

The Relationship of Information Usage Characteristics to Planning System Sophistication: an Empirical Examination

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Summary

The relationship between corporate-level planning and information systems was examined empirically. A continuum of planning system sophistication was constructed based on the level of openness to outside influences combined with the planning horizon. Future-oriented, external and environmental types of information were found to be strongly correlated with increased planning sophistication. The impact of environmental turbulence (complexity-volatility) on planning systems also was examined. Complexity was strongly correlated with planning sophistication, whereas no relationship was found between volatility and planning sophistication.

Planning has long been identified as an essential function of management. However, in recent years dissatisfaction with the output of planning systems has grown. Although this has led some to question the value of planning (Leontiades and Tezel, 1980; Kiechel, 1982), most managers still feel uncomfortable leaving the future direction of their organization entirely to chance.

The problem is not with the fundamental utility of planning, but rather with the nature of the planning systems (Higgins, 1981; Peters, 1982; Peters and Waterman, 1982). As actually implemented, many planning systems bear little resemblance to the process described in strategic management literature. In an appraisal of current planning systems in the United States, Steiner (1983) concluded that 'clear identification of purposes of strategic planning' and 'strategic thinking' were two areas in which actual planning systems fell short of the ideal.

A major reason for the failure of firms to conduct true strategic planning appears to be related to a lack of awareness of the significance of appropriate types of information to facilitate that process. The importance of relevant information to strategy formulation has frequently been emphasized in the literature (Chandler, 1962; Ansoff, 1965, 1979; Andrews, 1971; McNichols, 1977; Hofer and Schendel, 1978). In addition, a number of authors have described specific systems to provide strategic information (King and Cleland, 1974; King, Dutta and Rodriguez, 1978; Radford, 1978; King and Rodriguez, 1981; Grant and King, 1982). Other authors have presented techniques by which executives can break down preconceived patterns of thought to identify the information necessary to support their strategic decision-making (Mitroff and Emshoff, 1979; Klein and Newnan, 1980; Cosier, 1981).

More recently, information systems have been increasingly discussed as a means of gaining strategic advantage (Gerstein and Reisman, 1982; McFarlan, 1984). However, articles in this area have been primarily prescriptive and based on anecdotal evidence. Relatively little empirical research has been conducted on the nature of strategic information and the manner in which it is incorporated into the planning process.

This study investigated corporate-level planning systems and the information collected to support that process to determine if the procedures recommended by the literature were actually reflected in practice. Since the need for strategic planning becomes particularly acute in periods of high environmental turbulence, the impact of perceived environmental complexity and volatility on information requirements as well as the character of the planning effort itself was also examined.

CONCEPTUAL OVERVIEW

Strategic management theory holds that the fundamental goal of planning is to produce a strategy which achieves a 'match', 'fit' or 'alignment' of internal resources and capabilities with external opportunities and threats (Andrews, 1971; Hofer and Schendel, 1978; Ansoff, 1979; Summer, 1980). However, it must be remembered that 'planning' is a multi-dimensional concept.

Planning systems will vary depending on their time horizon, the level of the organization at which the planning takes place and the objectives of management. A 1-year operating plan or budget is probably the most prevalent form of planning. However, in order for planning to be effective a longer-term perspective corresponding to the length of time necessary to execute a strategy is required.

Executives also address strategy formulation at a number of levels (McNichols, 1977; Hofer and Schendel, 1978). 'Primary' or corporate-level strategies define the domain of an organization, and 'secondary' or business-level strategies address the manner in which the organization will compete in that domain (Bourgeois, 1980).

The purposes for which managers establish planning systems also differ. Eliasson (1976) identified analysis and control as two distinct aspects of planning. Lorange (1980) made a similar distinction between adaptive and integrative aspects of planning. Leontiades (1980) characterized these aspects as evolutionary planning and steady-state planning. The analysis or adaptive dimension addressed external factors and responded to environmental change, whereas the control or integrative dimension focused on the co-ordination of internal resources. Strategic management theorists have tended to emphasize the analysis/adaptive dimension, whereas practitioners have tended to focus on the control/integrative dimension (Eliasson, 1976).

Considerable debate has taken place on whether it is desirable or even possible to conduct strategic decision-making in a formal planning system. A number of authors have held that planning in large, complex and diverse organizations can be effectively managed only by the use of formal systems (Aguilar, Howell and Vancil, 1970; Uytterhoeven, Ackerman and Rosenblum, 1973; Hofer and Schendel, 1978). However, other authors have argued that strategy formulation primarily takes place on an informal basis and is not necessarily communicated to the organization as a whole (Wrapp, 1967; Mintzberg, 1973; Quinn, 1980).

