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THE ORGANIZATIONAL EVOLUTION OF TECHNOLOGY BASED NEW VENTURES: A STAGE OF GROWTH MODEL

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ABSTRACT

Based upon two case studies, this paper develops a four stage model of growth for high technology new ventures. A review of the literature finds that existing models define stage of growth through a description of internal structural characteristics. By defining stage of growth in terms of the types and dominance of problems, a further understanding of growth issues becomes possible. The successful transition of a firm from one stage to another is seen as a process of organizational learning. Propositions regarding stages and their effects on organizational design elements are offered and subsequent empirical research in progress is outline.

INTRODUCTION

The use of stage-development models have a long history across a number of social science disciplines. As Galbraith and Nathanson (1978) note, it is possible to find "proposed stages in individual cognitive development and socioemotional development, in group development and in the economic development of countries. Organization and management theory is no exception (p. 102)." Within the broadly defined organization literature such models include: strategy and structure work in business policy (Chandler, 1962; Scott, 1970; Wrigley, 1970); growth and adaptation models in the organizational literature (Filley, 1962; Moore, 1959; Greiner, 1972; Miles and Snow, 1978); and to some extent, in microeconomic theory (Williamson, 1975; Teece and Armour, 1981).

A recent literature review (Kazanjian, 1983) uncovered approximately twenty different organizational stage of growth/development models. Each is somewhat different in terms of the number of stages included and the organizational element addressed. However, one common characteristic does emerge. All present a sequence of stages through which organizations pass. Further, they see the change from one stage to another as a metamorphosis to a qualitatively different state (Galbraith and Nathanson, 1978). Several problems emerge from the overview of this literature. First, most of the stage of growth models primarily provide a description of organizational structure. A few focus at all on non-structural characteristics of the firm at different stages. In almost all cases though, the stages tend to be defined in terms of internal characteristics, resulting in a tautology of sorts whereby stages define internal characteristics which define stages. They provide little understanding as to why those characteristics emerge.

Is stage of growth simply a descriptive concept or does it represent something more? Secondly, many models are inflexible and offered in a universalistic fashion such that all organizations must proceed through all stages in sequence. Finally, the work related to stage of growth has been overwhelmingly conceptual, with few if any empirical studies to date. Exceptions would include Miller and Friesen (1980, 1983a, 1983b) and Van de Ven et al (1984).

RESEARCH DESIGN

As an initial step in a research project on growth patterns of technology based new ventures, two extensive case studies of corporate new ventures were undertaken. In general, the theory building process associated with this research can most accurately be described as inductive, based upon what Glaser and Strauss (1967) term comparatively grounded research. That is, it begins with observations of organizational phenomenon, from which, the outlines of a theory, suited to its supposed users, is structured.

> Generating a theory from data means that most hypotheses and concepts not only come from the data but are systematically worked out in relation to the data in the course of research. Generating a theory involves a process of research. By contrast, the source of certain ideas, or even "models," can come from sources other than the data (1967, pp. 3 and 6).

Considerable time was spent in each venture, interviewing the chief executive, all of his direct reports as well as the heads of each function and of selected sub-units. Additionally, any of those individuals who were among the early employees of the firm and were still with the company were interviewed. To provide balance several relatively new employees (less than 3 months) were interviewed, as were some who has recently left the company. In all, over 60 managers and employees were interviewed across

the two ventures. Additional data was gleaned from an archival review of such documents as business plans, organization charts, employee rosters and various internal memoranda. The cases were reviewed by the CEO for accuracy and disagreements of an interpretive nature between the CEO and the researcher or other managers were noted in the text.

These new ventures, backed by a major Fortune 500 company, are both high technology firms in an electronics/telecommunications based industry. The names of all organizations and individuals have been disguised to protect anonymity. The case studies cover the history of the ventures from their respective creations through August, 1979. As a stage of growth model to be outlined in a later section was strongly suggested by the case data itself, independent of a review of such models in the literature, a brief summary of the cases is provided below. The intention is to provide some flavor of the experience of these firms, with the understanding that space limitations preclude presentation of the full, rich base of data which could establish a detailed linkage to all elements of the model to follow. The reader is referred to Kazanjian (1983) for the complete version of each.

ALPHA, INC.

The origins of Alpha, Inc. are traced to 1974 and Tom Riley, the founder and driving force of the firm. Working with semi-conductors technology, he developed what became the first commercially available electronic based product to a market then relying on mechanical technologies. With financial backing in a venture capital mode from the parent firm, Riley proceeded to overcome several key technical hurdles, build prototypes, and hire engineering support. During these early days of the firm,

activities were implicitly and informally organized around project management principles with all employees working in one room. By August of 1976, the first prototype was completed and in January, 1978 the company announced and offered its first product.

