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UNIVERSITY OF ALBERTA

**ORGANIZATIONAL CHANGE
IN HIGH TECHNOLOGY NEW VENTURES**

BY

ELAINE FRIEDMAN

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

IN

ORGANIZATIONAL ANALYSIS

FACULTY OF BUSINESS

EDMONTON, ALBERTA

SPRING 1992



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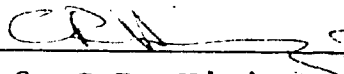
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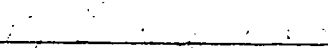
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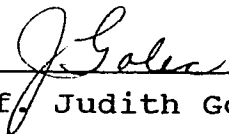
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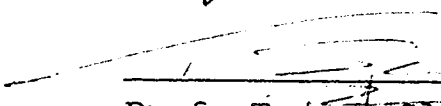
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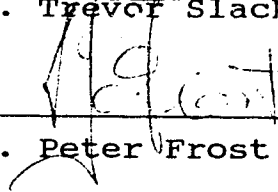
The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Organizational Change in High Technology New Ventures submitted by Elaine Friedman in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Organizational Analysis.


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March 12/92

ABSTRACT

The purpose of this dissertation was to contribute to a general theory of organizational change and to increase our understanding of organizational development. After examining existing theories of change, Hinings and Greenwood's theory (Hinings and Greenwood, 1988) was found to be the most comprehensive to date. The framework was enhanced by adding the concepts of power and satisfaction with interests as directors of change.

Three high technology new ventures were studied from their founding to the present. Methods used for data collection included an analysis of publications and internal documents as well as interviews. Interviews were carried out over a period of five years during which two of the organizations were expected to undergo a reorientation.

The findings confirm the value of Hinings and Greenwood's theory in explaining organizational change and illustrate the connective value of this theory. The results suggest that the high impact system for these organizations is the system for managing relationships with the environment. The results also show that change does not ensure survival. Implications for the development of new organizations are discussed.

ACKNOWLEDGEMENT

I would like to acknowledge the expert advice and guidance of my committee members: Prof. John Brown, Prof. Judith Golec and Prof. C.R. Hinings. I am particularly indebted to my supervisor, Bob Hinings, who inspired me to do this work. His enthusiasm, encouragement and mentorship have meant so much to me.

I would also like to acknowledge all those organizations and individuals who were so generous with their time, information and ideas.

A special thanks is extended to my husband, Harry, and my daughters, Jackie and Lisa, for their patience and understanding. Without their encouragement and support I could not have completed this undertaking.

Finally, I would like to thank my parents, Fannie and Jack Elstyne, who have always believed in me.

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CHAPTER 1

INTRODUCTION

Developing our knowledge of organizational change has become increasingly important. Today, under turbulent conditions, established organizations struggle for survival. New or young organizations not only face the same challenges but also have to adapt to changes within the organization. These include changes brought on by the passage of time, such as an increase in formalization; or a shift in focus, such as a change from research to production.

Driven by a faltering economy, research has recently focused on strategic change as a means of survival and growth for large corporations. However, while new organizations have the potential for improving economic conditions through job creation (Birley, 1986) and fostering administrative and technological innovation in industries (Brittain and Freeman, 1980; Tushman and Anderson, 1986), their failure rate is extremely high. A study by Dun and Bradstreet showed that 53 percent of all failures and bankruptcies posted in 1980 occurred in less than five years from a firm's founding; and 80 percent of businesses failed in less than 10 years from their founding. Studies in population ecology such as those by Carrol and Delacroix (1982) and Freeman, Carrol and Hannan (1983) have also shown that organizational mortality is age dependent.

Although the importance of innovation for the business firm and society as a whole is seldom disputed (Van de Ven, 1986), to a great extent young innovative firms have been overlooked by organizational theorists. While the emergence of entrepreneurship as an area of study has led to a burgeoning field of prescriptive literature, there is still a gap to be bridged between this developing discipline and traditional theory.

There is no doubt that to organizational theorists today "The study of the nature and processes of change, stability, transformation and transition is the contemporary challenge." (Greenwood and Hinings, 1987, p.563) However, there are few well articulated theories to help understand both the content and sequencing of organizational change and as Greenwood and Hinings (1987) point out, there are even fewer empirical studies because of the lack of theoretical thrust and also because of the costs involved in longitudinal studies.

Organizational transition is generally conceded to be a turbulent period resulting in organizational change. Various viewpoints exist regarding the exact nature of the change, the degree of turbulence and the length of time associated with the change.

Kimberly and Quinn (1984) view the concept of transition as a major change which results in, among other things, a new alignment of values in the overall culture of the organization.

Lundberg (1984) describes organizational transitions as signalling a break from the familiar. He suggests a transition is a major shift in the organization's character, nature, and functioning; a change in historicity and control; a change in values and ideals; as well as a change in the structures and ways of operating that have characterized the organization for some period of time.

Miller and Friesen (1984) focus on configuration. They argue for the existence of a relatively small number of very common but quite different organizational configurations encompassing a rather large fraction of the population of business firms. Change or transition represents movement from one configuration to another.