Camillus (1982) labelled the first position as synoptic formalism (comprehensive planning) and the second as logical incrementalism, and concluded that both approaches

have an appropriate role. Extensive analysis leading to a major shift in strategy (synoptic formalism) can and should take place only infrequently. The intervening period could be used to refine the execution of the strategy (logical incrementalism). However, some means of monitoring the environment between the synoptic formalism exercises would be required to ensure that the assumptions upon which the strategy was based remained valid.

Regardless of the process by which it takes place, the analysis/adaptive (openness) dimension must be addressed for true strategic planning to take place. Within this context strategic planning is qualitatively different from *long-range* planning. In strategic planning the firm's domain remains open to investigation and redefinition. Long-range planning assumes the firm's domain to be essentially given.

The external search or environmental scan required by strategic planning leads the organization to attempt to secure new and different types of information not readily available from the organization's transactional information system (Davis, 1974; Radford, 1978). This information tends to be qualitative, aggregated and external to the organization and is often communicated through informal channels (Hayes and Radosevich, 1974; Mintzberg, Raisinghani and Theoret, 1976; Gordon, Larcker and Tuggle, 1978). Ansoff (1979) held that the degree to which an organization is successful in integrating such information into its planning will determine the level of strategic thrust of that organization.

A number of previous studies have provided some insight into the relationship between planning and information. Eliasson (1976) concluded that the analytical/adaptive dimension was unlikely to be addressed in formal planning systems. At the time of his study such systems concentrated almost entirely on financial data.

Human sources of information have been found to be particularly important to environmental scanning (Kefalas and Schoderbek, 1973; Keegan, 1974). Other researchers have concluded that a major portion of strategic information gathering had taken place only on an informal and irregular basis (Aguilar, 1967; Keegan, 1974; Fahey and King, 1977). More recently, Thomas (1980) reported that environmental scanning systems were well established in very large multinational companies. However, Jain (1984) found that only 29 per cent of the *Fortune* 500 companies responding to his survey had developed formal environmental scanning systems. The quality of these systems evolved over time and the existence of a 'formalized system of strategic planning' was found to be a prerequisite to the development of a structured environmental scanning system.

Palia, Hitt and Ireland (1980) found that the importance of internal functional areas varied depending on a firm's overall strategy. Hitt, Ireland and Stadter (1982) concluded that a proper match between the importance of certain internal functions and a firm's grand strategy was related to performance. The importance of external and environmental factors could also be expected to vary with the nature of a firm's planning system.

Not all planning takes place at the same level of sophistication. Lorange and Vancil (1976) described an evolutionary development of planning systems within organizations. They proposed that as the planning effort matured, the characteristics of that effort would shift, reflecting management's increased familiarity with the planning process. Higgins (1981) found that 'mature' planning systems addressed different problems in comparison with recently introduced systems. Miles, Snow and Pfeffer (1974) and Ansoff (1979) have suggested that organizations may conduct their planning at various levels of openness with success dependent on whether the level matched the environmental turbulence facing the organization.

In this study, corporate-level planning systems were assumed to exist on a continuum of

Table 1. Expected relationship between type of planning and information

	Characteristics of type of planning			Characteristics of information	
	Mission/goal/objective	Assumed relationship with environment	Time horizon	Range of information sought	Level of aggregation
Short-term forecasting	Identify near-term operating results	May be either stable or unstable	Less than 1 year	Internal, external	Aggregated
Budgeting	Financial control of operating results	Stable	Normally 1 year	Internal	Very detailed
Annual planning	Identify problems, opportunities and turning points to 'maximize' results on annual basis	Unstable	1 year	Internal, external, some environmental	Detailed
Long-range planning	Identify problems, opportunities, and turning points to 'maximize' results of current or closely related operations over a longer period	Stable	5, 10 or 15 years	Internal, external, close environmental	Detailed
Strategic planning	Identify threats to current operators and new areas where skills may be applied	Unstable	5, 10 or 15 years	Internal, external of strategic nature, wide range of environmental	Aggregated

increasing sophistication, with planning sophistication defined as a combination of the level of planning openness and the planning horizon. This definition conformed to the basic elements of strategic planning models presented by a number of authors (Ansoff, 1965, 1979; Andrews, 1971; McNichols, 1977; Summer, 1980). Five key points on that continuum were defined: short-term forecasting, budgeting, annual planning, long-range planning and strategic planning. Characteristics of each type of planning and the related information requirements as defined in this study are shown in Table 1.

