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PLANNING PROCESSES AND STAGE OF GROWTH
IN TECHNOLOGY BASED NEW VENTURES:
AN EMPIRICAL ASSESSMENT

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ABSTRACT

A review of the planning literature fails to uncover any consensus on what constitutes successful planning processes. Typically, planning processes have been categorized in several major schools of thought: comprehensive rationalist (Ansoff, 1965; Ackoff, 1970); incrementalist (Lindbloom, 1969; Quinn, 1978); and behavioral political (Cyert and March, 1963; Bower, 1972).

One criticism of these views of planning is that all three may be correct given different circumstances. Organization structure contingency theorists state that there is no one best way to organize, and that organization structure is affected by each firm's situation in terms of such variables as strategy, environment, size and technology. This same theoretical perspective of equifinality, accepted in organization theory, has been used to explain differences in planning processes by such authors as Schendel (1977), Miller (1975), Litschert (1971), McCaskey (1974), Richards (1978), and others.

However, a gap can be found specifically related to existing contingency theories of planning processes in that most do not consider or acknowledge that organizations may be at different stages of growth and development.

This paper builds upon a four stage model of growth for technology based new ventures previously developed and validated by the author. In order to test the effects of stage of growth on planning, it is necessary to develop a definition of planning that includes greater detail on the nature of the underlying dimensions than usually appears. Elements or components of planning used in this research, adopted from Lorange (1980) are: objective setting, strategic programming, and budgeting. It is proposed that what distinguishes these three planning components at various stages of growth are key underlying dimensions of formalization, centralization, and time horizon.

The basic proposition regarding the relation of planning processes to stage of growth is that the nature of planning components will differ by stage of growth such that early stage firms will demonstrate processes consistent with an incremental paradigm whereas later stage firms will demonstrate processes consistent with a comprehensive rationalist paradigm. This proposition results in nine specific hypotheses, which are tested with a sample of over one-hundred technology based new ventures created within the past fifteen years. Based upon analysis of variance, specific hypotheses were supported with statistically significant results in five of nine cases. Further, these results held when analyses were conducted controlling for external variables such as size, age, and rate of growth. However, it is not clear that distinctly different planning paradigms could be said to exist for early versus later stage firms.

INTRODUCTION

A review of the planning literature fails to uncover any consensus on what constitutes successful planning processes. Typically, planning processes have been studied in several major schools of thought (Quinn, 1978; Allison, 1971), including:

1. Comprehensive Rationalists: This view based in part on systems theory and tied to a notion of bounded rationality suggests that planning should be an analytical integrating holistic process which coordinates all the units of the organization in an effort toward the accomplishment of some well defined specifically identified ends (Ansoff, 1965; Ackoff, 1970).
2. Incrementalists: This approach to planning suggests that the rate and scope of environmental change is too vast to understand and that any effort of comprehensive planning toward some established end five or ten years in the future is sheer folly. All that can be hoped for is incremental planning of a much more intermediate range as the future unfolds (Lindbloom, 1969; Quinn, 1978).
3. Behavioral/Political: A component of the comprehensive rationalists view is the idea that organization structure should be determined by the strategy or desired ends. However, a competing view suggests that planning is overwhelmingly a political process based on power and interpersonal dynamics. Therefore, this view would propose that structure (the existing balance of powers within the firm) determines strategy (March and Simon, 1958; Cyert and March, 1963).

One criticism of these views of planning is that all three may be correct given different circumstances. Organization structure contingency theories state that there is no one best way to organize, and that organization structure is affected by each firm's situation in terms of such variables as environment, size and technology. This same theoretical perspective of equifinality accepted in organization theory has been used to explain differences in planning processes by such authors as Schendel (1977), Miller (1975), Litschert (1971), McCaskey (1974), Richards (1978), and others, thus giving rise to a fourth school of thought-contingency theories of planning processes.

Several difficulties are apparent in the review of all four schools in this literature. Contingency theories of planning processes address the first

problem in that it should be apparent that there is no one best way to plan. Additionally, however, all four schools of thought seem to focus on what might be called top management planning or strategic planning. Other planning processes, such as business planning, new product planning, or production planning are either considered of lesser significance or seem to be ignored altogether. Finally, most of the work on planning processes is descriptive. There have been few attempts so far to capture or understand dimensions that underlie all variously described planning processes.

A review of the emerging work on contingency theories of planning (McCaskey, 1974; Miller, 1975; and Schendel, 1977) points to several conceptual gaps. Although these studies focus on planning processes, those processes are usually not specified or detailed other than being categorized in general descriptive terms such as "rational or interpreneurial" or "with objectives or without objectives." Although an expanding list of contingency variables has been studied, a gap can be found specifically related to existing contingency theories of planning processes in that most do not consider or acknowledge that organizations may be at different stages of growth and development. Although exceptions can be found (Lorange, 1980; Mintzberg and Waters, 1982); most omit a crucial contingency in the determination of planning processes: stage of growth.

