes will add strategic value to the firm.

The value-based process model provides two major contributions. First, it provides a monitoring and control perspective to the potential set of IS markets. This design perspective often leads the planning team to focus on products and services that have been the traditional domain of MIS. Second, it provides a direct link to the existing application base. Since many of the existing systems were developed to support functions or processes, the inclusion of this object set helps IS planners assess their strategy in the context of the existing IS asset base. This aspect is critical to the ability to effectively translate the strategic IS plan into a viable development action plan.

Critical Assumption Sets. The critical assumption set consists of assumptions that underlie the CSFs. They are the reasons why planners and stakeholders believe the CSFs to be valid. The assumptions can be used by the planner in two ways. First, they can serve to identify a critical IS market-executive information systems. Executive information systems are defined as information systems used to monitor and analyze critical assumptions. As the term suggests, this market is of particular relevance to senior executives. Since these assumptions often involve beliefs about the environment, thereby requiring external data, the critical assumption set offers a significantly different and important view of the strategic data model. Second, the critical assumption set provides data that can be used to assess the external validity of the IS plan. This usage of the assumption set will be discussed in the next section.

Strategic Data Models. The representational form of the strategic data model is often an entity relation data model and is similar to the global data modeling concept (Gane and Sarson, 1979; IBM, 1984), currently advocated by those pursuing a data resource management strategy. However, the strategic data model differs in a critical way: there is no attempt to create a complete and consistent data model. Rather, the focus is on identifying the significant value-added data classes and how they relate.

The strategic data model provides two services. First, it facilitates the coordination of investments across a range of management support system markets, e.g., DSS, MIS, and EIS. Second, it establishes where to focus initial efforts to more effectively manage the data resource. While this data model is not complete (given the focusing effort of the CSFs), the ability to provide management with strategic data requires this model to address the critical needs represented by the strategic goals and their CSFs.

A key issue in using strategic data models is maximizing the probability that the models reflect the strategic data needs of management without losing the focusing characteristic of the planning process. Henderson, Rockart and Sifonis (1984) discuss this issue, arguing that the validity of the strategic data model is gained through data view integration rather than through an exhaustive assessment of a single perspective. That is, each of the object sets (critical decision sets, value-based process, and critical assumption

set) reflects a different perspective of information requirements. Integrating these perspectives into a single strategic view of the data resource is one mechanism to ensure validity of the strategic data model. As is the case throughout this process, a second mechanism is the feedback and evaluation processes with key managers and stakeholders.

It is important to note that the strategic data model is intended to augment rather than replace a detailed data model that underlies the information systems infrastructure. Such detailed data models provide a means to control the accuracy and the integrity of specific data resources within the firm. The strategic data model is intended to provide the basis for justifying the investment necessary to define and implement data resource management systems across the organization.

Consistency and Validity

Beyond identifying the products of a strategic IS planning effort, the proposed methodology addresses two related issues: the internal consistency and the external validity of the IS plan.

The internal consistency of the plan should be assessed for both beliefs and behaviors. Since this strategic IS planning approach explicitly elicits both CSFs and critical assumptions, the internal consistency of the plan with respect to the strategic business plan can be directly assessed. That is, a planning process often requires significant interpretation between organizational levels and therefore is subject to inconsistency. The strategic business plan is generated from a different, more general planning context than the IS plan and often involves individuals who will not directly participate in IS strategic planning. As a result, inconsistency in either behaviors or beliefs is possible. The approach taken here allows the planner to use the CSFs and assumptions to identify possible inconsistencies and to focus attention on resolving them.

External validity of the IS plan addresses the possibility that a given planning process may omit or incorrectly address relevant factors. An externally valid plan is one that does not suffer significantly from the collective bias of those involved in the process. As discussed previously, techniques such as a dialectic planning process may serve to increase the likelihood that a given plan is externally valid. The approach taken here

adopts the notions discussed by Churchman (1971), King (1983), and others. External criteria and multiple models are used to assess the validity of a plan. In particular, the critical assumption set provides data for this assessment using multiple externally competitive models or social models. The results of this assessment are fed back to the strategic business planner. Such an assessment can indicate inconsistencies or omissions suggesting either: (1) the strategic business plan is invalid; or (2) the strategic business plan was not communicated or interpreted at the lower levels in an appropriate way. Either planning failure could result in an invalid IS strategic plan.