These points were not considered to be discrete categories with individual planning systems moving from one category to another in a step-wise fashion. Rather, a company was expected gradually to adopt an increasing number of the characteristics associated with another point on the continuum until that point more accurately described its planning effort.

This continuum was not intended to describe a firm's complete planning effort, but to focus on those characteristics which have been used to define *strategic* planning. It also was directed at the highest level of planning conducted by a firm. A firm conducting strategic planning at the corporate level might very well conduct long-range planning at the division level. Budgets and annual plans could be prepared at the same time as the longer-term plans or at another point in time. It also is possible for firms to make major shifts in either direction in response to changing conditions. Nevertheless, the purpose of this study is to address the types of information associated with strategic planning as conducted at the corporate level.

Since strategic planning has been defined as more open to outside influences, an increase in the importance of external information would be expected. Empirical support for such a

relationship is likely to provide useful guidance to companies attempting to improve their planning process. Furthermore, data on the specific types of information used should be helpful in the design of information systems to support a firm's planning process.

If the literature is correct regarding a relationship between information and planning systems, the following propositions should be supported.

1. As the planning process becomes more sophisticated, external and environmental types of information will become more important.
2. As the planning process becomes more sophisticated, informal sources of information will become more important.

The concept of environmental turbulence has been closely intertwined with the need for strategy reformulation. A number of authors (Chandler, 1962; Miles, Snow and Pfeffer, 1974; Ansoff, 1979; Camillus, 1982) have contended that as turbulence increases, the impetus for formulation of a new strategy increases. An empirical study by Lindsay and Rue (1978) found support for the proposition that the level of perceived environmental turbulence did affect the planning process and the resulting strategy.

Environmental turbulence has most frequently been discussed as consisting of two dimensions: complexity—the number of factors that must be addressed, and volatility—the rate of change of those factors (Emery and Trist, 1965; Thompson, 1967; Duncan, 1972; Lindsay and Rue, 1978; Ansoff, 1979).

Both of these dimensions are likely to affect the design requirements relating to scope (complexity) and timeliness (volatility) of information systems. However, environmental turbulence should not be viewed as acting directly on planning and information systems, but through the 'strategic choice' of the executives in an organization (Child, 1972). The importance of the chief executive officer's (CEO) active involvement in the planning process also has been emphasized by a number of authors (Andrews, 1971; Drucker, 1974; Eliasson, 1976; McNichols, 1977; Hofer and Schendel, 1978). Thus, we are not addressing an objective measure of turbulence, but rather executives' *perceptions* of complexity and volatility.

The impact of environmental turbulence on a firm's planning and information systems was expected to conform to the following propositions.

3. The greater the perceived complexity of an organization's environment, the more sophisticated its planning system.
4. The greater the perceived volatility of an organization's environment, the more sophisticated its planning system.

The overall relationships among environmental turbulence, information types, information systems and the planning classification are presented schematically in Figure 1. Various types of information, including data on environmental turbulence, are brought to senior management's attention through the firm's information systems, both formal and informal. In response, senior management decides on the appropriate characteristics of the planning process. That decision reflects management's perception of the level of complexity and volatility (both internal and external). The outcome of the planning process is a strategy, which, it is hoped, will have a positive effect on performance.

As a result of management's decision on the nature of the planning to take place, certain types of information are considered relevant. As an organization moves to more

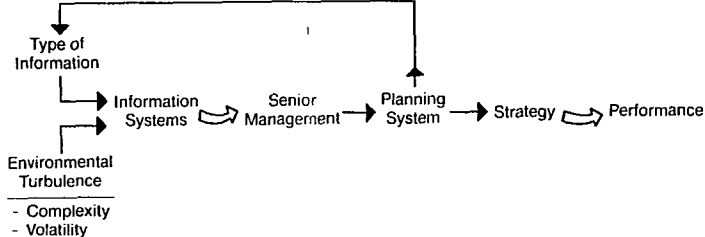


Figure 1. Relationships of information and situational factors to planning systems

sophisticated planning, a wider range of information is considered to be relevant, and the relative importance of different types of information shifts. The new information also may influence the nature of the planning system and, as a result, may alter that system.