With commercialization and strong product demand, the number of employees increased dramatically. Although some staff was in place for each function, it was becoming necessary to flesh out the functional organizations as Alpha built depth in engineering, brought new plant capacity in line, positioned a national field sales force and structured administrative systems and support capabilities. With this increase in the number of personnel, it was necessary to establish more formalized structures and reporting mechanisms. Everyone no longer knew everyone else by name and not everyone could report directly to Riley, as had been the case. Therefore in December 1977, the first formalization of structure was instituted with a functional organization design.

By April 1979, the number of employees had exceeded 1,000. With this growth came a need to modify the structure, specifically to reduce Riley's span of control. With even greater growth at an increasing rate projected for the next year, it was no longer possible to have over 10 individuals reporting directly to the chief executive. Therefore, Riley consolidated his organization under four vice-presidents; Marketing, Operations, Administration, and International.

Corresponding to the growth of Alpha and its development of an increasingly formal and centralized structure at the level of the total organization, each function evolved differently in response to specific pressures and needs. It is important to note however that each function faced a series of

of problems related to its specific task orientations. Further, each function experienced a "crisis" at some point which served as a precipitating factor for the introduction of greater structure and rationality to that function, made in the form of increased specialization.

Although there are differences among the individuals recruited within functions as would be expected, there was a clear difference between the type of individuals hired by Alpha before January 1978 and those hired after. Although the motivations of the early employees who accepted a position at Alpha differ somewhat, some consistent patterns emerged. Those individuals who started before January 1978 have been characterized as entrepreneurial risk takers - individuals who welcome new challenges and enjoy the lack of organizational formality and structure.

These individuals fit essentially into two categories. First there were the older, more mature managers with previous start-up experience. These individuals had either started their own companies or started new plants or relocated plants for existing firms. Second, there were the younger workers with either none or one to three years of previous work experience and with no start-up experience at all. There were very few exceptions to these.

From among these early employees, a significant level of turnover resulted due to burn out, lack of expectation fulfillment regarding compensation or advancement, and dissatisfaction with increasing formality and structure. Alternatively, some were hired away by the competition as Alpha was seen as the leader in the emerging new market.

By January 1978, the number of employees began to pick up markedly. As the size of the venture grew, and the organization was faced with

pressures on each of the functions for improved performance, efficiency and control, Alpha looked outward to provide an infusion of new managerial talent. In fact, as the organization expanded, a different type of individual was attracted. The task was no longer to build the operation from the ground up, but to transfer the venture in a multimillion dollar worldwide operating company. This required managerial talents and capabilities very different from those of 1976-77. So after 1978 Alpha was attracting more experienced 35-40 year old managers with operating experience in companies such as Xerox, IBM, ITE, General Signal Corporation and others.

Over the early history of the firm it seems that planning and budgeting reflected managerial style. The five year planning process was seen to be done primarily for the parent company's benefit in 1977. There were 50-60 people then and the view of planning was just to send the parent some numbers which reflected a best guess so that Alpha could get what it needed. By 1978, with personnel up to 300-400, it was seen as a mechanism to build internal commitment as the entrepreneurial spirit and climate became somewhat diluted. In 1979, there was a far greater deal of complexity to be dealt with. By 1980 there were proposed to be 5 plants and 3 product lines (2nd and 3rd generations). The strategy emerging was to introduce and obsolete generations quickly, staying on the front end of the technology. As the venture grew to exceed 1,000 employees and organizational problems within each function began to emerge, the emphasis for planning and budgeting shifted to deal with these issues and complexities.

The Alpha Corporation changed dramatically in the first three and a half years of its existence. Some initial activity centered around a handful of individuals attempting to develop a product idea and convince

the financial backers of its viability. Given funding, the venture was essentially a research and development lab tied to an intense effort of continued entrepreneurial sell directed at the financial backers. The emphasis was on getting the product to work. The approach was that of a model shop. Organization stressed project management priniciples. By 1979 Alpha became somewhat of a different organization as it moved toward becoming a high volume $100 million/year operating company functionally organized with a central location. Alpha had not quite fully attained that status at the time of this research.

The period of mid 1977 to late 1979 would be considered a transition period characterized by a series of organizational shocks or crises. The first of these was an engineering crisis from mid-1977 to early 1978. In effect the difficulty was to get the product to work with reliability and functions promised. The second crisis following shortly thereafter in the late half of 1978 was in manufacturing. The problem was to overcome "manufacturing constipation" - getting more machines off the end of the line. A third crisis emerged in early 1979 within the marketing function. The problem was an inadequate sales force and marketing practice allowing Alpha to sell more machines. At the time of this research, the emergence of problems in the area of product reliability, service within marketing, and in financial controls were suggested by several sources.