The purpose of this paper therefore, is to specifically develop the variables and underlying dimensions of planning processes and to set forth their relationship to an evolutionary model for high technology growth-oriented new ventures. For this subset of organizations, stage of growth is hypothesized to be a more useful contingency than other variables as it provides a greater basis for understanding beyond simple correlational relationships of planning processes with other contingencies such as size or technology. Further, it

also emphasizes an historical approach rather than simple static relationships, thus allowing for greater causal understanding.

STAGE OF GROWTH MODEL

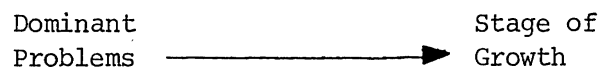
The growth model proposed in this research might be interpreted as what Starbuck (1971) terms a metamorphosis model, in that it describes problems likely to be encountered by organizations of differing circumstance and the organizational forms likely to result. The term stage of growth was selected advisedly for lack of a better descriptor. Although numerous references in the literature and grounded case examples support the model to be discussed, it should be made explicit that none of these phases define an organization's life cycle per se. Further, it is contended that there is no life cycle or phased sequence applicable to all organizations, and that recurrent cycles and patterns in organizations, which in fact do exist, are a product of environment and task requirements.

Therefore, it is critical that this research be seen as a mid-range theory (Pinder and Moore, 1977) of growth. That is, the validity of this stage of growth model is a function of its assumptions and focal population, which are: (1) that it obtains for high technology new ventures only; (2) that it explains only internally generated growth as opposed to growth by acquisition or merger; (3) that a market segment or niche exists such that demand conditions are not limiting; and (4) that the focus is an initial growth within a single product/technology base (Filley and House, 1969).

New ventures are created for the specific purpose of developing and marketing a new product or service (to be referred to as product). The organization is seen as consisting of various subsystems representing types of specialized knowledge or competence--the task system by which the firm's

purposes are achieved (Normann, 1971). The objective of the new venture therefore is to define, develop and market the product while constructing the appropriate and supportive task system.

As part of this process, it has been observed that the venture manager faces a patterned range of strategic and operational problems (listed in Chart 1) from product conceptualization to organizational maturity. This list emerged from the cases, but was subsequently field tested and refined through interview with managers of other new ventures, some are more dominant at times than others and that a sequential pattern of dominance exists. The particular problems faced at a given time will define the venture's position in a new stage of growth, as depicted in the diagram below.



The four stages of growth and the dominant problems of each stage are summarized in Figure I.

PLACE FIGURE I ABOUT HERE

PLANNING

In order to develop a testable theory of the affects of stage of growth on planning it is necessary to develop a definition of planning that includes greater detail on the nature of the underlying dimensions than usually appears. Planning is defined as a decision making process by which certain objectives or desired ends and the associated implementation activities are established for the future at various levels of the organization. Specifically, planning is not a unitary organizational process at the policy formulation level only, but is a multi-level process, with multiple planning processes existing within the lowest level.

At each level of the organization, some form of planning exists, but these processes may be different. For example, at the corporate level planning is a strategic process undertaken to set corporate goals and objectives which will drive the entire organization. This is largely a resource allocation process directed at how much to invest in various businesses of the firm. At the business level, the process is directed at how to compete in a particular product/market position. Finally, at the functional level the planning process is concerned with maximizing the synergistic contribution of the function given the resources allocated to it. Within virtually all firms, multiple functional planning processes exist.

The focus of this research is new ventures which are single business organizations. In this context then, the study of the effect of growth on the evolution of the planning process centers on the building of a business planning system within the venture.

Numerous authors in the policy field have outlined, in differing terms, the various components or steps of the planning process (Ansoff, 1965; Ackoff, 1970; Lorange, 1980; Hofer and Schendel, 1978). The elements or components of planning to be used in this research, adapted from Lorange, (1970) are presented below:

Objective Setting: This activity is directed toward the generation and examination of alternative strategic actions for the whole organization as well as sub-units. It is typically based upon: assessment of the firm's opportunities; assessments of the firm's threats; relative performance evaluation; delineation of assumptions and constraints.

Strategic Programming: Once objectives have been set, it remains to be determined how they will be achieved. Strategic programming focuses on this issue with most of the activity at the functional level. The intent and emphasis is on developing long-term programs for achieving internal growth. Such activities are inherently cross-functional.

Budgeting: Given objectives and strategic programs, near term assignment of tasks and financial resources are determined through the budgeting process.

