Strategic Management of the Information Systems Function: Changing Roles and Planning Linkages

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STRATEGIC MANAGEMENT OF THE INFORMATION SYSTEMS FUNCTION:
CHANGING ROLES AND PLANNING LINKAGES

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Summary

Recent writings argue that the management information systems (IS) function should no longer be viewed in its traditional role, but in terms of a strategic role for exploiting IS-based competitive advantages. Rooted in such a strategic role perspective, this paper develops a research model of IS planning effectiveness -- where effectiveness is viewed in terms of the degree of IS support to strategic management of an organization. This model is tested using probit analysis on data from 311 IS organizations. Research results are employed to arrive at a set of important guidelines for redefining the role of the IS function. In addition, broader implications for functional-level planning and future directions for planning systems research are developed.
INTRODUCTION

Within the strategic management field, the three-level categorization of the strategy concept (in terms of corporate, business, and function) is widely accepted (Grant and King, 1979, 1982; Hofer and Schendel, 1978; Lorange and Vancil, 1977). These three levels of strategy are formally linked through the strategic planning processes and systems (see for example, the three-cycle planning process in Lorange and Vancil, 1977, and an alternate two-cycle process in Camillus and Grant, 1980). Such linkages typify that the functional-level strategies are directly derived from the "higher level" strategies.

If one subscribes to the above viewpoint, planning activities at the different functional levels have a well-defined "functional focus." As Hofer and Schendel (1978) noted, "[A]t the functional area level, the principal focus of strategy is on the maximization of resource productivity.... (and) functional area strategy (is) to be constrained by business strategy and is, in turn, to be constrained by corporate strategy." (p. 29). Accordingly, functional planning focuses on the development of action plans and programs to implement relevant areas of the overall business-level strategic plan (King and Cleland, 1978, Lorange and Vancil, 1977), which is derived from the organizational (or, corporate-level) strategic plan.

However, in recent times, there are increasing concerns that the subordination of functional strategies to the business-level strategy may be too restrictive for exploiting potential sources of competitive advantages that may lie within various functional areas. More prominent and central roles are being accorded to many functions in the overall strategic management activity.
Emerging themes include "strategic marketing management"—a strategic or a firm-wide role of the marketing function (e.g., Abell and Hammond, 1979; Wind and Robertson, 1983; Thomas and Gardner, 1985), and "strategic human resource management" highlighting the importance of the human resource function (e.g., Fombrun, Tichy, and Devanna, 1985).

Along similar lines, recent discussions have focused on the possibilities of exploiting function-based competitive advantages. For instance, Skinner (1985), and Wheelright (1984) discuss different modes that can be employed for obtaining competitive edge through the manufacturing function (see also Hayes and Wheelright, 1984). Similarly, Porter and Millar (1985) and Rockart and Scott-Morton (1984) discuss notions of exploiting information-based competitive advantages.

Such conceptualizations accord a more prominent (or "strategic") roles to these functions by virtue of their ability to provide important sources of comparative advantages. Consequently, the scope of functional-level planning is broader than the development of action plans and programs to implement the chosen strategy, but in fact drive the formulation and evaluation of strategies, both at the business and corporate levels.

This paper focuses on the role played by the information systems (IS) function in the overall strategic management. It begins by contrasting the traditional role assigned to this function with the emerging notions of "strategic role". Based on the strategic role requirements, important planning system design imperatives are identified to develop a research model of IS planning effectiveness. Here, IS planning effectiveness is viewed in terms of the overall support provided by IS in strategic management. Subsequently, this model is tested using data from over 300 U.S. organizations to evaluate the relative importance of the various systems design factors presumed to influence IS planning effectiveness.
This paper is based on two assumptions. One is that formalized planning systems play a major role in enhancing organizational capability to exploit IS-based competitive advantages. While we do not discount the role of other factors especially the external competitive conditions in enhancing these advantages (and in the transformation of these advantages to superior performance), we believe that formalized systems play an important role in providing an institutionalized mechanism to exploit such advantages. Alternatively, these systems (as also the overall formal strategic planning systems) can be construed as necessary but not sufficient for the development of superior strategies, and the attainment of superior performance.