While many external models could be used to assess the external validity of IS planning, the two important classes include a competitive model of the firm and a social/political model of the firm. In the next section we use Porter's (1980) competitive forces model to illustrate an assessment of the critical assumption set. While a social/political model is not used in this analysis, such an evaluation could provide additional insight to critical social/political trends.

Assessing the External Validity of an IS Strategic Plan: An Example

Our case example concerns a large retail organization that developed a strategic IS plan. This firm manages a large number of convenience stores and has been an innovative leader in expanding the range of products and services offered by these stores.

The strategic IS planning process

The strategic IS planning process proceeded as indicated in Figure 1. The executive management team and many upper level managers were interviewed by members of the IS planning team to elicit its CSFs and critical assumption sets. Focus group sessions were used to clarify and consolidate both the CSFs and the critical assumption sets. In total, over 50 interviews were conducted.

The IS strategic planning process was conducted after completion of a strategic business planning process. Although Figure 1 captures the nature of the overall planning process, it is

important to recognize that the business planning process and IS planning process utilized different consulting firms as external facilitators. These processes differed in terms of the level of participation and influence of key managers. Thus, as discussed earlier, the overall planning process required effective transmission of the products of one planning stage to the participants of a subsequent stage, given shifts in the level of participation and influence of specific individuals. In this case, while the strategic business planning process did not explicitly develop CSFs, the planning process was quite extensive and generated a set of strategic goals for the organization. These goals were used as a starting point for the strategic IS planning exercise.

Strategic assumptions of the firm

Table 1 shows the thirteen strategic assumptions resulting from the IS planning process. Although we have modified these assumptions somewhat to avoid revealing specific concerns of the firm, they represent the basic orientation of the critical assumption set. Figure 2 shows an assessment of the distribution of these assumptions across Porter's (1980) five competitive forces.

Porter (1980) argues that five major sources affect the competitive position of the firm: (1) intra-industry rivalry; (2) buying power; (3) supplier power; (4) threats of new entrants; and (5) possible substitute products. The description of these competitive forces provides a basis for evaluating each assumption and mapping each assumption into a particular force. Of course, this mapping process is in itself an assessment — some assumptions could fall under more than one competitive force. The debate necessary to classify a particular assumption often helps to clarify and perhaps suggest alternative mappings for some assumptions. In this case, the assessment was conducted by a member of the planning team and an external expert familiar with the Porter model. Although minor differences in assessments were noted, subsequent discussions resolved any conflicts, leading to the consensus mapping shown in Figure 2.

Intra-Industry Competition Assumptions

Two significant issues emerge from the assessment illustrated in Figure 2. First, as might be

Table 1. Critical Assumptions

1. Existing retail outlets are the core/primary business.
2. The industry is mature.
3. Quality people with specific characteristics are needed and will be less available.
4. Energy-related organizations are our long-term competition.
5. If we cannot broaden our market, our growth is limited.
6. Working with other energy companies is complementary to strategy.
7. Acquisition is not a primary path for growth.
8. Electronically delivered services will have a viable marketplace.
9. Technology will improve productivity in specific ways.
10. It will be two to three years before we achieve key information flow from a strategic IS system.
11. The retail business is market-driven and is changing in specific ways.
12. Different types of markets must be managed differently.
13. Our real estate investment must be completed.

expected, the strategic IS plan was driven predominantly by assumptions relating to how the firm competes with intra-industry rivals — a critical assumption recognized the emerging threat of new entrants, e.g., gas stations could expand their services to include products and services offered by their convenience stores.