It is argued that what distinguishes these three planning components at various stages of growth are what can be seen as key underlying dimensions:

Formalization. Planning processes can be differentiated on the basis of their degree of formalization. Formalization consists of two primary aspects. First is the extent to which the procedures and processes of planning are known, legitimized and institutionalized in a series of rules and written instructions or memoranda. The second aspect relates to the degree to which planning functions are scheduled on a recurrent basis with a series of stages that relates to each other sequentially. In essence, highly formalized planning systems are marked by activities that have been planned for themselves in an attempt to gain efficiency, accuracy and reliability.

Centralization. Centralization refers to the relative concentration of authority in making planning decisions at high levels in the organization hierarchy. This decision making could be rested in a single individual or dominant coalition, or delegated lower in the organization.

Time Horizon. Organizations plan sequences of instrumental activities for accomplishing desired ends in the future. The span of time proposed to accomplish these chains of activities, is the planning process time horizon. We would expect that intra firm variance in time horizons could exist between hierarchical levels as well as between functional areas (Lawrence and Lorsch, 1969).

The study of the effect of growth on processes in general, and on planning in specific, is much sparser than is the case for structure, for example. As mentioned earlier, much of the work has been either descriptive of existing practices or prescriptive as to what planning should be. Some empirical studies of planning processes have looked at the correlation of performance for firms with formal planning systems as opposed to those without. Very little research has centered on the initial evolution of planning systems. An exception is Hofer and Schendel (1978) who built upon the pattern of organizational evolution described by Chandler (1962), and outlined the "development of the concept of strategy as an explicit tool for managing economic and social organizations." In so doing, they trace the evolution of planning at multiple levels from intuitive informal interactions to formal, explicit processes. Lorange (1980) also discusses the evolution of planning

systems and the tailoring of the system's design to the firm's stage of growth, but the context is not that of the initial growth of a new organization. Additionally, both of these represent conceptual works. No empirical research was uncovered in this topic.

A critical issue of interest here is timing. It would seem that with a contingency perspective that an incremental approach to planning would best fit the early stages of growth, for it is at this time that the firm's product, strategy, organization and in some cases, the market and industry, are yet evolving. The rationalist perspective would thus be ineffective as changing conditions would require almost continual changes in goals and action plans. In contrast however, for late stage firms, a lack of clear goals and directions could lead to internal confusion and inconsistent efforts across sub-units which have become increasingly specialized given the requirements of late stages. Correspondingly, we would expect longer time horizons for late stage firms as well.

Formalizing the planning process with the establishment of objective setting, budgeting and strategic programming too early makes little sense given the essentially unprogrammable nature of the early stage tasks. Here, premature introduction of bureaucracy in the form of planning may inhibit innovation, so needed in stages 1 and 2, and would therefore be dysfunctional. Waiting too long to do so will unquestionably take a toll in efficiency, given the explosion of new roles and activities. It could also detract from an organization's effectiveness as an appropriate planning system will be needed to focus activities and resources and to refine or redirect the business idea in late stage 3 and 4 as the initial growth slows and new growth momentum is needed.

THE CHARACTER OF PLANNING BY STAGE OF GROWTH

Based upon case observations (See Kazanjian, 1983), the following explanation of the evolution of planning processes in new ventures is offered. Stage 1 and early stage 2 firms are small and tend to be dominated by one or a few owners who typically maintain tight control on all activities. Out of a sense of ownership and indispensability, very few others are involved in critical decisions. Due to this closely controlled approach involving few others, planning usually is an informal and in some cases, intuitive process. That is to say that planning may be a cognitive process in the mind of the owner. As such, whatever planning is done is highly centralized and well integrated within the owner/manager. In these stages, the firm probably has little real structure. The corporate business, and functional levels of planning converge on the same process because there is no clear distinction between what constitutes appropriate problems for each level. The main problem of establishing a viable firm requires close coordination of all tasks in a highly interdependent fashion. For similar reasons, time horizons are short range and they tend to be tied to milestones of product development or "entrepreneurial sell" funding decisions. Usually by this time a rudimentary budgeting process has been put into place to allocate resources granted by financial backers and to support subsequent requests for additional funds.