It should be mentioned that in most cases and certainly in manufacturing and marketing, the crises were overcome mostly by expanding the number and type of personnel. It is felt that the financial crisis will require an emphasis not on the number of personnel but on the nature and quality of information and decision processes.

BETA, INC.

The genesis of a low cost fiber optics based product can be traced to John Thomas, developer of the product and first president of Beta, Inc. Starting in 1969 with a series of small seed grants, the evolution of the product from initial conception to the first contracted development work took approximately two years and represented the transition from very informal product experimentation to the beginnings of what was to be the Beta organization. Working prototypes were developed by early 1972, leading to acquisition of additional, more significant funding and movement toward commercialization. The major milestones associated with the technical development are listed below:

Milestones

Initial Development
Building proof of principle machine
Testing and debugging
Construction of two prototypes
Construction of ten-twenty prototypes
for test and evaluation

Toward the end of this activity a consultant was contracted to conduct market research and another to structure basic administrative systems. Shortly after Thomas dedicated himself fulltime to the firm and hired several engineers, these two consultants joined the firm as employees.

From its earliest point, Beta employed a strongly centralized functional organization. Through the middle of 1977, all functions reported directly to the president, and in some cases several departments of the same function did so. In June of 1977 a new president was brought on board as a result of performance based pressures from investors, and Thomas was appointed chairman of the board. A gradual transfer of authority and

responsibility transpired over the forthcoming six month period. By January, 1978 the new president had completed some consolidation, mostly within marketing, and created new functions of Planning and International based on outside appointments.

As was the case with Alpha, most of the organizational structure and internal system development were initiated at the functional level. Here again, each function was seen to transition from an informal, non-specialized activity to a more structured, specialized and formalized organization typically as a result of precipitating crises.

Although the specific technical backgrounds differed, the types and characteristics of early and later employees at Beta paralleled the experience of Alpha. Further, the increasing formalization of internal planning processes and the increasing reliance on them to manage complexity was also similar to Alpha.

Overall, Beta seems to have demonstrated a pattern of growth similar to that of Alpha which includes some internal organizational "shocks" or "crises." Beta began with a prolonged start-up period, characterized by several funding proposals and the initiation of the marketing and financial/administrative functions on a consultative, contracted basis. The transition from this early start-up organization to a high growth, high volume company was characterized by several funding proposals and the initiation of the marketing and financial/administrative functions on a consultative, contracted basis. The transition from this early start-up organization to a high growth, high volume company was characterized by a series of "crises." The first two came relatively close together. By early 1977, it became apparent that Beta was not making its sales numbers. The

"marketing crisis" of that period resulted in the hiring of a new president with an extensive marketing background who was phased in from June 1977 to early 1978. Shortly after assuming duties as the president, he uncovered what might be described as another crisis - an "engineering and product planning void." The main problem was that no one at Beta was concerned about new products or even subsequent generations of existing products. By many, 1978 was seen as a corrective year to address these two crises, each overcome with the addition of a deepened and strengthened functional marketing and R&D capability based upon the influx of new talent.

Although recognized as a problem at about the same time, a "financial/administrative" crises centering on the gross inadequacy of billing procedures and inventory controls, was not focused upon until 1979 due to the pressing nature of the other two "crises." However, much of 1979 was concentrated on issues related to that problem, specifically financial and accounting systems and controls, MIS, and planning and budgeting.

Place Figure I About Here

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 circumstances and the organizational forms likely to result. The term stage of growth was selected advisely 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. As Penrose (1952) states:

> "The characteristic use of biological analogies in economics is to suggest explanations of events that do not depend upon the conscious willed decisions of human beings. . . We have no reason whatsoever for thinking that the growth pattern of a biological organism is willed by the organism itself. On the other hand, we have every reason for thinking that the growth of a firm is willed by those who make the decisions of the firm and are themselves part of the firm, and the proof of this lies in the fact that no one can describe the development of any given firm or explain how it came to be the size it is except in terms of decisions taken by individual men. Such decisions, to be sure, are constrained by the environment and by the capacity of the men who make them, but we know of no general laws predetermining men's choices, nor have we as yet any established basis for suspecting the existence of such laws." (p. 808)

Further, as Rhenman (1973) discusses:

> "The increasingly complex structure of an organization that is growing in both size and experiences is not determined by any inherited traits, nor does it undergo any predictable cycles. Instead, the morphogenesis of an organization (to borrow the biologists' term for the ability of a biological system to acquire increasingly complex structure) seems to have something of the character of a learning process which, to a very great extent, can be consciously influenced." (p. 174)

Both Penrose and Rhenman argue then 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 more a product of environment. There are, for example, technological discontinuities within existing industries, emergence of new industries, shifts in demand patterns among other factors.

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 (largely environmentally determined) 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 on initial growth within a single product/technology base (Filley and House, 1969).