METHODOLOGY

The previous major study of the effect of situational variables on the planning process identified 98 variables (Aguilar, Howell and Vancil, 1970). That study sought to define the appropriate design of a formal planning system given the situational characteristics of the organization. The directors of the study concluded that the research had provided useful insights; however, it was not possible to develop a general theory due to the large number of variables involved and the level of complexity of the organizations studied. This outcome was considered by the directors to be highly probable at the initiation of the study.

The objectives of the current study were more limited. This study focused on a specific aspect of the planning process and used a limited number of situational variables.

Population

The study population was defined as large public manufacturing companies found in the *Fortune* 1000 lists. This group was selected for its importance, the availability of information and the relative homogeneity of its activities, compared with utilities, financial institutions and service organizations. See the 'Data Collection' section for a more detailed discussion of the sample.

Research design

The study was organized into two phases. (1) A field study of eight Chicago-area manufacturing firms and (2) a questionnaire survey of large manufacturing firms.

This design was chosen in an attempt to balance the strengths and weaknesses of field studies and questionnaire surveys. The field study was conducted in order to evaluate whether the conclusions drawn from the literature reflected actual operations in industry and to provide guidance in the development of the questionnaire. Field studies, although rich in qualitative data, do not normally contain a large enough sample size to provide a basis for statistical tests of hypotheses. Questionnaire surveys offer the advantage of reaching a larger sample more efficiently. However, the danger that respondents will interpret questionnaires in a different manner than intended by the researcher is always present. In addition, the direction of causality between variables is more difficult to define in a questionnaire survey, and respondents often do not have the opportunity to provide information on additional variables that may affect the relationships under investigation.

Measures

Planning classification

Firms were assigned to the defined categories on the basis of conformity of their planning systems to the strategic planning models previously discussed, coupled with the length of their planning horizons. Respondents were asked to indicate the level of emphasis their corporate-level planning placed on 19 items, derived from the literature and the field study, on a five-point scale ranging from 'no emphasis' to 'strong emphasis' with a 'not applicable' alternative available.

In order to identify items which could be grouped together to represent alternative dimensions of the planning process, the 19 items were evaluated using factor analysis. Eight items, which closely matched the *a priori* definition of strategic planning shown in Table 1, were loaded on a single dimension.

1. An emphasis on new areas of operations (items a and b).
2. An attempt to match internal capabilities with external trends (items c, d, e and f).
3. An assumption that the relationship between the firm and its environment is unstable (items g and h).

These items were used to develop a scale for planning openness, which is shown in Table 2. Cronbach's reliability coefficient α indicates the degree to which error variance is present in a scale (Cronbach, 1970). The scale for planning openness produced a Cronbach's α of

Table 2. Definition of planning classification construct

Planning openness	Planning horizon
a. Emphasis on totally new markets	1. Less than 1 year
b. Emphasis on closely related markets	2. 1 year
c. Emphasis on qualitative objectives	3. More than 1 year, less than 5 years
d. Emphasis on definition of the nature of the firm	4. 5 or more years
e. Emphasis on the effect of social, political and technological trends on the firm	
f. Emphasis on internal capabilities of the firm	
g. Emphasis on long-term variances from prior plans	
h. Emphasis on contingency plans	

Planning classifications

PLANNING OPENNESS

		1	2	3	4	5
PLANNING HORIZON	1	Short-Term Forecasting				
	2	Budgeting		Annual Planning		
	3	Long-Range Planning			Strategic Planning	
	4	Long-Range Planning			Strategic Planning	

Table 3. Distribution of planning classification

	Code	Number	Percentage
Short-term forecasting	1	—	—
Budgeting	2	7	7.9
Annual planning	3	3	3.4
Long-range planning	4	50	56.4
Strategic planning	5	29	32.6
	Total	89	100.0

0.75, which was considered an acceptable level of reliability for this type of research (Edwards and Kilpatrick, 1974). The summed scores of the eight items were converted to a five-point scale for planning openness.

The planning horizon was divided into four categories based on the longest period for which a specific plan was prepared. These scales were used to categorize the firm's planning process, as shown in Table 2. The distribution of the planning classification is shown in Table 3.

Information characteristics

For the purposes of this study, following the work of a number of authors (Ansoff, 1965; Andrews, 1971; Kashyap, 1972; Rothschild, 1976; McNichols, 1977), three categories of information and information systems were defined.

1. Internal—operations within the enterprise.
2. External—factors outside the enterprise with which the enterprise interacted directly on a regular basis.
3. Environmental—factors outside the enterprise with which the enterprise did not directly interact, but which might affect operations. This included both the broader social/economic climate and areas into which the firm might expand in the future.