As described earlier, stage 3 is a period of high growth and correspondingly, of considerable change, as the venture's product gains market acceptance. At the beginning of this stage, planning is informal and revolves around the president, thus making it a highly centralized process. However, as the tasks of the organization become more complex and interdependent and as the number of employees and functions expand rapidly, new planning processes evolve. These might include materials planning, personnel hiring planning, and facilities planning, as well as planning processes of the individual

functions among others. Although the entrepreneur still wishes to maintain a central involvement in all planning, he begins to share the responsibilities with a group of close confidants. The number of processes increases rapidly, making it increasingly difficult to comprehend and coordinate all that goes on. The former integrating mechanism for planning processes in stage 1 and 2 - the entrepreneur/owner - begins to get overloaded. By the end of this stage, the functional and business levels of planning have clearly emerged, with multiple processes within levels. Planning horizons begin to be extended beyond the short range as market success and profitability provide the latitude to reasonably assure that the firm has become a growing concern. However, different planning processes particularly between the newly created functional divisions, use different time horizons consistent with their environmental domains. It is also during this period that an objective setting process is established, usually at both the business and functional levels, serving as much needed coordinating mechanisms.

By the end of stage 3 and certainly in stage 4, planning becomes highly formalized with numerous rules, schedules, meetings and deadlines. This formalization includes a standardization of procedures which usually mandates an integration of planning processes within and between levels. The degree of participation in the process is vastly expanded due to the increased size and specialization over earlier stages as well as the addition of an experienced professional executive team in many cases. The time horizon for the business level spreads to a longer range view of up to five to ten years, but each planning process still employs a time horizon appropriate to its focus. It is in this final stage that the venture's first major effort at strategic programming is undertaken, typically in the form of a new product development process - an interfunctional activity which has the potential of determining the nature and direction of future growth and development.

In sum, organizations have multiple levels of planning and multiple processes within levels. The major underlying dimensions of these planning processes (and of their major components of objective setting, budgeting and strategic programming by extension) are formalization, centralization and time horizon. Finally, the evolution of the planning processes, as discussed above, is believed to be a representative pattern for the initial growth of high technology new ventures.

Clearly, it would be desirable to undertake a test of all hypotheses suggested by this discussion: that is, to test the effect of stage of growth on the nature of planning. This would require data on objective setting, budgeting and strategic programming at the business level as well as objective setting and budgeting for each function, all measured in terms of underlying dimensions of formalization, centralization and time horizon. However, given the need for multiple measures to test for reliability and the data collection constraints imposed by the nature of the sample, this research will focus only on the business level.

Intuitive logic as well as the description of planning by stage elaborated above would suggest that early stage firms maintain a largely incremental planning process with evolutionary movements toward a rational process. It is proposed however, that planning components will adopt rational characteristics related to formalization, centralization and time horizon in a particular sequence. More specifically, it is proposed that budgeting will be the first formalized, given the need to manage scarce resources, after which objective setting will be established. Strategic programming is seen here as largely an interfunctional activity and therefore, requires some measure of functional specialization to develop first.

Based upon the above discussion then, the following proposition is

established.

Proposition: The nature of budgeting, objective settings and strategic programming (basic components of planning) differ by stage of growth, and will develop in a sequential pattern with budgeting formalized first followed by objective setting and strategic programming.

RESEARCH DESIGN

The level of analysis is that of the organization: Mailed questionnaires were sent to 225 venture CEOs as the targeted respondent in each firm. The use of multiple respondents within each firm whose completed questionnaires could be pooled utilizing an appropriated weighting scheme (Van de Ven and Ferry, 1981) would result in greater measurement validity (Kurlinger, 1973). The CEO was elected nonetheless as the single respondent for each firm for several reasons. Primary among these are logistics and access. The point of access in most of the firms in the sample is clearly the CEO, who typically is extremely busy. It was suggested by venture capitalists and researchers in the field that getting responses from CEOs alone would be difficult in itself, but requesting multiple responses would lessen the chance of any response at all. Further, as the questionnaire would be administered by mail and not in person, the prospect of ensuring consistency in the number and types of respondents across firms would be unwieldy.

It should be noted, however, that the selection of the CEO as a single respondent, representative of the firm, has ample precedent both in the organization and strategy fields, as evidenced by studies such as Miles and Snow (1978), Hrebiniak and Snow (1980), Hambrick (1980), and others. Clearly, among the new ventures in this sample, which are not particularly large firms (mean number of employees = 262), the CEO can be highly knowledgeable of all operations, is usually intimately involved with operations, and in most

instances, is the driving individual of the firm whose views and perceptions are clearly most important.

The development of the specific instrument used in this research included a review and trial completion by several new venture managers, venture capitalists, and new venture researchers. This field test assisted in developing the final language and structure of the questionnaire. No major problems of interpretation were uncovered and many of the suggestions incorporated were editorial. The single exception related to the list of problems which were to be used as one measure of stage of growth. Several pertinent changes and additions were suggested by the field testers.

The firms included in the sample were located through venture capitalists or similar institutions. Four such sources provided the names and addresses of 225 firms which met the required criteria. To be included, a venture had to have been created since 1970, situated in a business considered high technology-computers, electronics, and related - and must be an autonomous, free standing firm. No intra-corporate start ups or joint ventures were included.