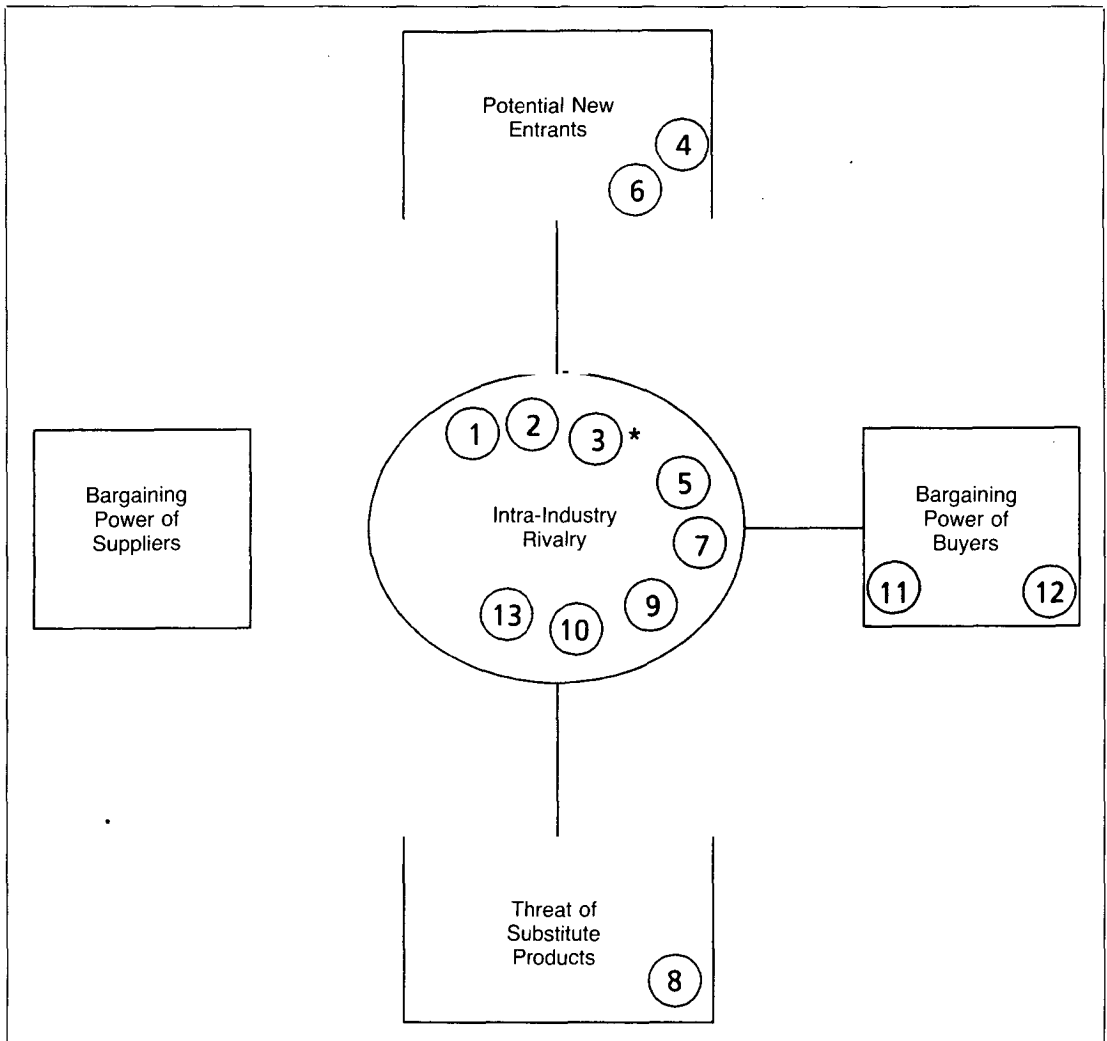
Perhaps more significant was the lack of assumptions relating to threats from substitute products and supplier power. Discussions with senior management on this apparent omission suggested that the IS strategic plan did not reflect all aspects of the emerging business strategy. That is, it seemed that the use of this external model to assess the products of the IS plan indicated a lack of validity. But given the nature of the products and services delivered by these retail outlets, significant erosion of the firm's competitive position caused by substitute products is unlikely. Therefore, the lack of critical assumptions concerning threats of substitute products was not surprising.