It should be noted that the third assumption is not unreasonable for firms which are situated at or near the growth stage of an emerging industry. The experience of firms in selected computer components markets as well as for those in the personal computer market (for a time), genetic engineering, a robotics and related markets would suggest instances when in fact, demand is not a limiting factor. Further, the shortness and overlapping character of product life cycles in such technology intense industries tends to fuel growth as well.

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 Table I) from product conceptualization to organizational maturity. This list emerged from the cases, but was subsequently field tested and refined through interviews with managers of other new ventures, venture capitalists, and researchers of new ventures.

Place Table I About Here

It appears that 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 Figure II.

Place Figure II Here

It has been found that this stage of growth perspective provides an appropriate framework reflective of the growth of high technology new ventures, as evidenced by the case data. Also, considerable support for a stage of growth perspective can be found in the literature. Moore (1959) offers a three stage model which includes phases of growth, consolidation and organization. According to Rhenman (1973):

> "Selznick (1957), Zetterberg (1962), Blake (Blake et al. 1966) and others have suggested that there is a certain regular pattern in the historical development of organizations. Selznick suggests that a new organization first seeks recognition from a hostile environment and tries to create for itself a distinctive competence. As this develops, the organization grows, and in the process becomes more bureaucratically organized. Blake and his colleagues have recognized similar processes. They speak of three phases in developing companies: the entrepreneurial stage, the mechanical stage and lastly, the dynamic stage. Zetterberg suggests instead that the organization develops in cycles geared mainly to the replacemnt of a particular leader by another complementary type, as required for the growth of the organization." (p. 173)

Further, Filley and House (1969) developed a model which proposed three stages in the life of a business firm. The first stage consisted of traditional or craft firms which are characteristic of the majority of small businesses, dominated by a single owner/founder. Based upon the

introduction and promotion of some innovation, the firm moves into a second stage of dynamic growth, which results in increases in sales, market share and number of employees. As growth tables off, the firm enters the third and final stage, that of rational administration, during which time the organization adopts more formal structures and objective setting processes.

In much the same fashion, Hosmer, Cooper and Vesper (1977) proposed the existence of a four-stage model which included: 1) direct founder operation; 2) early growth; 3) one layer middle management; and 4) multi-layered management. However, the primary focus of this model is structure. Steinmetz (1969) also proposed a four-stage, structure focused model. Independently, Cooper (1978) offered a three-stage view of entrepreneurial organizations, discussing their development in terms of early stage, growth, and later stage phenomenon. Much in the same approach as these models, Clifford (1973, 1975, 1976) presented various issues associated with threshold firms based upon large numbers of observations by McKinsey and Company in their consulting work. Working from much more of a pay-back, venture capital perspective, Webster (1977) viewed the emergence of ventures in terms of five stages - pre-venture, "jelling the deal," in production, in market, and payoff. More recently, Churchill and Lewis (1983) propose a five-stage model, which outlines stages of existence, survival, success, take-off, and resource maturity. Unlike other models, however, Churchill and Lewis present alternative evolutionary steps among stages.

Adizes (1979) carried the life cycle notion further with a model which depicted both the growth and decline of firms. Utilizing various combinations of primary roles or tasks - produce, administer, entrepreneur, and integration - he postulates a 10-stage model from entrepreneurial courtship

(initiation) to death. Unlike most models, but similar to Churchill and Lewis, he offers alternative step-wise progressions at each stage.

Greiner (1972) views the evolution of organizations as being punctuated by a pattern of revolutions, precipitated by crises related to coordination and control of decision-making. Much of his argument relates to issues of leadership and coping with increasing size.

An independent stream of related literature evolved within the strategy field. Chandler (1962) initiated a stream of research stretching over a decade or more with his milestone strategy-structure work which tracked the developmental characteristics of large industrial enterprises. The basis for much of his argument is that through vertical integration and growth, firms evolved toward multi-departmental/multi-functional status and that through diversification, evolved toward multi-national organizational forms. Building on this work, Scott (1971, p. 5) proposed a three-stage model for growth:

> Stage 1) A small company with one or a few functions performed largely by one manager. Growth in volume, geographic coverage and vertical integration leaders to;
>
> Stage 2) A multi-departmental enterprise, with specialized managerial departments based upon function. Diversification leads to;
>
> Stage 3) A multi-divisional enterprise, with divisions based largely on product-market relationships.

As another extension of Chandler's work, and building upon the categorization scheme and empirical findings of Rumelt (1974), Williamson (1975) outlines a similar evolution of stages, but views the critical choice to be between reliance on the marketplace or the internal hierarchy for various functions, determined largely by market failures conditions of his model.