The survey package mailed to each CEO included a questionnaire, a cover letter, a postage paid reply envelope and when possible, an endorsement letter from the venture capitalist who had financially backed the firm. A total of 105 (46%) of those surveyed responded, which appears quite reasonable when compared to response rates from mailed questionnaires usually reported in the organizational literature.

Operationalizing Planning Constructs

Planning has been discussed in considerable detail in Chapter III. It is apparent from that discussion and a review of the literature, that the development of empirical research in general and highly reliable measurement instruments in particular in this area, lag the work done on structure.

Given the adaption of Lorange's (1980) constructs of planning used here - objective setting, budgeting, and strategic programming -- specific measures were developed to capture them. As referenced earlier, specific hypotheses have been posited regarding the nature of the underlying dimensions of Lorange's planning constructs for firms in different stages. Specifically, it is the formalization, centralization, and time horizon of objective setting, budgeting, and strategic programming activities that are of interest. The characteristics and measurement rationale of each of these underlying dimensions is presented below.

Formalization. The constructs of planning processes can be differentiated on the basis of their degree of formalization. Formalization consists of two primary aspects. First is the extent to which the procedures and processes of planning are known, legitimized and institutionalized in a series of rules and written instructions, memoranda, etc. These rules can cover almost all of the normally cited planning functions such as; environmental scanning, creation and evaluation of alternatives, decision making and implementation. The second aspect relates to the degree to which planning functions are scheduled on a recurrent basis with a series of stages that relate to each other sequentially. In essence, highly formalized planning systems are marked by activities that have been planned for themselves in an attempt to gain efficiency, accuracy, and reliability.

Centralization. Centralization refers to the relative concentration of authority in making planning decisions at high levels in the organizations hierarchy. This decision making could be rested in a single individual or dominant coalition, or delegated lower in the organization. Different forms of planning exist at multiple levels in the firm (e.g., business, functional, new product development, materials). Each of these general categories of planning would be subject to centralized or decentralized decision making authority. In analyzing the planning processes of a new venture, the concern and focus is on planning at the business level.

Time Horizon. Organizations plan sequences of instrumental activities for accomplishing desired ends in the future. The span of time proposed to accomplish these chains of activities, for each of the multiple planning functions, is the planning processes time horizon. We would expect that intra-firm variance in time horizons could exist between hierarchical levels as well between functional areas

(Lawrence and Lorsch 1969). Also, the entire firm would be dominated by one time horizon imposed by business level.

It is within this context then, that specific measures of planning were developed and field tested as discussed earlier. Three measures for each planning variable, with the exception of time horizon, were included in the questionnaire to allow for the calculation of coefficient alphas as a reliability check. The mean of the three measure index was then used in subsequent analyses as the measure of that corresponding variable.

It should be noted that five of the six planning variables for which reliability analyses were conducted have coefficient alphas in the range of .67 to .90 suggesting strong measurement reliability. Only a single measure - new product development centralization - with coefficient alpha of .47 can be viewed as having only moderate reliability.

THE IMPACT OF STAGE OF GROWTH ON PLANNING VARIABLES

A one way analysis of variance was conducted on the nine planning variables which reflect the formalization, centralizational, and time horizon of budgeting, objective setting, and new product development. Statistically significant relationships at the .05 level or higher of the variables across stage were found for five of the nine variables. Each of the nine are discussed in further detail within the context of specific hypotheses. The results of the overall ANOVAs run for each planning variable against stage are presented in Table I.

It was suggested earlier that the nature of the basic components of planning - budgeting, objective setting, and strategic programming (new product development) will differ by stage of growth and will develop in a sequential pattern. The specific corresponding hypotheses and the results

PLACE TABLE I ABOUT HERE

of their test are presented below:

H_{1a}: Firms in stages 2-4 will have budgeting processes which are more formalized than firms in stage 1.

Although the overall ANOVA for budgeting formalization against stage was significant ($F = 4.3872, P < .0006$) the planned comparison of budgeting formalization means for stage 1 firms against stage 2-4 firms was not significant ($F = 3.5981, P < .0607$). However, based upon the strong results of the overall ANOVA, a post-hoc comparison was conducted on the means of stage 1 and 2 firms with those of firms in stages 3 and 4. This analysis demonstrated highly significant findings ($F = 13.5585, P < .0004$) suggesting that budgeting in new ventures does not become formalized until stage 3.

H_{1b}: Firms in stages 1-3 will have budgeting processes which are more centralized than firms in stage 4.