The other assumption is that the initiative to change the role of the IS function and to reorganize the charter and the process of planning at different levels is a general management task which cannot be relegated to the IS function. The magnitude of redefinition in the role specification of this function and the perceived potential to alter the basis of competition that the informational technology apparently possesses (e.g., McFarlan, 1984) makes it an important strategic management issue. As Porter and Millar (1985) noted, "The management of information technology can no longer be the sole province of the EDP department.... general managers must be involved to ensure that cross-functional linkages, more possible to achieve with information technology, are exploited" (p. 159). Hence, this theme is examined here from a strategic management perspective than from a typical functional lens.

THEORETICAL PERSPECTIVES

Key Shifts in the Role Definition of the IS Function

Traditional "Service" Role. The traditional role assigned to the IS function can be derived from the definitions of IS that are commonly employed.
For example, Ein-Dor and Segev (1978) define IS "as a set of facilities and personnel for collecting, sorting, retrieving, and processing information which is used, or desired, by one or more managers in the performance of their duties" (p. 1631). Similar views are echoed by Ives, Hamilton, and Davis (1980) who define IS "as a computer-based organizational information system which provides information support for management activities and functions" (p. 910). Both definitions imply a "service" role to the IS function, charged primarily with the task of efficient and effective data processing to provide the required information for decision making.

Such a role specification is typical although some have argued defining the role in line with the organizational strategy. For example, Zani (1970) noted that "strategy should exercise a critical influence on information systems design" (p. 98), while King (1978) argued that the "IS-strategy set" (composed of IS objectives, IS constraints, and IS design strategies) should be derived from the "organization's strategy set" (composed of organizational mission, objectives, and strategies). However, such conceptual arguments do not appear to have produced the necessary results, as indicated by King's observation in 1983. He noted that IS is still viewed as a "service function that is periodically turned on and off as needed, much as the hot water and air conditioning are turned on and off as needed" (King, 1983).

Emerging "Strategic" Role. The need to redefine IS appears to have gathered momentum over the last two to three years. The current thinking is that the IS function is a critical area of operations (much like product quality, technological developments, and efficient manufacturing) that may provide opportunities for exploiting information-based comparative advantage.

In this perspective, information systems and the constituent technologies can be used to alter the definition of the industry structure, redefine corporate strategy, and reorient a company's business (competitive) strategy.
(For an overview, see Benjamin, Rockart, Scott-Morton, and Wyman, 1984; Parsons, 1983; Porter and Millar, 1985; Rockart and Scott-Morton, 1984.) Many illustrations of exploiting IS-based competitive advantages have been cited in the popular press (e.g., Business Week, 1985), where the more popular examples include: Merrill Lynch's Cash Management Account, and Dun and Bradstreet's new product blitz as illustrations of information-based new products; Foremost-McKesson's use of information systems to gain a competitive edge in a wholesale distribution business (that is not traditionally viewed as "information-intensive"). See Wiseman (1985) for detailed descriptions of various uses of information systems to gain competitive advantages. What is interesting and perhaps significant is that the possibilities of exploiting IS-based strategic advantages are not limited to some specific, so-called "information-intensive" industries -- which argues well for a generic transformation in the role definition of the IS function.

The Planning Systems Imperatives

The role transformation requires appropriate changes in management structure (such as responsibility and reporting relationships) and management systems and processes (especially, IS planning systems and its linkage to business planning). A logical corollary is that appropriate changes should be made in the goals set for IS planning as well as the criteria for evaluating IS planning effectiveness. We elaborate on this notion below.

When charged with a "service role," IS planning activities focus largely on the technical and organizational requirements to support information dissemination for decision making at different levels of the organizational hierarchy. Here, the goal "is to effectively meet the organization's information needs while managing the uncertainty that tends to surround the information resource" (Zmud, 1983; p. 275). Hence, IS planning effectiveness can be
evaluated using indicators such as (a) system use (e.g., Ein-Dor and Segev, 1978) or (b) user information satisfaction (e.g., Bailey and Pearson, 1983).

In contrast, the goals for IS planning and approaches to evaluate IS planning effectiveness are vastly different when the IS function is charged with a "strategic" role as discussed earlier. IS planning activities resemble organizational strategic planning activities that seek to exploit opportunities in the marketplace by appropriately matching them to internal capabilities and resources (see King and Cleland, 1978; Lorange and Vancil, 1977 for details of organizational strategic planning processes). Specifically, IS planning activities are not limited to hardware configurations and software support but extend to scanning relevant technological sectors to identify opportunities that can be exploited. Similarly, IS planning effectiveness should be evaluated in terms of the degree of achievement of IS planning objectives -- which reflect the redefined "strategic" role.