Although not focused directly on small, emerging firms, Miles and Snow (1978) outlined a pattern of growth for mature firms facing change of domain. Their adaptive cycle outlines "the three major problems which management must continually solve: entrepreneurial, engineering, and administrative," (p. 21). Under this scheme, the entrepreneurial problem is concerned with the redefinition of the firm's domain by the modification of product or market offerings. The engineering problems focuses on the creation of a system delivery capability for the changes opted. Finally, the administrative problem requires rationalizing and stabilizing of the solutions instituted in earlier stages.

Drawing from yet another literature, Cameron and Whetten (1983) state that:

> "Widespread agreement was found in the group development literature that groups process predictably through a series of six sequential stage . . . The importance of those sequential group stages is that similar transitions have been found at more macro (organizational) levels of analysis. Group phenomena often generalize to more aggregated units in organizations. And because there is a great deal of empirical evidence confirming the presence of sequential stages on the group level interest in organizational life cycle stages has emerged as well." (p. 12-13)

The model for this research, presented below, is heavily influenced by Galbraith (1982). While consistent with the body of theory supporting stage of growth models, it emerged from and is substantiated by the case data presented earlier. As the review of existing developmental models would indicate, none deals with technology based firms or even the influence of technology. In contrast to the slightly more common three stage models, high technology new ventures demonstrate an additional prefatory stage.

Place Table II About Here

As the model itself will show, the characteristics of this stage differ from the early stages of the four or five stage models discussed above and summarized in Table II. These differences related to the intensely technology focused tasks and the fact that in Stage 1 of the model, the firm typically does not yet have a well defined product offered in the marketplace. Further, rather than focusing upon a single driving factor such as size, leadership, or structure, this approach encompasses a more comprehensive and integrated organization design perspective. The four-stage model is presented below:

Stage 1, Pre-Start Up: This stage of growth is one not mentioned in many existing models and is largely unique to technology new ventures. Prior to the true creation of the new venture, as signified by incorporation or gaining of a major source of initial financial backing, virtually all ventures go through a period during which the primary focus of the entrepreneur and possibly several others, is on the invention and development of a product and/or a technology. In fact, this may be a circumstance in which some of the critical functions are assigned to part time employees or may be contracted out. For all purposes, structure and formality are non-existent, with almost all activity focused on technical issues as defined and directed by the founding entrepreneur(s). Major problems of the organization at this point include: construction of a product prototype (initially one, with requirements for multiple prototypes shortly thereafter), and selling of the product and business idea to financial bankers. At this stage the organization is engineering dominant with manufacturing done largely in a model shop mode. The functions, if considered at all, tend to be done implicitly, usually by the entrepreneur himself.

Stage 2, Start-Up: Given financial backing, new ventures go through a period, during which the major focus of the organization is on developing the product/technology for commercialization. At this point, the organization largely resembles a new product development team, with its problems and competences largely being technical. The focus is primarily on learning how to make the product work well and on how to produce it beyond the model shop prototype approach of Stage 1. Here, the first consideration emerges for building the organization's task system in addition to developing the product. By this time, the organization's engineering and manufacturing functions are formally created, and in many cases, the marketing and finance/administration functions

appear in an embryonic stage. Here again the venture will be dominated by a single owner or small number of partners. Usually, there are no explicit objectives for the firm, with the level of professionalism and training low. Communication and control is personal, face to face and revolves around the owner/partner. It is toward the end of this stage that the ventures product is publicly announced or first made available for sale.

Stage 3, Growth: Given technical feasibility and successful market acceptance, a period of high growth will typically result. The major problems of the firm at this point then, are to produce, sell and distribute the product in volume, while avoiding the shakeout of less effective or efficient firms from the market.

With pressures to attain profitability, the venture must carefully balance profits against future growth. Many ventures experience a sequence of functional "shocks" or "crises" as each function faces difficulty of building an efficient and effective task system. It is in this period that the firm experiences an almost constant state of change. The owner/partner remains central to all decision making, but little sense of hierarchy exists at first, as employees still feel a team spirit in the task of achieving success with an innovation. The number of employees increases rapidly and new functions are continually added. Employees tend to be entrepreneurial risk takers usually willing to forego prospects of a higher salary elsewhere in return for the opportunity for rapid promotion and advancement. Early in the growth stage, most employees find themselves to be generalists performing a broad range of tasks. However, later in the stage, as new functions are added, employees become increasingly more specialized. By this time engineering, manufacturing, marketing and finance/administration are firmly established as functional specialties. Also during this stage, the function of human resource planning/personnel is added, typically in response to the need to hire large numbers of individuals.

This stage might best be described as transitional. Formalization of structure, procedures and processes is at least initiated, if not established in all functions. However, the tendency of the owner/entrepreneur to be inolved in all decision making is hard to unlearn and so a constant tension exists between the formal and informal structures. Communication and control becomes increasingly more impersonal throughout the stage.