The overall ANOVA of this variable with stage did in fact demonstrate high levels of statistical significance ($F = 4.354, P < .0064$), but an examination of budgeting centralization means for firms in each stage demonstrates that there seem to be virtually no difference on this variable between firms in stage 3 and those in stage 4, establishing this hypothesis as not supportable. However, the means also establish stage 3 as the breakpoint for centralization to a more decentralized process. The post-hoc comparison demonstrates that the degree of budgeting centralization is greater for firms in stages 1 and 2 in comparison with those in stages 3 and 4. ($F = 12.2537, P < .0007$).

H_{1c}: Firms in stage 4 will have budgeting time horizons which are longer than of firms in stages 1-3.

This hypothesis is clearly not supported by the analysis. A one-way analysis of variance shows that there is no difference in budgeting time horizons for firms across the four stages ($F = .1477, P < .9309$). Based on the lack of any relationship, no further analyses with this variable were conducted.

H_{2a}: Firms in stages 3-4 will have objective setting processes which are more formalized than firms in stages 1-2.

This hypothesis received strong and direct support from the analysis.

The overall ANOVA established a relationship of objective setting formalization to stage ($F = 5.1485$, $P < .0024$) while the planned comparison of objective setting means of firms in stage 1 and 2 with those of firms in stages 3 and 4, demonstrated an even stronger statistically significant relationship ($F = 10.2455$, $P < .0018$).

H_{2b}: Firms in stages 1-3 will have objective setting processes which are more centralized than firms in stage 4.

As with budgeting centralization and in much the same fashion, the objective setting centralization hypothesis was not supported. Although the overall ANOVA against stage was significant ($F = 3.6138$, $P < .0159$), stage 3 firms have more decentralized objective setting processes than do stage 4 firms. However, a post-hoc comparison of objective setting means indicates that firms in stage 1-2 have processes which are more centralized than those in stage 3-4 ($F = 11.8772$, $P < .0008$).

H_{2c}: Firms in stage 4 will have an objective setting time horizon which is longer than that for firms in stages 1-3.

No significant relationship was found for objective setting time horizons with stage of growth through the overall ANOVA ($F = 1.425$, $P < .2406$). On the basis of these findings, no further analyses were conducted with this variable.

H_{3a}: Firms in stage 4 will have new product processes which are more formalized than those of firms in stages 1-3.

This hypothesis was supported at high levels of statistical significance, and yet it appears that even stronger support can be found for competing hypotheses. The overall ANOVA of new product development formalization with stage was significant ($F = 4.0599$, $P < .0091$) while the planned comparison of means which directly tests this hypothesis was also supported ($F = 6.8131$,

$P < .0104$). However, in viewing the mean formalization scores across stages in the overall ANOVA, an interesting pattern presents itself. Stage 1 firms demonstrate high new product development formalization which drops off considerably for stage 2 firms and then increases for stage 3 firms against firms in stages 1, 3, and 4 on this variable clearly establishes stage 2 firms as having less formalization ($F = 10.72, P < .0014$). One explanation may be found in the fact that the new product development is almost always a priority for high technology firms given their technology push orientation and the radically shortened product life cycles which result. In this instance, for stage 1 firms the primary focus is initial product development which requires a product development process. Therefore, facing the dominant problems associated with product development results in the need to focus on these activities with management time and attention. New product development becomes less of a concern in stage 2. In reviewing the specific measure of new product development formalization, two of the three deal with monitoring and review processes while the third captures the degree of policies and procedures. It is logical that such review processes would be in place for firms in stages 1 and 4.

H_{3b} : Firms in stages 1-3 will have new product development processes which are more centralized than those of firms in stage 4.

No support for this hypothesis was found. The overall ANOVA of new product development centralization with stage showed no relationship ($F = .4134, P < .7437$). Given that the variable did not differ by stage, nor did it suggest trends or patterns, no further analyses were conducted using it.

H_{3c} : Firms in stages 3 and 4 will have new product development time horizons which are longer than those of firms in stage 1 and 2.

As with the other two hypotheses related to time horizon variables, no support can be found for the effects of stage of growth on new product development time horizons. With the overall ANOVA demonstrating no relationship

($F = .1435$, $P < .9336$) no further analyses were deemed necessary.

Overall, among the nine hypotheses which proposed relationships of stage of growth to various planning variables, only two were directly supported via planned comparisons. However, another three variables were found to have statistically significant relationships to stage based upon post-hoc comparisons. Primary among the non-supportable hypotheses are the three relating to time horizons, none of which were found to have any relation to stage of growth.