However, effective management of supplier relations is a key strategic issue for the firm. In fact, the firm has been vertically integrating to affect its supplier relations. Not surprisingly, the firm has had a clear intent to invest in information technology that would affect its ability to remain flexible in its supplier relationships. The lack of assumptions relating to this issue was viewed by managers as an omission and indicated the need to adjust the IS strategic plan and to check whether the strategic business plan adequately addressed this issue.

Iterative Nature of the Planning Process

A second major concept illustrated by this example is the iterative nature of many strategic planning processes. The initial strategic business plan is created and then tested in the context of strategic resource-planning efforts. This iterative strategy should not be confused with the concept of incrementalism. The intent of the strategic planning process is to prescribe a set of goals (ends) and policies (means) that will achieve these goals and to foster a consistent set of beliefs that will constitute the foundation for interpreting the environment. An iterative planning process recognizes that resource strategies provide an intermediate transformation between the business strategies and the investment or action plans necessary to accomplish a given business strategy. The resource strategy not only helps to set a more concrete planning context for the action plan but also serves to provide evidence as to the internal consistency of the strategic planning process in general, as well as the external validity of the resource plan given the interpretation of the business strategy by the organization. The emphasis on interpretation reflects the fact that an invalid plan can result from omission of key issues introduced by a given planning context or from an imperfect communication link between the two planning levels.

This concept is consistent with the current planning and design methodologies advocated for turbulent, ill-structured environments. For example, evolutionary or adaptive planning is the dominant approach taken for DSS (Keen and Scott



* This is an example of a social/political assumption that does not fit easily within the Porter framework.

Figure 2. Initial External Assessment

Morton, 1977; Naumann and Jenkins, 1982). The need for multilevel feedback during a design process, particularly to address the validity of a planning frame, is emphasized by Churchman (1971) and recognized by the strategic planning research community (Lorange and Vancil, 1977; Schendel and Hofer, 1979). As the convenience store example illustrates, feedback from the more concrete IS strategy planning effort can provide a means to assess the external validity of a strategic resource plan, as well as provide evidence as to the effectiveness of the linkage between two levels in a planning process.

Summary

This article attempts to define the components of a strategic IS plan and show how the products of this effort can serve three purposes:

1. provide a context for defining the markets and thereby the products and services to be delivered by the information systems function;
2. provide a basis for establishing the internal consistency of an IS plan for both behavior and beliefs; and

3. provide a basis for assessing the external validity of an IS plan.

This last issue is the focus of the example discussed in the previous section. An important issue relates to the selection of the external model to be used in the validity assessment. Why choose Porter's (1980) model over other strategy-competitive frameworks? As Churchman (1971) argues, the answer to this question is to use multiple models, not to attempt to find a single universal model. For example, one could assess the validity of the IS strategy from a social/political perspective, thereby emphasizing issues such as regulatory trends. Even if the strategic business planning process effectively uses techniques such as stakeholder analysis to minimize the risk of omitting a key issue, poor communication of the strategic business plan is still possible. Thus, a validity assessment is still warranted.

A final issue concerns the appropriate level of effort to be committed to the strategic business planning process prior to the strategic resource planning effort. As advocated by planning methodologies such as adaptive design, the level of effort for strategic business planning in the initial iteration should be sufficient to identify high-impact opportunities. This planning process could be executed with an intent to iterate. In contrast, the traditional top-down strategic planning process often assumes little organizational learning and little iteration as a result of the strategic planning process. The position taken here is that many organizations are facing novel opportunities and threats that are due, in large part, to new information technology. As a result, a strategic planning process that emphasizes learning and focuses on iterative feedback, as well as validity checks between the strategic business plan and strategic IS plan, will prove beneficial to the organization.

Acknowledgement

The authors wish to thank the reviewers for their many useful comments. This work was supported by the M.I.T. Management in the 1990s project.

References

Alexander, C. *Notes on the Synthesis of Form*, Harvard University Press, Cambridge, MA, 1964.