Stage 4, Maturity: As the growth rate slows to a level consistent with market growth, the firm enters a new stage. The major problems of the organization at this point are to maintain the growth momentum and market position. The typical focus accordingly becomes development of a second generation product which presents new challenges. By this time, the venture has evolved from an organic

R&D lab into a stable functional operating company characterized by rational, stable functional operating company characterized by rational, bureaucratic principles across the organization. Usually, the owner/partner had been either replaced or supported by a professional, experienced manager or team of managers. A formal structure has been established and is closely adhered to with rules and procedures correspondingly standardized and formalized. Employees become highly specialized, non-risk takers. Communication and control processes are formalized and impersonal. The major issue for firms in this stage then is how to allocate managerial attentions and resources between the current product oeprations and new product development efforts.

The four stages of growth, the dominant problems of each stage, and the nature of structure, processes, people, and rewards observed in each stage are summarized in Figure III. Obviously, individual ventures may vary from this pattern, and stages will overlap, but case observations and support from the literature establish this sequence as a reasonable standard.

Place Figure III About Here

GRWOTH AS A FUNCTION OF ORGANIZATIONAL LEARNING

The theoretical role of dominant problems is important not only in defining and operationalizing discrete stage, but also in understanding the transition from stage to stage, which is viewed here as an organizational learning process (Rhenman, 1973 and Normann, 1977). Miles (1982) in referencing Hirschman and Lindbloom notes that "organizational learning occurs in response to immediate problems, imbalances or difficulties, in what Downs (1967) has referred to as performance gaps . . . They argue that the intra-organizational conflicts and tensions created by these immediate problems serve a constructive function in stimulating search behaviors that lead to organizational learning." (pp. 157-158)

Duncan and Weiss (1979) go on to argue that:

> "This search can thus be understood as the basic activity underlying the organizational learning process. . . The attempt to solve these problems constitutes organizational learning. The decision makers attempt to account for failures of knowledge in terms of providing a refinement or change in existing knowledge by integrating the results obtained from specific organizational activities." (p. 92)

As stated previously with this model, it is the particular problems faced at a given time which define a venture's position in a particular stage of growth. The venture will then undergo some search for knowledge and competence, and if successful, will resolve these problems. This then constitutes an organizational learning process in that many of the problems encountered by the new venture can be anticipated to recur in sequent growth cycles (Miles and Snow, 1978). To that extent, the new venture must be able to map these solutions onto the organization in terms of specific functions, structures, people, as well as information, decision and planning processes so that solutions to these problems are not tied to specific individuals and would not have to be re-invented in their absence (Jalenik, 1978). In other words, the solutions to these recurring problems are institutionalized by the organization to provide a solution replication capacity. Such an organizational learning cycle, presented in Figure IV, explains how a new venture makes the transition from one stage of growth to the next.

Place Figure IV About Here

This cycle is dynamic in that as problems are resolved, new, different problems become dominant. The dominance of these new problems will require the search for additional and/or different knowledge and competence, positioning a venture in a new stage of growth. New structures and processes

will be institutionalized while some existing ones will have to be changed. In this matter, the metamorphosis from stage to stage is affected in two ways. First, some elements of the organization develop with the institutionalization of additional structures and processes which were not previously required. Second, some elements of the organization may be radically altered from one type to another, as with, for example, types of people or reward systems. So, each stage consists of a package of structures, processes, systems, rewards, managerial styles and so on. A movement to a new stage is repackaging of all dimensions (Galbraith and Nathanson, 1978). It should be stressed however, that all underlying dimensions of the organization do not make that transition from stage to stage simultaneously. A firm may be in transition, with some elements in one stage and other elements in another stage - so overlap does exist.

Propositions

From this discussion, two major propositions emerge:

Proposition 1: Stages of growth are observable under bounded conditions for a subset of firms (technology-based new ventures). The defining elements for each stage are the set of dominant problems facing the firm.

Proposition 2: Stage of growth problems of this model serve as four distinct task contingencies. Specifically, a different array and fit or organization design variables is appropriate for each stage of growth.

OPERATIONALIZING STAGE OF GROWTH: TOWARD AN EMPIRICAL ASSESSEMENT OF THE MODEL

As most of the stage of growth research to date has been descriptive and largely clinical, there have been few examples of how stage might be operationalized for purposes of more detailed empirical assessment. The two examples to be discussed here suggest that the primary focus tends to be some mechanism by which firms are categorized into a group which

corresponds to a stage. Van de Ven et al (1984) in a study of 14 corporate sponsored educational software start-ups classified firms in some undisclosed manner, but based upon empirical assessments argue that stage could be operationalized based upon multiple performance indicators, suggesting that low performers would be categorized as early stage firms and high performers would be categorized as later stage firms. Performance measures included growth (in sales, number of employees and customers), independence from finance sponsors, and both internal and external subjective evaluations. A different approach was employed by Miller and Friesen (1980, 1983a, 1983b). Selecting firms which were at least twenty years old, they compiled histories based upon publically available information supplemented by questionnaire data. External raters then assigned firms to particular stages according to internal characteristics of the firm.