The respondents to the questionnaire were asked to indicate the relative importance and stability of 60 types of information which had been identified by various authors as necessary for effective planning (see Table 4).

Sources of information

The importance to the planning process of eight sources of information was measured using a five-point scale ranging from 'very unimportant' to 'very important' with the option of 'not applicable' available. The questionnaire included the following sources of information: specific management information systems (MIS) for planning, accounting system, personal contact with superiors, personal contact with subordinates, personal contact with outsiders, outside publications, inside reports and outside studies.

Environmental complexity and volatility

Complexity was defined as the number of factors taken into account in the planning process. Respondents were asked to indicate the relative importance of 60 information types in determining the outcome of the firm's planning process. A five-point scale ranging from

Table 4. Information for planning

Information type	Information classification
Manufacturing factors	
Plant capacity	Internal
Workforce availability	External
Unionization	External
Raw material sources	External
Detailed manufacturing costs	Internal
Marketing factors	
Market research policies	Internal
Product quality	Internal
Distribution	Internal
Sales force type	Internal
Sales force size	Internal
Advertising and promotion policies	Internal
Service policies	Internal
Credit policies	Internal
Detailed sales forecast	Internal
Research factors	
Basic research emphasis	Internal
Applied research emphasis	Internal
Engineering capability	Internal
Managerial factors	
Organization structure	Internal
Management availability	External
Financial controls	Internal
Detailed administrative expense	Internal
Information systems	Internal
Financial factors	
Long-term financing	External
Cash management	Internal
Customer factors	
Types of customers	External
Customer location	External
Product use	External
Service required	External
Customer strategies	External
Industry factors	
Total market dollars	External
Total market units	External
Market share	External
Market segments	External
Pricing trends	External
Cyclicality/seasonality	External
Ease of entry and exit	External
Financial traits	External
Capacity/use	External
Suppliers	External
Trend setters	External
Industry growth rate	External
Competitive factors	
Competitors—types	External
Competitors—numbers	External
Competitors—abilities	External
Potential competitors	Environmental

continued

Table 4. *continued*

Information type	Information classification
Definitional factors	
Firm's public image	External
Basic strategy/mission	Internal
Distinctive competence	Internal
Key vulnerabilities	Internal
Social/political/technological factors	
Demographic trends	Environmental
Life style changes	Environmental
Legislative trends	Environmental
Pressure groups	Environmental
Regulatory trends	External
Technological trends	Environmental
Obsolescence	Environmental
Economic factors	
Inflation/deflation	External
Revaluation/devaluation	External
Short-term economic forecast	External
Mid/long-term economic forecast	Environmental

'very unimportant' to 'very important' was used with an alternative of 'not applicable' available. Complexity was divided into internal and external components, depending upon the nature of the information types.

Respondents were also requested to indicate the relative volatility of the information types over the last 3 years, taking into consideration both the frequency and the magnitude of fluctuations on a five-point scale ranging from 'very unstable' to 'very stable'. Volatility also was divided into internal and external categories. The sample distributions of the summed scores for each type of complexity and volatility were used to create five-point scales for each variable.

Role of senior management

Senior management involvement in the planning process was evaluated using five-point scales to measure the importance of four possible levels of activity: setting goals at the start, mid-way review, review and revision near the end, and review and approval at the end of the planning process.

Data collection

The field study consisted of structured interviews with 11 executives in eight companies, representing seven industries. Six of the companies had sales between \$7000 and \$1000 million. The remaining two firms had sales of \$600 and \$100 million, respectively. The lines of business reported ranged from seven to one with a mode of four. The executives held a variety of positions: president and CEO (1), vice president for administration (1), corporate planner (4), group president (1), group planner (2), division controller (1) and MIS director (1). All executives agreed to complete and comment on the survey questionnaire at a later date to determine the clarity of instructions and time necessary to complete the form. The executives stated that the questionnaire was understandable, comprehensive and did not take an excessive amount of time to complete. The responses gathered in the field study were compared to the questionnaire data to assess the instrument's validity. The subjective evaluations from the field study closely matched the quantitative measures.