- Barriff, M.L. and Galbraith, J.R. "Intraorganizational Power Considerations for Designing Information Systems," *Accounting, Organizations and Society* (3:1), August 1978, pp. 15-27.
- Boland, R.J., Jr. "The Process and Product of System Design," *Management Science* (24:9), May 1978, pp. 887-898.
- Bostrom, R.P. and Heinen, J.S. "MIS Problems and Failures: A Socio-Technical Perspective, Parts I and II," *MIS Quarterly* (1:3), September 1977, pp. 17-32; and (1:4), December 1977, pp. 11-28.
- Boynton, A.C. and Zmud, W. "A Critical Assessment of Information Technology Planning Literature," working paper, University of North Carolina, Chapel Hill, NC, 1985.
- Boynton, A.C. and Zmud, R.W. "An Assessment of Critical Success Factors," *Sloan Management Review* (25:4), Summer 1984, pp. 17-27.
- Carroll, J., Thomas, J. and Miller, L. "Aspects of Solution Structure in Design Problem Solving," IBM Research Report, RC-7078, 1978.
- Cash, J.I., Jr. and Konsynski, B.R. "IS Redraws Competitive Boundaries," *Harvard Business Review* (63:2), March-April 1985, pp. 134-142.
- Churchman, C.W. *The Design of Inquiring Systems: Basic Concepts of Systems and Organization*, Basic Books, Inc., New York, 1971.
- Daft, R.L. and Weick, K.E. "Toward a Model of Organizations as Interpretation Systems," *The Academy of Management Review* (9:2), April 1984, pp. 284-295.
- Davis, G.B. "Comments on the Critical Success Factors Method for Obtaining Management Information Requirements in Article By John F. Rockart," *MIS Quarterly* (3:3), September 1979, pp. 57-58.
- Davis, G.B. "Letter to the Editor," *MIS Quarterly* (4:2), June 1980, pp. 69-70.
- De Greene, K.B. *Sociotechnical Systems: Factors in Analysis, Design, and Management*, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1973.
- Gane, C. and Sarson, T. *Structured Systems Analysis: Tools and Techniques*, Prentice-Hall, Inc., Englewood Cliffs, NJ, 1979.
- Henderson, J.C. "Managing the Design Environment," working paper, Massachusetts Institute of Technology, Cambridge, MA, 1986.
- Henderson, J.C. and Nutt, P.C. "On the Design of Planning Information Systems," *The Academy of Management Review* (3:4), October 1978, pp. 774-785.