Both the rigor and specificity of the Miller and Friesen methodology are appealing, but face limitations in the case of newly emerging, single business technology-based new ventures. Given that many such firms actively shun publicity for purposes of protecting proprietary product/market positions, they tend to be difficult to locate. Correspondingly, it becomes necessary to conduct research via primary data collection as public information (annual reports, 10K reports, magazine articles) do not exist.

Once a listing of firms, consistent with the assumptions of this model, were identified (possibly through cooperation with venture capitalists), it then becomes possible to gather data using interviews or questionnaires which would allow firms to be categorized based upon a configuration of organizational characteristics. Alternatively, based upon brief generic

descriptions of various stages, respondents could categorize their own firm. Self categorization techniques have precedence in business policy research (see Hrebiniak and Snow, 1980 and Hambrick, 1980).

One inherent strength of the problem driven stage model presented in this paper is that it readily lends itself to measures which could serve as either a prime measure of stage of growth or as a reliability assessment for the categorization mechanism employed. A number of options are possible given the listing of theorized dominant problems. Based upon a ranking of dominant problems, it would be possible to use the rankings as input to a multi-dimensional scaling program which would map the firms in a multi-dimensional space. Alternatively, problems could be rated on a low to high scale in terms of current dominance to the firm. Such rankings could then be used as input to a clustering program. Also with ratings of dominant problems, analysis of variance could be conducted to assess if ratings of dominant problems differ across stages as theorized. Scheffe tests could be conducted for purposes of planned comparisons.

The contribution of such research would be to: 1) either challenge or reinforce the validity of stage of growth models; 2) begin to develop alternative operationalizations which allow for reliability testing; and 3) allow for a range of hypothesis testing regarding the theorized effect of stage of growth as the independent variable on any number of dependent variables. The overall effect would be to shift such research from a largely descriptive paradigm toward an increasingly prescriptive, normative approach which can result from well structured, replicated tests of contingency theories.

It is important to note that these approaches produce a cross sectional assessment of a longitudinal theory. Although a helpful first step, the true test of such a model would require multiple waves of data collection, allowing the research to track the movement of specific firms at various points in time.

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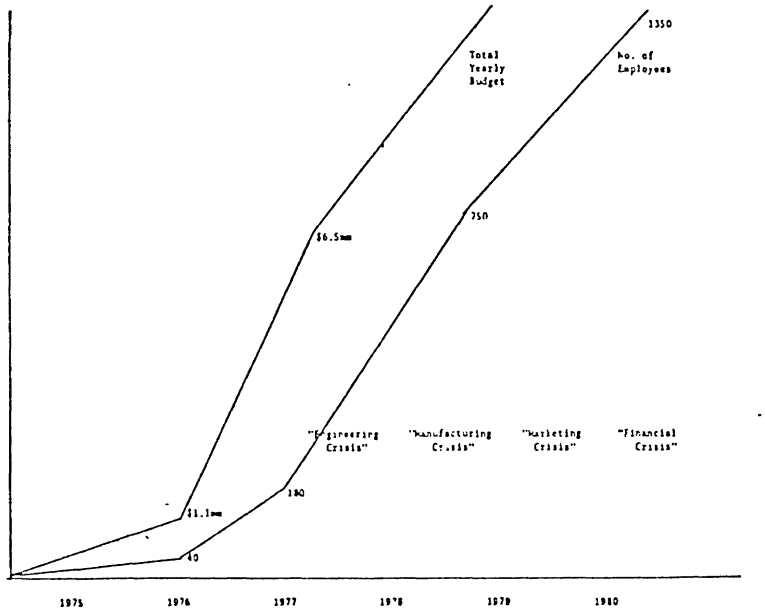
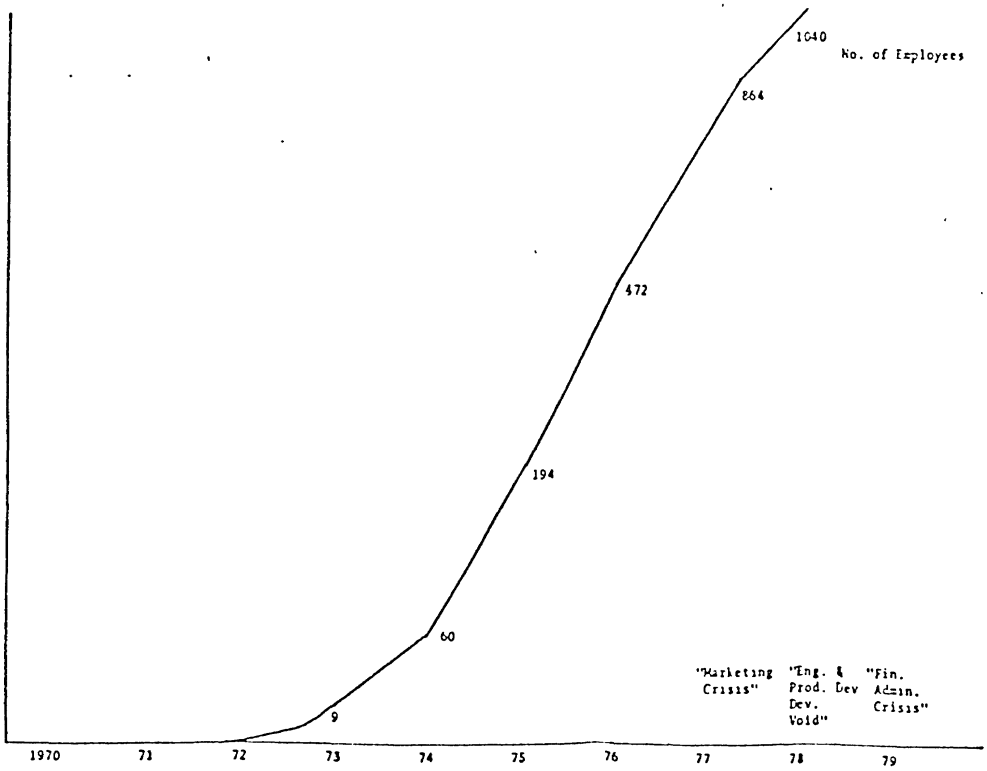
FIGURE I