Rooted in the "strategic role" perspective of the IS function, a research model specifying the impact of important characteristics of IS planning systems on IS planning effectiveness is developed in the next section.

RESEARCH MODEL

The research model is based on two components -- a set of independent variables (important theoretical dimensions of IS planning system) that are related to a dependent variable (IS planning effectiveness conceptualized in terms of achievement of multiple goals of IS planning).

Theoretical Dimensions of IS Planning

The research stream on IS planning can benefit from the progress made in the research stream on strategic planning systems, and several guidelines have been suggested (Venkatraman, 1985). Specifically, if one is interested in
understanding the complex nature of the relationship between planning activities and planning effectiveness, a uni-dimensional conceptualization of planning is to be avoided. Based on a review of the planning literature, we identified five theoretical dimensions. Our interest was to balance parsimony on the one hand, and relevance and importance on the other hand. The dimensions are:

(i) the degree of perceived dependence on IS
(ii) the responsibility assigned for the IS planning function
(iii) the degree of linkage between information systems planning and business planning
(iv) the span of technology coverage in IS plan development; and
(v) the comprehensiveness of the IS plan.

Each dimension is discussed below to provide justifications for its inclusion in the research model. Hypotheses relating these dimensions to IS planning effectiveness are also developed.

Perceived Dependence on MIS. A major impetus to view IS from a strategic role perspective is likely to be the perceived opportunity or a vision in the minds of senior managers that IS-based strategic advantages can accrue to the organization. Alternatively, we note that managers' perception that their business (and their strategies) are critically dependent on IS is an important requisite to reorient the role of the IS function. Wiseman (1985) attributes the successful exploitation of IS-based competitive advantages in companies like Dun and Bradstreet, McKesson and Bancone to the managerial vision and perception of the link between their strategies and IS.

Managerial perceptions have long been argued to be an important variable in strategic management research. The underlying logic is that it is the managerial perception (rather than some abstract notion of objective reality) that guides managerial action and decision making (e.g., Anderson and Paine,
1975; Weick 1979). Based on such arguments, our view is that this perceived dependence is likely to be positively related to IS planning effectiveness. Stated more formally, we have our first hypothesis as follows:

H1: Perceived dependence on IS will have a positive and significant effect on IS planning effectiveness.

Planning Responsibility. A key aspect of the role transformation lies in effectively organizing the planning activities that seek to integrate different "islands of technology" (McFarlan and McKenney, 1984) as well as identifying new avenues for exploiting comparative advantages. Effective planning requires the assignment of managerial talent and resources commensurate with the importance attached to the activity. If a firm realizes the potential of IS in its own context and perceives the importance of IS planning, then it would be reflected in assigning senior-level managers to carry out the planning function (see Steiner, 1979 for a discussion in a parallel context of strategic planning). On the other hand, if the planning responsibility lies with ad hoc and transient planning staff, then the planning activities are not likely to be co-ordinated, which is unlikely to enhance IS planning effectiveness. Thus, our second hypothesis is:

H2: Planning responsibility will have a positive and significant effect on IS planning effectiveness.

Planning Linkage. This is perhaps the most important dimension influencing IS planning effectiveness by virtue of linking the functional level IS planning activities with business planning. Such a linkage serves as an important two-way conduit. By ensuring appropriate linkages across the two levels, the requirements and constraints of the IS function can be reflected in business-level considerations, and the concerns of the business level can
be appropriately translated at the level of the IS function. A parallel theme in strategic planning is the oft-emphasized need for ensuring linkage between the various cycles of the planning process (Camillus and Grant, 1980; Lorange and Vancil, 1977), which is critical for strategy implementation.

Many conceptual arguments (e.g., King, forthcoming), as well as the results of exploratory studies (Pyburn, 1983) highlight the importance of this dimension in the overall IS planning process. Based on these, our expectation is that the degree of linkage between IS planning and business-level planning will be positively related to IS planning effectiveness. Thus, our third hypothesis is:

H3: The degree of planning linkages between IS planning and business planning will have a positive and significant effect on IS planning effectiveness.