Controlling for External Variables: Size, Rate of Growth, and Age

A potential critique of stage of growth or development models is that they mask effects of other independent variables, and in fact, are only descriptive constructs which capture certain configurations of organizational and situational variables. Through the contingency debates of the 1970's organization theorists argued variously for size, technology, and environment as prime determinants of structure. Pugh, Hickson et al (1969), Child and Mansfield (1972), and Blau et al (1976) strongly supported the notion that structure, in the form of increased formalization, centralization, and specialization, and by extension, process in the form of increased integration, all were in response to size. Woodward (1965), Perrow (1967) and others argued for the view that technology was the prime factor, while the work of Burns and Stalker (1961), Lawrence and Lorsch (1967) and Trist (1977) suggest an influence from environment. Obviously, these same arguments could be directed to challenge the influence of stage of growth.

In attempting to directly analyze external variables, several would be precluded based upon the research design. Technology was controlled for via sampling, thus removing the prospect of examining the effects of various configurations of this variable planning. Likewise, given that the firms all are drawn from a common industrial sector, environmental influences such

as the rate of technological change, or cyclical characteristics of demand, would also be assumed to be common.

However, there are several salient variables for which data is available. For the reasons cited above, size data, as indicated by the total number of employees, and the age of each firm were collected. Additionally, firms were asked to supply figures on total sales for the current and previous years, from which rate of growth was subsequently calculated.

The primary purpose of analysis of covariance is to increase the precision of an analysis by removing possible sources of variance that are attributable to factors not being controlled directly. However, if the covariate means are unequal (i.e., the covariate is correlated with the treatment levels) ANCOVA can still be performed, but the results are more ambiguous since the adjustment for differences in the covariate means can also remove some of the effects of the treatment levels along with it (Green, 1978). The means of size, rate of growth, and age are not equal across the four stages. Further, stage is highly correlated with size ($r = .445$), age ($r = .4697$), but not rate of growth ($r = .1728$). Nonetheless, an analysis of covariance was conducted for all variables which had a significantly supportable relationship to stage.

The results of the analysis of covariance, controlling for size, rate of growth, and age, show adjusted means comparisons with slightly reduced F ratios and P values. Even so, for the five planning variables which had significant relationships to stage - budgeting formalization, budgeting centralization, objective setting formalization, objective setting centralization, and new product development formalization - the results of ANCOVA still left each variable with a significant relationship to stage, as Table II depicts. In summary, it can be stated that the effects of stage of growth on these planning variables, can be viewed with reasonable confidence as not being explainable by the effect of several other independent variables. Specifically, the ANCOVAs

conducted do not radically diminish the effect of stage nor do they suggest a critical role for size, rate of growth, or age. This emerged despite the relatively strong correlation of size and age with stage which might have led to ambiguous results. These findings are clearly interpretable and do reinforce the independent effects of stage of growth as consistent with the theoretical model.

PLACE TABLE II ABOUT HERE

Assessing the Importance of Stage of Growth

Given the nature of the research question, the hypothesis testing effort to this point has utilized analysis of variance and analysis of covariance. Such techniques focus on specific treatment variables and whether mean responses differ significantly across treatment variable levels. However, they do not indicate how much of the variance associated with the dependent variable is attributable to the treatment. In multiple regression, R^2 plays an important role as a summary measure of the adequacy of fit of some model to the data. Correspondingly, the omega-squared coefficient, analogous to R^2 , can be used as a goodness of fit measure, as it also provides an estimation of the treatment's effects on the variation in the response variable (Green, 1978).

Using the formula:

$$\omega^2 = \frac{SSA - (J-1) MSW}{SST + MSW}$$

where MSW denotes the within group mean squares, SSA denotes the sum of squares among groups, SST denotes the total sum of squares, and J denotes the number of levels over which the treatment variable is classified (Green, p. 225), the coefficient is readily computed from the output of the ANOVAs conducted.

The omega-squared coefficient was calculated for each dependent variable, based on results of the one-way overall ANOVAs. Interestingly, the results indicate that in addition to the fact that the means of dependent variables differ by stage with high statistical significance in most cases, even when controlling for external variables, stage of growth is only a low to moderate determinant of the associated variance. As would be expected, for dependent variables which demonstrated no difference across stage of growth, omega-squared values were from .01-.03.

However, for those dependent variables with statistically significant relationships to stage, omega squared ranged from .08-.11, indicating accountability for 8-11% of the variance. These values would correspond to r values of .29-.33.

IMPLICATIONS

Even though over half of the specific hypotheses related to planning can be said to have been supported - i.e., statistically significant differences in variable measures across stages - these results cannot be said to fully support the use of different planning paradigms across stages. If, in fact, early stage firms employed incremental processes while later stage firms used a rational paradigm, one would expect much lower scores on the formalization of planning for stage 1 and 2 firms in contrast to stage 3 and 4 firms. In fact, scores on these measures ranged from only 3 to 4 on a scale of 6 across all stages. Also, one would expect longer objective setting time horizons for stage 3 and 4 firms than for stage 1 and 2 firms. Surprisingly, all firms reported objective setting time horizons in the range of 3 to 4 years. Finally, omega-squared coefficients suggested that stage accounts for a relatively small portion of the variance of planning variables.