Table 5. Distribution of firms by size

Size category	Lowest sales level (000,000)	Sample interval	Total number of companies	Number of companies sampled	Number of companies responding
7	\$8000	all	30	30	13
6	\$5000	2	28	14	11
5	\$2000	4	116	29	14
4	\$1000	6	111	18	7
3	\$500	6	159	27	11
2	\$200	6	310	51	23
1	\$118	6	246	41	10
Total companies			1000	210	89

The questionnaire survey was conducted in July 1980. A random sample of 210 companies, stratified by sales level, was selected from the 1980 *Fortune* 1000 list.¹ As can be seen by the distribution of firms by size (Table 5), the *Fortune* 1000 contains a few extremely large companies and then exhibits a more uniform pattern. Owing to their size and complexity, these firms are particularly significant to the economy as a whole and should have the greatest access to sophisticated management techniques. In order to ensure that these companies were well represented in the final sample, these companies were more heavily sampled.

This resulted in the final sample being more heavily weighted numerically with larger companies than the overall *Fortune* 1000. However, it was felt that this weighting more closely reflected the level of economic activity represented by these firms. The questionnaire was directed to the officer considered most likely to be responsible for corporate-level planning as identified in the *Standard & Poor's Directory of Corporate Officers, 1980*. In many cases, the corporate planning executive was identified. The second alternative was the financial vice president, with the treasurer being the final choice. There were 89 usable questionnaires returned for a response rate of 42.4 per cent.

Data analysis

Non-parametric correlation analysis and one-way analysis of variance were used to evaluate the individual propositions. Factor analysis of the information types resulted in the construction of 10 information factors. The overall relationship of information to planning systems was evaluated using non-parametric correlation analysis, analysis of variance and multi-variable regression techniques.

RESULTS

Field study

Strategic planning, as defined in this study, was practised in only two of the eight companies in the field study. The other companies concentrated their planning efforts on improved operating performance in their current industries. The information collected appeared to be

¹ The questionnaire and list of sample companies are available from the author upon request.

closely related to the nature of the planning taking place. Interestingly, enhancement of the information system was one of the first steps taken by firms attempting to revitalize their planning process. In the three field study companies whose planning systems were undergoing major modification, each company had revised or was in the process of revising the information system used to support planning.

One of the most striking findings of the field study was the lack of formal environmental information systems, particularly considering the prominence this factor has been given in the literature for a number of years. Managers referred to environmental data as being 'absorbed' or incorporated by 'osmosis'.

The companies did collect substantial amounts of external information. Industry trends and competitor, customer and market share data were the most prevalent categories, augmented by a general attempt to identify opportunities and threats in current or closely related markets. Internal data were primarily based on financial reporting and capital appropriation systems. Four companies indicated that they attempted to identify their strengths and weaknesses.

Overlaying this formal information were senior management's informal sources and visceral judgement based on extensive outside contacts and experience in the industry. These intangible factors often restricted the range of alternatives considered and appeared to be the single most important factor in determining the degree of openness of the organization.

Inadequate information can also lead to a lower level of openness in a firm's planning process. Two companies indicated that they had made no acquisitions during the prior 10 years following a series of transactions which proved unsuccessful. These companies had attempted to increase the level of their strategic thrust and decided on a strategy of diversification. However, based on the comments of their executives, they did not gather sufficient information on the areas or companies into which they diversified. When the acquisitions proved unsuccessful, the companies retrenched to a less open level of planning.

The situation in several of the field study companies supported the proposition that increased environmental turbulence would lead to a higher level of openness in planning. However, at least one exception was noted and the possibility of additional exceptions appeared to be present in three other cases. In these companies, increased turbulence resulted in a retreat from new and unfamiliar areas back to familiar markets and industries.

Questionnaire survey

The three propositions regarding the relationship of types and sources of information and environmental complexity to the planning process were supported. The proposition relating environmental volatility to the planning process was not supported (see Table 6).

Strong support for the importance of external and environmental information to higher levels of planning was provided by the statistical analysis. Four information factors and eight separate individual information types were found to be significantly correlated ($p \leq 0.01$) with planning classification (see Table 7).

These information factors and types can be characterized as outward looking, focused on the future and qualitative in nature. Those items most closely related to the internal functions of a firm (workforce availability, product quality, engineering capability, management availability and information systems) also expressed an external orientation, with the possible exception of information systems. Of the eight information types defined as environmental, five were included in this group.

Taken as a whole, these items were found to be very strongly predictive of the level of planning using multiple-variable regression analysis. These variables produced equations

with an R^2 of 0.452 and an F score of 4.50 ($p \leq 0.01$) when environmental match was included, and an R^2 of 0.421 and an F score of 3.97 ($p \leq 0.01$) when environmental match was excluded.