**Span of Technology Coverage.** This dimension seeks to capture the breadth of coverage of the technological environment in IS planning. Normative and descriptive writings in the strategic planning literature emphasize the importance of environmental scanning in strategic planning (Camillus and Venkatraman, 1984; Fahey and King, 1977; Thomas, 1980) including the need to recognize and respond to weak signals (Ansoff, 1975). In the context of IS planning (with a particular focus on exploiting information technology-based strategic advantages), it is particularly critical to scan the technological sector to identify possible mechanisms that can be used to gain strategic advantages. Our expectation is that the span of technology coverage will be positively related to IS planning effectiveness. Thus, our fourth hypothesis is:

H4: Span of technology coverage will have a positive and significant effect on IS planning effectiveness.
Comprehensiveness of MIS Plan. While the above dimension focuses on the technological sector, this dimension reflects the degree of comprehensiveness of the IS plan document. We view a comprehensive plan document as one that incorporates a wide array of strategic factors such as alternative technological projections and alternative business projections, as well as specific plans for areas such as equipment, software, systems development, etc. The completeness of the plan document may not be as critical as the planning process that produces the final plan document (King and Cleland, 1978). Since the comprehensiveness of the process cannot be adequately captured, except perhaps through participant observation or laboratory studies, we make the assumption that the comprehensiveness of the plan document is at least an adequate indicator of the underlying process and will be positively related to IS planning effectiveness. Thus, our fifth, and final hypothesis is:

H5: Comprehensiveness of the IS plan will have a positive and significant effect on IS planning effectiveness.

IS Planning Effectiveness

Assessing the effectiveness of IS planning (or its broader version of organizational strategic planning) has been an area of controversy and debate. We reflect the important concerns in the literature on strategic planning effectiveness (e.g., Camillus, 1975; Hax and Majluf, 1984; King, 1983; Lorange and Vancil, 1977) and IS planning effectiveness (e.g., King, 1984), in conceptualizing IS planning effectiveness. We derive two guidelines for our conceptualization. The first is that a goal-based approach (evaluating in relation to a specified objective for IS planning) should be employed instead of using either generic indicators or financial performance surrogates (King, 1984). The other reflects concerns of the broader organizational effectiveness literature (Steers, 1975) and calls for the use of multiple indicators to capture the complex notion of IS planning effectiveness.
Based on these guidelines, IS planning effectiveness is viewed in terms of the degree of success achieved in relation to three important goals: (a) business programs are assured of IS support; (b) development of a strategy for the selection of information technologies; and (c) development of appropriate scheme for allocation of IS resources. The first indicator is reflective of a position that IS is interwoven with the business programs (King, forthcoming; Benjamin et al, 1984). The second seeks to capture the notions of "technology strategy" within the IS function, but one that reflects broader implications and ramifications (McFarlan and McKenney, 1984). The third indicator taps a more conventional facet of IS planning, namely allocating IS resources which, in recent years, has been steadily increasing in value and importance for most organizations.

Thus, the three indicators reflect non-overlapping facets of IS planning effectiveness, and taken together capture the central notions of the effectiveness concept. Instead of combining them into one overall concept (which may not be meaningful), we test the hypotheses separately for each indicator. The research model is shown in Figure 1.

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INSERT FIGURE 1 ABOUT HERE

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RESEARCH METHOD

This section describes our research method and focuses on the following issues: (a) the data collection procedure; (b) operationalization of constructs— including assessment of measurement properties; and (c) the data analytical scheme for testing the set of five hypotheses.
Data

Data for this research study were obtained from a larger project on the role of information systems planning in meeting business objectives. This project was conducted in 1982 by Cresap, McCormick and Paget, Inc., a management consulting firm, and a detailed description of the data collection procedure and general trends uncovered by the study are provided in a report published by them. Briefly, the questionnaire was pretested with the help of senior executives of information systems function in eleven companies. The finalized instrument was mailed to the chief executives or chief financial officers or senior managers of the information systems function of 1500 large U.S. corporations. 334 firms responded to the study representing a response rate of over 22%. A subset of the database consisting of 311 cases (that provided full data on the variables necessary for testing the research model) is employed for the analysis carried out here.

Operationalization of Constructs

Operationalization and measurement issues generally have received inadequate attention in strategy research (Venkatraman and Grant, 1986) which limits the substantive interpretation and cumulative theory development and testing. To address this requirement, we paid particular attention to the operationalization and measurement issues in this study. Four of the five independent variables (except planning responsibility) were operationalized using multi-item scales. The dimension reflecting planning responsibility was scored as either 1 (dedicated senior-level planner) or 0 (ad hoc planning staff), and IS planning effectiveness was operationalized using the three indicators noted earlier, each scored as 1 (realization of the planning goal) or 0 (not realized). Detailed operationalizing scheme (and assessment of measurement properties) for the four multi-item independent variables is
discussed below. The specific set of indicators representing the four constructs along with the anchors employed for calibrating them are listed in the Appendix.