The fact that stage accounts for only a moderate portion of the variance associated with planning variables raises several interesting issues. If stage is not a strong explanatory factor, it is highly possible that one of the external variables controlled for - size, rate of growth, or age - has an influence. For example, size has been proposed by a number of authors (Schendel, 1977) as a salient contingency factor influencing the nature of planning processes. Effects of those external variables can and will be accounted for in subsequent work via regression analysis and comparable techniques.

So even though statistically significant results support a number of hypotheses in a strict technical sense, it is not at all clear from these findings that early stage firms employ a different planning paradigm from later stage firms. This may be attributable to several factors. It is possible that the periodicals and academic literature as well as educational programs have succeeded in communicating the benefits of planning, but in so doing have biased individuals toward rational, goal driven processes. As a result, it is difficult to find a mature firm which does not engage in a rather formal, structured strategic planning process. New ventures are initiated in many instances by individuals who have left more mature firms and as such, may be designing processes which reflect practices of their previous employers. For whatever reason, although the planning processes of stage 3 and 4 firms are more formalized and decentralized than those of stage 1 and 2 firms, the pattern of mean scores of the variables across stage would not support a more incremental planning process among early stage firms.

FIGURE 1

STAGE OF GROWTH	PRE-START-UP	START-UP	GROWTH	MATURITY
Dominant Problems	Developing a new product or technology application	Product support and customer service	Produce in volumes adequate to meet demand	Cost control
	Securing financial resources and backing	Attracting capable personnel	Management depth and talent	Penetrating new geographic territories
	Acquiring key outside advisors or board members	Adequate facilities and/or space	Meet sales targets	Administrative burden and red tape
		Developing a network of reliable vendors and suppliers	Definition of organizational roles, responsibilities and policies	Development of financial systems and internal controls
			Management information systems	Establishing a firm position in a new product/market segment
			Attaining profitability or market share goods	

TABLE 1

OVERALL ANALYSIS OF VARIANCE STAGE--PLANNING VARIABLE MEANS

<u>PLANNING VARIABLE</u>	<u>Stage 1</u>	<u>Stage 2</u>	<u>Stage 3</u>	<u>Stage 4</u>	<u>F=</u>	<u>P<</u>	<u>Results</u>
BUDGETING FORMALI- ZATION	3.2754	3.2436	4.1961	4.3056	4.3872	.0006	Significant
BUDGETING CENTRALI- ZATION	4.5362	4.3205	3.8939	3.8333	4.354	.0064	Significant
BUDGETING TIME HORIZON	1.7895	1.6087	1.5882	1.5833	.1477	.9309	Not Signif.
OBJECTIVE SETTING FORMALI- ZATION	3.4783	3.2692	3.6078	4.4259	5.1485	.0024	Significant
OBJECTIVE SETTING CENTRALI- ZATION	4.0290	4.0385	3.0588	3.2778	3.6138	.0159	Significant
OBJECTIVE SETTING TIME	4.000	3.0870	3.5294	3.5278	1.425	.2406	Not Signif.
NEW PRODUCT DEVELOPMENT FORMALI- ZATION	4.2319	3.2949	3.0196	4.5648	4.0599	.0091	Significant
NEW PRODUCT DEVELOPMENT CENTRALI- ZATION	3.7246	3.8462	3.5882	3.8148	.4134	.7437	Not Signif.
NEW PRODUCT DEVELOPMENT TIME HORIZON	2.7895	2.5652	2.5882	2.6111	.1435	.9336	Not Signif.

TABLE II
ANALYSIS OF COVARIANCE

VARIABLE	ANOVA-STAGE		ANCOVA-SIZE		ANCOVA-GROWTH		ANCOVA-AGE	
	F=	P<	F=	P<	F=	P<	F=	P<
BUDGETTING FORMALIZATION	4.3872	.0006	3.2213	.0237	4.2550	.0076	2.7901	.0456
BUDGETTING CENTRALIZATION	4.3540	.0064	3.4506	.0202	4.3045	.0072	3.9476	.0110
OBJECTIVE SETTING FORMALIZATION	5.1485	.0024	3.7367	.0142	4.3162	.0071	4.1675	.0084
OBJECTIVE SETTING CENTRALIZATION	3.6138	0.159	2.8156	.0442	3.3084	.0241	3.1934	.0277
NEW PRODUCT DEVELOPMENT FORMALIZATION	4.0599	.0091	4.0468	.0093	3.3102	.0232	4.8412	.0037

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