- Henderson, J.C., Rockart, J.F. and Sifonis, J.G. "A Planning Methodology for Integrating Management Support Systems into Strategic Information Systems Planning," *Journal of Management Information Systems*, (4:1), Summer 1987, pp. 5-24.
- Hofer, C.W. and Schendel, D. *Strategy Formulation: Analytical Concepts*, West Publishing Co., St. Paul, MN, 1978.
- IBM Corporation. *Business Systems Planning: Information Systems Planning Guide*, Application Manual GE20-0527-4, IBM Corporation, White Plains, NY, July 1984.
- Keen, P.G.W. and Gerson, E.M. "The Politics of Software Systems Design," *Datamation* (23:11), November 1977, pp. 80-84.
- Keen, P.G.W. and Scott Morton, M.S. *Decision Support Systems: An Organizational Perspective*, Addison-Wesley Publishing Company, Reading, MA, 1978.
- King, W.R. "Evaluating Strategic Planning Systems," *Strategic Management Journal* (4:3), July-September 1983, pp. 263-277.
- King, W.R. "Strategic Planning for Management Information Systems," *MIS Quarterly* (2:1), March 1978, pp. 27-37.
- King, W.R. and Zmud, R.W. "Managing Information Systems: Policy Planning, Strategic Planning and Operational Planning," in *Proceedings of the Second International Conference on Information Systems*, Cambridge, MA, December 7-9, 1981, pp. 299-308.
- Konsynski, B.R., Kottemann, J.E., Nunamaker, J.F. and Stott, J.W. "PLEXSYS-84: An Integrated Development Environment for Information Systems," *Journal of Management Information Systems* (1:3), Winter 1984-85, pp. 64-104.
- Kottemann, J.E. and Konsynski, B.R. "Metasystems in Information Systems Development," in *Proceedings of the Fifth International Conference on Information Systems*, Tucson, AZ, November 28-30, 1984, pp. 187-204.
- Leonard-Barton, D. "Introducing Production Innovation into an Organization: Structured Methods for Producing Computer Software," Center for Information Systems Research Working Paper #103, Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA, June 1983.
- Lorange, P. and Vancil, R.F. *Strategic Planning Systems*, Prentice-Hall, Englewood Cliffs, NJ, 1977.
- Markus, M.L. and Pfeffer, J. "Power and the Design and Implementation of Accounting and Control Systems," *Accounting, Organizations and Society* (8:2/3), July 1983, pp. 205-218.
- Mason, R.O. and Mitroff, I.I. "A Program for Research on Management Information Systems," *Management Science* (19:5), January 1973, pp. 475-487.
- Mason, R.O. and Mitroff, I.I. *Challenging Strategic Planning Assumptions: Theory, Cases, and Techniques*, John Wiley & Sons, Inc., New York, 1981.
- McLean, E.R. and Soden, J.V. *Strategic Planning for MIS*, John Wiley & Sons, New York, 1977.
- Mitroff, I.I. and Featheringham, T.R. "On Systematic Problem Solving and the Error of the Third Kind," *Behavioral Science* (19), 1974, pp. 383-393.
- Mostow, J. "Toward Better Models of the Design Process," *The AI Magazine* (6:1), Spring 1985, pp. 44-57.
- Munro, M.C. and Wheeler, B.R. "Planning, Critical Success Factors, and Management's Information Requirements," *MIS Quarterly* (4:4), December 1980, pp. 27-38.
- Naumann, J.D. and Jenkins, A.M. "Prototyping: The New Paradigm for Systems Development," *MIS Quarterly* (6:3), September 1982, pp. 29-44.
- Porter, M.E. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*, Free Press, New York, 1980.
- Pyburn, P.J. "Linking the MIS Plan with Corporate Strategy: An Exploratory Study," *MIS Quarterly* (7:2), June 1983, pp. 1-14.
- Rockart, J.F. "Chief Executives Define Their Own Data Needs," *Harvard Business Review* (57:2), March-April 1979, pp. 81-93.
- Rockart, J.F. and Scott Morton, M.S. "Implications of Changes in Information Technology for Corporate Strategy," *Interfaces* (14:1), January/February 1984, pp. 84-95.
- Schendel, D.E. and Hofer, C.W. (eds.), *Strategic Management: A New View of Business Policy and Planning*, Little, Brown and Company, Boston, MA, 1979.
- Schein, E.H. *Organizational Culture and Leadership: A Dynamic View*, Jossey-Bass Publishers, San Francisco, 1985.
- Thomas, J.C. and Carroll, J.M. "Psychological Study of Design," *Design Studies* (1), 1979, pp. 5-11.
- Venkatraman, N. "Research on MIS Planning: Some Guidelines from Strategic Planning Research," *Journal of Management Information Systems* (2:3), Winter 1985-86, pp. 65-77.

About the Authors

John C. Henderson received his Ph.D. from the University of Texas, Austin. He is an associate professor of management science at the Sloan School of Management and a member of the Center for Information Systems Research, M.I.T. Prior to joining the faculty at M.I.T., he served on the faculty at Ohio State and Florida State universities. Dr. Henderson has taught and published in the fields of decision support systems, MIS design and implementation, and the strategic impacts of information technology. His work has appeared in *Management Science*, *MIS Quarterly*, *Journal of Management Information Systems*, *Academy of Management Review*, *Omega* and *IEEE Transactions on Management*.

John G. Sifonis is a partner in the national office of Arthur Young & Co. and is the national director of Strategic Management Services for the firm. He is a graduate of the Case Institute of Technology and has completed additional post-graduate work there and at the University Of Minnesota School of Management. Mr. Sifonis has been a guest speaker at several universities and for The Conference Board. Rated as one of the top 10 MIS consultants according to a recent trade journal, he has appeared on local television stations discussing subjects such as the use of computers in general business and strategic information systems planning. Mr. Sifonis has co-authored articles with Drs. John C. Henderson and John F. Rockart, of the Sloan School of Management, M.I.T.