**Perceived Dependence on MIS (DEPEND).** This was measured as a five-item Likert-type scale as indicated in the Appendix. The unidimensionality and measure reliability of this construct was assessed using the principles of confirmatory factor analysis that allow for the incorporation of measurement errors (Bagozzi, 1980; Joreskog and Sorbom, 1978). Analyses were carried out using the LISREL IV program (Joreskog and Sorbom, 1978). Maximum likelihood estimates for the unidimensionality criterion were: $\chi^2 (df:5) = 16.71$, $p \leq .01$, Bentler and Bonnet (1980) index; $\Delta = 0.95$; and the measure reliability is indicated by $\rho_c = 0.733$, and Cronbach alpha = 0.71. These statistics provide strong support that the construct is unidimensional and that the measure is reliable.

**Planning Linkages (LINK).** This was also measured as a five-item Likert-type scale as shown in the Appendix. Measurement test procedures were similar to the one for the DEPEND dimension, and maximum likelihood estimates from the LISREL IV program were: $\chi^2 (df:5) = 7.47$; $p \leq 0.188$; $\Delta = 0.98$; $\rho_c = 0.76$, and Cronbach alpha = 0.798. Again, these statistics support not only the unidimensionality criterion but also the reliability requirement.

**Span of Technology Coverage (TECH).** One overall measure reflecting the number of different technologies that are formally coordinated, monitored, and overseen by the IS function is employed as the operational measure for this dimension. This is an indication of the breadth of coverage of the technology sector.

**Comprehensiveness of MIS Plan (COMPR).** Eight strategic factors were rated as to whether each is included or not in the development of the plan.
Data analysis to evaluate the existence of a cumulative hierarchical pattern (i.e., a Guttman-type scale) indicated positive results (coefficient of reproducibility = 0.885). Guttman-type scales have been shown to be useful in measuring strategic planning (Wood and LaForge, 1981) instead of adopting crude dichotomizations. Thus, a Guttman-type scale with range from 0 (not comprehensive) to 8 (fully comprehensive) was used to measure this dimension.

Data Analysis

Since the dependent variable(s) in this study was measured using a two-level dichotomous scale (realization of goals or not), the research model was tested using probit analysis. An ordinary least squares (OLS) regression cannot be used since the underlying assumption of continuous dependent variable is violated, and the implication is that the estimates of sampling variance will be biased and the tests of significance and confidence intervals computed based on this variance will be invalid, even for large samples (see, for instance, Aldrich and Nelson, 1984).

In this probit model estimation, the dependent variable can be interpreted as "propensity to realize the goal set for IS planning". The equation underlying the model developed in this study can be specified as follows:

\[
E_i = C + B_{1i} \text{DEPEND} + B_{2i} \text{RESP} + B_{3i} \text{LINK} + B_{4i} \text{TECH} + B_{5i} \text{COMPR}
\]

where,

\[ E_i \] = Effectiveness in IS planning for \( i=1,2,3 \) (i.e., three separate indicators)

DEPEND = Perceived dependence on IS

RESP = Planning responsibility

LINK = Linkage between IS planning and business planning
TECH = Span of technology coverage
COMPR = Comprehensiveness of IS plan

The hypotheses developed in the previous section predict that all the coefficients, B1, B2, B3, B4, and B5 (for each of the three indicators of effectiveness) would be positive and statistically different from zero.

Two additional steps of data analysis were carried out to test the stability of the coefficient to ensure internal validity of results. In the first step, the model was reanalyzed in four subsamples with 25% of the sample randomly deleted each time. If the significance of the coefficients fluctuate in the subsamples, then the internal validity criterion is not satisfied, and more focused subsample analyses based on specific descriptive criteria may have to be carried out. In the second step, the model was reestimated using a two-group discriminant analysis, which serves to ensure that the results are not sensitive to the various assumptions that underlie the different statistical models.