Table 6. Results of hypotheses testing

	Type of test	Results	Level of significance
1. As the planning process becomes more sophisticated external and environmental types of information will become more important	Non-parametric correlation regression analysis	Supported	***
2. As the planning process becomes more sophisticated informal sources of information will become more important	Non-parametric correlation ANOVA	Supported	***
3. The greater the perceived complexity of an organization's environment, the more sophisticated its planning system	Non-parametric correlation ANOVA	Supported	***
4. The greater the perceived volatility of an organization's environment, the more sophisticated the planning system	Non-parametric correlation ANOVA	Not supported	—

*** ≤ 0.01 .

Table 7. Information factors/types very strongly related to planning classification

Information factor/type	Spearman correlation coefficient	Significance
Technical	0.40	***
Technological trends	0.34	*** Environmental
Obsolescence	0.37	*** Environmental
Environmental match	0.38	***
Market segments	0.26	*** External
Pricing trends	0.22	** External
Basic strategy/mission	0.46	*** Internal
Distinctive competence	0.40	*** Internal
Key vulnerabilities	0.41	*** Internal
Industry	0.29	***
Ease of entry and exit	0.31	*** External
Financial traits	0.35	*** External
Capacity/use	0.34	*** External
Political	0.24	***
Legislative trends	0.22	** Environmental
Pressure groups	0.17	* Environmental
Regulatory trends	0.24	*** External
Workforce availability	0.29	*** External
Product quality	0.26	*** Internal
Engineering capability	0.29	*** Internal
Management availability	0.39	*** External
Information systems	0.32	*** Internal
Cyclicality/seasonality	0.28	*** External
Industry growth rate	0.27	*** Internal
Potential competitors	0.32	*** Environmental

* $p \leq 0.10$; ** $p \leq 0.05$; *** $p \leq 0.01$.

An alternative interpretation might be that respondents identified all of the factors in the planning process as receiving strong emphasis and all information as being important, whereas others made more moderate judgements. A certain amount of bias no doubt took place. However, a review of the ranking of the information types and sources indicated that this was not a complete explanation since significant differences in the rankings were evident across the planning classifications.

Personal sources of information were found to be related to increased planning sophistication with the exception of personal contact with superiors, which was ranked as the most important in all categories of planning. Personal contact with outsiders was very strongly correlated ($p \leq 0.01$) and personal contact with subordinates strongly correlated ($p \leq 0.05$) to the planning classification. In addition, specific MIS for planning, outside publications, inside reports and outside studies were also positively correlated ($p \leq 0.05$) to the planning classification. The accounting system was negatively correlated with the planning classification at a weak level of significance ($p \leq 0.10$) (see Table 8).

These results indicate a pattern of increased interest in receiving external information on a timely basis. The importance of a specific MIS for planning also lends support to the contention that strategic information is not easily handled in a firm's normal operating systems.

Both internal complexity and external complexity were found to be significantly related to the planning classification ($p \leq 0.01$), using both correlation analysis and analysis of

Table 8. Non-parametric correlation analysis of importance of information sources with planning classification

Information sources	Spearman correlation coefficient
Specific MIS for planning	0.23 **
Accounting system	(0.14) *
Personal contact with superiors	0.07 —
Personal contact with subordinates	0.18 **
Personal contact with outsiders	0.28 ***
Outside publications	0.18 **
Inside reports	0.23 **
Outside studies	0.19 **

* $p \leq 0.10$; ** $p \leq 0.05$; *** $p \leq 0.01$.

Table 9. Spearman correlation coefficients: SMSTART = senior management involvement at the start of the planning process

	Planning classification	Internal complexity	External complexity	Internal volatility	External volatility
Internal complexity	0.31 ***				
External complexity	0.37 ***	0.62 ***			
Internal volatility	(0.03)	(0.39) ***	(0.31) ***		
External volatility	0.11	(0.28) ***	(0.28) ***	(0.60) ***	
SMSTART	0.31 ***	0.31 ***	0.23 ***	(0.28) ***	(0.08)

*** $p \leq 0.01$.

variance. Neither internal nor external volatility was found to be related to planning classification by either analysis technique.

Comprehensive analysis

Non-parametric correlation analysis of the situational variables revealed a very strong negative relationship ($p \leq 0.01$) between complexity, both internal and external, and volatility, again both internal and external. Senior management involvement at the start was very strongly related to complexity ($p \leq 0.01$). Internal complexity, external complexity and senior management involvement at the start were strongly correlated with the planning classification ($p \leq 0.01$) (see Table 9).

DISCUSSION

This study established empirical support for the importance of gathering external, forward-looking information in order to conduct true strategic planning. A model focusing on the planning dimension of openness, which had been emphasized in the literature, coupled with the planning horizon, was developed to measure planning sophistication.