ALPHA, INC.



BETA

Table I

Theorized Dominant Problems

Technology-Based New Ventures

1. Developing a new product or technology application
2. Securing financial resources and backing
3. Acquiring key outside advisors or board members
4. Product support or customer service
5. Attracting capable personnel
6. Adequate facilities and/or space
7. Developing a network of reliable vendors and suppliers
8. Produce in volumes adequate to meet demand
9. Meet sales targets
10. Management depth and talent
11. Cost control
12. Definition of organizational roles, responsibilities, and policies
13. Management information systems
14. Attaining profitability or market share goals
15. Penetrating new geographic territories
16. Administrative burden and red tape
17. Development of financial systems and internal controls
18. Establishing a firm position in new product/market segments

Figure II

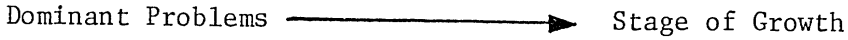


Table II

Stage of Growth/Development Models

Three Stage Models	Four Stage Models
Moore (1959)	Rheman (1973)
Filley and House (1969)	Hosmer, Cooper & Vesper (1977)
Cooper (1978)	Galbraith (1982)
Clifford (1973)	
Scott (1971)	
Miles and Snow (1978)	

Five Stage Models	Other Models
Webster (1977)	Chandler (1962)
Churchill and Lewis (1982)	Selznick (1957)
Miller and Friesen (1980, 1983)	Zetterberg (1962)
VandeVen, Hudson and Schroeder (1984)	Blake et al. (1966)
	Adizes (1979)
	Greiner (1972)
	Williamson (1975)
	Cameron and Whetten (1983)

FIGURE III

DOMINANT PROBLEMS / CHARACTERISTICS	PRE-START-UP	START-UP	GROWTH	MATURITY
	Developing a new product or technology application Securing financial resources and backing Acquiring key outside advisors or board members	Product support or customer service Attracting capable personnel Adequate facilities and/or space Developing a network of reliable vendors and suppliers	Produce in volumes adequate to meet demands Meet sales targets Management depth and talent Cost control Definition of organizational roles, responsibilities, and policies Management information systems Attaining profitability or market share goals	Cost Control Penetrating new geographic territories Administrative burden and red tape Development of financial systems and internal controls Establishing a firm position in new product/market segments
PEOPLE	Generalists----------Specialists Technologists----------Bureaucrats Non-Professional----------Professionals Consultants, Part-Timers----------Career Employees			
STRUCTURE	Informal----------Formalized Centralized----------Decentralized Group Centered----------Functional			
REWARDS	Equity (For Few) ----------Compensation & Benefits Ground Floor Opportunity----------Career Development & Exp. Non-Bureaucratic Setting----------Stable, Secure, Growth Oriented Setting			
PLANNING PROCESSES	Informal----------Formal Centralized----------Decentralized Long Range Undifferentiated----------Specialized Short Range, Single Time Horizon----------Multiple Time Horizon			

Figure IV

Organizational Learning Cycle