RESULTS

Table 1 reports the descriptive statistics and Pearson's zero-order correlations among the independent variables. Table 2 reports the results of the Probit analyses for the three runs using the CRAWTRAN program (Avery, 1978). Three overall statistics are of interest in addition to the magnitude and statistical significance of the individual coefficients. These are: (1) overall likelihood ratio statistic; (ii) pseudo $r^2$; and (iii) the proportion of correct classification. These are discussed below.
First, the likelihood ratio statistic which follows a $\chi^2$ distribution tests the joint hypotheses that all the coefficients in equation (1) except C are zero. This is analogous to the F-Statistic in the OLS regression equation. Thus, the full model's ability to explain a significant portion of the variation in the effectiveness of IS planning is tested using the following likelihood ratio statistic (Altman, Avery, Eisenbeis, and Sinkey, 1981):

$$-2[\ln L - \ln L'] \sim \chi^2 (m-1)$$

where,

- $m$ = number of independent variables
- $\ln L$ = log likelihood of the function of the Probit analysis
- $\ln L' = \alpha \ln(a/T) + b \ln(b/T)$.
- $\alpha$ = number of effective planners (those that realized the particular goal)
- $b$ = number of ineffective planners, (those that did not realize the particular goal), and
- $T$ = $a+b$ (total number of observations used)

As reported in Table 2, the chi-squared statistic for each of the three runs is significant at $p \leq .01$.

The second indication of the overall explanatory power is the pseudo $r^2$ statistic as defined by Domencich and McFadden (1975):

$$\rho^2 = 1 - \ln L/\ln L'$$

the values of $\rho^2$ for the three runs range from 0.108 to 0.166, and can be interpreted similar to $r^2$ values of OLS regressions. The third procedure for evaluating the model's explanatory power is to examine the percentage of correct classifications. For the first goal, the full model from the probit analysis correctly classified 67.9% of the companies, while a naive model that
classifies all organizations as not achieving the particular goal would have classified only 52.3%. Similar interpretations can be made regarding the other two goals, where the estimated model classified a significant higher proportion than the corresponding naive models. These three statistics taken together provide support for the models developed and tested here.

Further, in the subsample analyses to test the stability of the results, all the statistically significant variables (p < .10) retained the same hypothesized sign and the same general level of statistical significance in each run, and the probit functions classified over 60% of the holdout sample correctly, at a minimum. The other test employed discriminant analysis to cross-validate the results. This set of analyses for the three dependent variables yielded similar results as the probit results reported, attesting to the robustness of the results. (Results of the subset probit analyses and discriminant analyses are provided in a technical appendix available from the authors.)

DISCUSSION

In the discussion section, we begin by interpreting the research results for organizing IS planning activities. Subsequently, we develop implications for functional-level planning and identify future directions for planning systems research in general.

Interpretation of Research Results

Several interesting and important issues emerge from the research results reported earlier. To begin with, the overall research model is supported, indicated by three different test statistics. The various theoretical dimensions argued to significantly influence the achievement of a set of important goals for IS planning emerged as significant (with the exception of
the assignment of planning responsibility). Planning responsibility did not emerge significant in any of the probit runs (including the subsample analyses and the discriminant analyses) indicating that it has a negligible role in the attainment of the goals. It appears that it is more important to focus on the development of a comprehensive plan, widely scan the technology sector and link the IS plan with the strategic plan than be concerned with who is organizing and co-ordinating the planning efforts. The ensuing discussion focuses on the interpretation of those hypotheses that received empirical support in this study.

The first hypothesis on the importance of perceiving the dependence on IS and IS-based technologies was supported in two out of the three probit runs. It is particularly interesting that it emerged significant in relation to the achievement of IS support for business programs and the development of a strategy for the selection of information technology but not for the allocation of IS resources. Perception of opportunities rooted in IS and information technology could be expected to result in supporting the business programs but need not play a major role in the resource allocation process. Thus, the failure of the coefficient $B_1$ to achieve statistical significance in the third run is not a major weakness in the model. Results of testing the fourth hypothesis of the importance of the span of technology coverage were similar to the results for the first hypothesis and can be similarly interpreted.

The third hypothesis specified that the link between IS planning and business planning would be positively and significantly related to the three indicators of IS planning effectiveness. As indicated in Table 2, the three coefficients are in the expected direction, and statistically significant at p-levels better than 0.01. The magnitudes of these coefficients and their corresponding strong t-values attest to the importance of linking the formalized processes of IS planning with the overall firm-level planning which
seeks to match organizational capabilities with market opportunities. The results support King's (1978) call for linking IS strategy set with organizational strategy set.