The relationship between strategic planning and external, future-oriented information had been predicted by a number of authors (Kashyap, 1972; Hayes and Radosevich, 1974; Mintzberg, Raisingham and Theoret, 1976; Radford, 1978; Ansoff, 1979; Gordon, Larcker and Tuggle, 1978).

The field study findings also supported this relationship. In field study companies, a first step in improving the execution of the analysis/adaptive dimension of planning was enhancement of the amount and type of information available to management. However, the strength of this relationship indicated that the mere cognizance of the importance of this type of information is insufficient. Strategic management must also address the methods by which such information can be integrated into the planning process.

Recently, firms have been able to gain a competitive advantage through superior application of operating information systems (Gerstein and Reisman, 1982). Firms with well developed strategic information systems should also be able to compete more effectively, whereas firms in the long-range planning category are likely to fall behind.

Informal and external sources of information also were strongly correlated with strategic planning. The means by which these sources of information can be more fully captured by organizations without destroying the characteristics of timeliness and subjectivity that make them so valuable must be investigated. In addition, further study is required to evaluate the sufficiency of informal systems for this task.

Perceived complexity was found to be very strongly related to the level of planning, as predicted by Ansoff (1979). However, no strong relationship was found between volatility and the planning process. This contradicted current theory (Ansoff, 1979) and previous empirical studies (Lindsay and Rue, 1978).

Tung (1979) has proposed that a third dimension of routineness be added to the evaluation of environmental characteristics. A relatively predictable environment may call for an aggressive reformulation of strategy as prescribed by the literature, whereas an unpredictable environment may require a more conservative approach.

The very strong negative relationship between volatility and complexity indicated that complex information and planning systems apparently require excessive time to process and/or to revise in rapidly changing circumstances. The appropriate response to increased environmental turbulence requires further study on both the theoretical and practical levels.

The findings of this study challenge a number of themes evident in the current literature in the field of policy. Most authors have assumed that all organization-wide planning should include a search for new opportunities and an explicit definition of the nature of the firm (Ansoff, 1965; Andrews, 1971; McNichols, 1977; Hofer and Schendel, 1978). Ansoff (1979) did define various levels of planning at a later date, but implicitly assumed more open systems to be superior.

However, more than two-thirds of the companies responding to this study did not emphasize the adaptive aspect of planning prescribed by the preceding authors. Whereas a shift to long-range planning appeared widespread, the move to strategic planning apparently involved a much larger conceptual leap. This pattern is similar to Eliasson's (1976) findings and lends support to the contention that a synoptic formalism planning exercise is unlikely to take place on a regular basis (Camillus, 1982).

Rather than criticizing management as unsophisticated, policy theory must investigate the possibility that a range of appropriate planning types may exist. The reasons for the lack of acceptance of academic planning models need to be examined. Although not specifically addressed in this study, a number of possible explanations are evident at this time.

1. The validity of the basic strategic planning model was not accepted by executives.
2. Implementation of strategic planning was deemed too difficult.
3. Senior management's objectives for the planning system may have been motivation and control rather than entrepreneurial creativity.
4. Strategic planning, as opposed to long-range planning, may take place on an informal basis.
5. Strategic planning was not considered appropriate given the environmental conditions.

Additional research will have to be conducted to evaluate these explanations as well as to identify other interpretations of this result.

In summary, policy theory must recognize that planning is a multi-dimensional concept. This study has found a wide divergence in the factors emphasized in corporate-level planning in a substantial number of major companies in the United States. The process of disaggregation of this construct begun by Eliasson, Fahey and King, Lorange, Leontiades and others must be continued in order to accurately assess the impact of planning systems. Researchers must address the qualitative content of planning systems as they are actually implemented, rather than strictly focus on the structure of such systems.

The dynamic nature of information also must be recognized in strategic management. As executives attempt to improve the planning process of their firms, new and different types of information must be gathered by the organization. Exposure to that information is likely to precipitate a search for additional information leading to a more open planning process.

The actual objectives of senior management for the planning system and their effect on the characteristics of that process represent another fertile area for future investigation. Senior executives' objectives may include a number of factors other than the creative generation of new strategies. The identification of a general pattern of such objectives would help to explain the distribution of the planning classifications and perhaps the growing dissatisfaction with the output of formal planning systems.

Finally, the fundamental importance of appropriate information to sound strategic decision-making must be explicitly recognized in the design and implementation of planning systems.

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