The final hypothesis linking the comprehensiveness of IS plan with different indicators of IS effectiveness was supported in all the three runs. The strongest support was in relation to the second indicator of effectiveness (development of a strategy for the selection of information technologies). This is in line with the expectation that the exhaustive coverage of strategic factors such as technology projections or business projections (details in the Appendix) is likely to result in systematically identifying the specific subset of information technologies that are likely to be useful for the organization. If we view the comprehensiveness of IS plan as a reflection of McFarlan and McKenney's (1984) call for integrating different islands of technology, the results can be interpreted to provide empirical support to their call for organizing to integrate different facets of the IS function.

**Implications for Functional-Level Planning**

The results of this study can be used to develop implications beyond IS planning for functional-level planning in general, especially those that have important roles in the strategic management of the organization.

The first implication focuses on the linkage between functional planning and organizational planning. Although strong conceptual arguments have been advanced in favor of such linkages (e.g., Lorange and Vancil, 1977), developing and implementing such linkages poses serious challenges. For example, Golden and Ramanujam (1985) discuss the problems associated with integrating human resource planning with strategic planning, and note that the integration can be best described as "between a dream and a nightmare". If benefits from emergent concepts like "strategic marketing", strategic human resources" have
to be realized by organizations, appropriate planning linkages have to be ensured. This is a major administrative challenge for managers at the functional levels and at the integrative level of corporate management.

The second important implication for functional-level planning relates to planning goals. This paper argued for a "strategic" perspective on the IS function and identified goals reflecting this perspective. Every function should be viewed in terms of two integrated "goal-sets" -- one reflecting its role in the general management of the organization, and the other reflecting its operational role (action plans and programs necessary to implement the plans). Our emphasis on the 'strategic' role of the IS function in the model development should not be construed as neglecting the "operational role" of informational support. While the research model, by necessity, focused on a narrow facet of goals reflecting the "strategic role", we would like to emphasize that the "operational role" is equally important and that planning activities should be organized to achieve both sets of goals.

Implications for Planning Systems Research

The role of formalized planning systems in strategic management is an important area of research (Schendel and Hofer, 1979). While most studies have focused on the link between dichotomous view of planning (planner vs. non planner) and financial performance, a recent set of studies (Ramanujam, Venkatraman, and Camillus 1986; Rhyne, 1985; Venkatraman and Ramanujam, 1985) have significantly departed from such a mode. These studies employed multiple dimensions of planning systems and multiple dimensions of planning effectiveness. However, those dimensions did not reflect functional-level planning that was shown here to have a strategic role. We would urge that future research on formalized planning systems and processes incorporate important facets of functional planning that link the key functions to the overall strategic planning.
CONCLUSIONS

A theoretical model of important characteristics of IS planning that seek to enhance the attainment of a "strategic" role of the IS function was developed and tested using data from 311 U.S. organizations. The important characteristics seem to be the degree of linkage between IS planning and strategic planning, perceived dependence on IS, the comprehensiveness of IS plan, and the span of technology coverage. These pose administrative challenges both at the level of the IS function and at the level of the corporate management. Implications for functional level planning and future research directions on planning systems are also noted.
REFERENCES


Table 1

Descriptive Statistics and Pearson's Product-Moment Correlations Among Independent Variables
(n=311)

<table>
<thead>
<tr>
<th>Variables</th>
<th>DESCRIPTIVE STATISTICS</th>
<th>CORRELATION MATRIX</th>
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<td>Mean</td>
<td>Sd</td>
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<td>1 RESP</td>
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<td>5 COMPR</td>
<td>8.0740</td>
<td>1.7954</td>
</tr>
</tbody>
</table>

*** p < .01
** p < .05
* p < .10
## Table 2

Summary of Probit Results

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Dependent Variable</th>
<th>IS Support for Business</th>
<th>Strategy for Selection of Information Tech</th>
<th>Allocation of IS Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Coeff</td>
<td>t-Statistic</td>
<td>Coeff</td>
</tr>
<tr>
<td>Planning Responsibility (RESP)</td>
<td>0.1647 0.9874</td>
<td>0.2033 1.179</td>
<td>0.045 0.2701</td>
<td></td>
</tr>
<tr>
<td>Firm's Dependence on IS activities (DEPEND)</td>
<td>0.5729 2.9834</td>
<td>0.4151 2.116</td>
<td>0.2726 1.45</td>
<td></td>
</tr>
<tr>
<td>Linkage between IS and business planning (LINK)</td>
<td>0.8277 4.3460</td>
<td>0.8551 4.303</td>
<td>0.8111 4.26</td>
<td></td>
</tr>
<tr>
<td>Span of Technology coverage (TECH)</td>
<td>0.1023 1.6828</td>
<td>0.1075 1.728</td>
<td>-0.0225 -0.377</td>
<td></td>
</tr>
<tr>
<td>Comprehensive of IS Plan (COMPR)</td>
<td>0.0873 1.741</td>
<td>0.1395 2.617</td>
<td>0.0941 1.918</td>
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</tr>
<tr>
<td>Sample size (n)</td>
<td>308</td>
<td>295</td>
<td>302</td>
<td></td>
</tr>
<tr>
<td>log-likelihood function</td>
<td>-180.481</td>
<td>-170.356</td>
<td>-185.466</td>
<td></td>
</tr>
<tr>
<td>$\chi^2$(df)</td>
<td>59.38(4)</td>
<td>67.84(4)</td>
<td>44.74(4)</td>
<td></td>
</tr>
<tr>
<td>p-level $&lt;$</td>
<td>.001</td>
<td>.001</td>
<td>.001</td>
<td></td>
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</table>

**PROPORTION OF CLASSIFICATION**

<table>
<thead>
<tr>
<th></th>
<th>Naive Model</th>
<th>Full Model</th>
<th>Pseudo r$^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.523</td>
<td>0.679</td>
<td>0.154</td>
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<tr>
<td></td>
<td>0.519</td>
<td>0.675</td>
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<tr>
<td></td>
<td>0.55</td>
<td>0.646</td>
<td>0.108</td>
</tr>
</tbody>
</table>

*** $=$ p $<$ .01  
** $=$ p $<$ .05  
* $=$ p $<$ .10
Figure 1

Theoretical Model of Key Relationships
Between IS Planning Dimensions and
IS Planning Effectiveness

PERCEIVED DEPENDENCE
ON THE IS FUNCTION
(DEPEND)

PLANNING RESPONSIBILITY
(RESP)

LINKAGE BETWEEN
IS PLANNING AND
BUSINESS PLANNING
(LINK)

SPAN OF TECHNOLOGY
COVERAGE IN IS
PLAN (TECH)

COMPREHENSIVENESS OF
IS PLAN (COMPR)

H1(+)  

H2(+)  

H3(+)  

H4(+)  

H5(+)

IS PLANNING
EFFECTIVENESS
(Achievement of IS goals reflecting the strategic role of IS)

H1 to H5 indicate the corresponding hypotheses developed in the text. The signs indicate the hypothesized sign for the relationships.
APPENDIX: MEASUREMENT SCALES

I. Perceived Dependence on MIS (DEPEND). This was measured using a three-point Likert-type Scale (ranging from applies precisely to does not apply) on the following five items: (i) our enterprise could function without information systems, although less efficiently (R); (ii) information systems provide operational support; (iii) our enterprise is critically dependent on smoothly functioning information systems; (iv) information systems are an integral part of our products and services; and (v) information systems have been of vital importance.

II. Planning Linkage (LINK). This was measured using a three-point Likert-type Scale (ranging from applies precisely to does not apply) on the following five items: (i) business plan states information system needs; (ii) the is plan refers to business plans; (iii) IS plans are closely checked against business plans; (iv) line and staff managers participate actively in information systems planning; and (v) business planning calendars and IS planning calendars are carefully synchronized.

III. Span of Technology Coverage (TECH). This was measured by counting the number of different technologies from among the following list that the IS function co-ordinated, or monitor: (i) computer-based systems; (ii) data communications; (iii) voice communications; (iv) personal computers; (v) word processing; and (vi) data base management systems.

IV. Comprehensiveness of the MIS PLAN (COMPR). This was measured based on a Guttman-type hierarchical pattern reflecting the consideration of the following factors in the development of the plan -- (i) alternative technology projections; (ii) staff development; (iii) financial projections; (iv) telecommunications plans; (v) data base plans; (vi) system development projects; (vii) equipment plans; and (viii) software plans. The support for the hierarchical pattern is provided by the coefficient of reproducibility of 0.885, greater than the threshold level of 0.85.