Greenwood and Hinings (1988) contend that organizations tend to operate within a paradigm providing consistency

between structural characteristics and guiding ideas which constitutes an archetype or design type. In their view, intra-paradigm change, i.e. change within an archetype, is not unusual as there is a tendency toward structural consistency. On the other hand, an inter-paradigm shift which involves a significant change in archetype or any of its major components is more difficult to achieve. This latter type of change, described as a quantum change by Miller and Friesen (1980), constitutes an organizational transition for Kimberly and Quinn (1984).

For the purposes of this study, an organizational transition involves a change in interpretive schemes accompanied by the appropriate changes in supporting structures and systems, i.e. an inter-archetype change. However, since such changes are seldom, if ever, instantaneous, and some changes lead to a heightening of the existing values, as a study of organizational change, this research will identify the various types of changes as they occur.

Any comprehensive theory of change must account for not only major transformational change, but incremental change as well as situations where there is no change at all. It must include both planned and unplanned change as well as the direction and timing of any change. The content and magnitude of change are of course significant. However, it is important to take into account changes in structure, systems and interpretive schemes of organizational members in developing an understanding of organizational change. In addition, a comprehensive theory of change should take into account not only what triggers change, but also factors that facilitate and inhibit the change process as well. Hinings and Greenwood's approach has been selected as the framework for this study since it fulfils these requirements.

The purpose of this work is to contribute to a general theory of organizational transition by extending the generalizability of Hinings and Greenwood's theory of change through testing it on a different type of organization facing different conditions. By applying the theory to change and stability in high technology new ventures, the generalizability will be increased from the public sector to the private sector, from large organizations to small, and also from a British to a Canadian setting.

In addition, this study will contribute to our knowledge of why organizations develop as they do. The choice of high technology new ventures provides the opportunity to study organizations from their founding, through early stages of growth and development. Hinings and Greenwood's theory will be used to explain why these organizations, which had the same goals when they were founded and faced similar conditions, followed different developmental directions.

Theories of Change

Numerous theories have been developed to explain organization structure. Contingency theory links structure to contextual variables. Structure has also been linked to strategy and to the stage of development of an organization. These theories, however, fail to take into account the role of strategic choice in either selection of context, strategy, or moving to another stage of development. Understanding why organizations develop as they do, requires not only an understanding of context, strategy and stage of development as determinants of structure, but understanding the dynamics underlying choices which have been made and the ability to enact them. Yet this understanding is overlooked in theories which favour statistical correlations with contextual variables (contingency theory) or look at development as a series of stages. In theories where change

is addressed, the focus is generally on the implementation of planned change. The factors that led up to the decision to change are not considered and situations where unplanned change occurs are ignored.

Stages of Development Theories

Life cycle theorists and others have developed stages-of-development models which describe the progression of an organization from its early small and simple state to a mature stage of large scale and operational complexity.

(Chandler, 1962; Channon, 1973; Greiner, 1972; Kimberly, 1980) These theorists suggest that structure is dependent upon the organization's state of development and that moving from one stage of development to another requires change.

The strength of this approach lies in its attempt to build a language for talking about organizational development and change. Clearly organizations do go through stages and the transition from one stage to another represents a point of crisis or difficulty for an organization.

However, there are two problems with this approach. The first is the tendency, sometimes explicit and always implicit, to suggest that all organizations follow the same pattern of development. The second is a failure to recognize that there are organizations which exhibit much inertia and do not change at all (Hackman, 1984). A comprehensive theory of change has to deal with these shortcomings.

Planned Change

Most studies which deal directly with change focus on planned change in large mature organizations (Kanter, 1983, 1984; Child and Smith, 1987; Pettigrew, 1985) or tracking strategy formulation over time. (Mintzberg and Waters, 1981, 1985; Quinn, 1982; Miles, 1982) The value of this approach

is that it provides an insight into conditions that facilitate or inhibit attempts at organizational change.

The main problem with this approach is its narrow focus. The study of planned change by definition excludes the study of unplanned changes. Yet both planned and unplanned change have a significant effect on organizational development. In addition, studies of planned change have been limited to the implementation of 'desired' change, ignoring the factors that underlie the change in beliefs which resulted in the desire for organizational change and why specific changes were seen to be desirable. A comprehensive theory of change has to include a framework for understanding why change occurs and how the direction of change is determined.

Contingency Theory

Contingency theory explains organizational structure in terms of contextual variables. Contingency theorists have reported numerous empirical studies correlating size, technology, context and structure (Pugh et al., 1968, 1969; Child, 1972; Blau and Schoenherr, 1971; Woodward, 1965; Thompson, 1967; Lawrence and Lorsch, 1967; Donaldson, 1985). Underlying this theory is the implicit assumption that a change in context will be accompanied by a corresponding change in structure.

The main problem with contingency theory is the fact that it is static. No attempt is made to understand how an organization moves from one state to another, nor to explain why some organizations never make the expected change. It also fails to take into account factors, such as managerial choice, power dependencies within the organization, commitment to interpretive schemes, culture, and organizational capability in the sense of both technological and managerial expertise, all factors which may have contributed to the selection of context and/or strategy or

which enabled or prevented the organization from developing in a particular way. Thus it does not qualify as a theory of change.

Nevertheless, it does have value in studying change. Its value lies in the links it establishes between contextual variables and structure. These links can be used to identify changes in context which are likely to precipitate structural change.

Organizational Development and Change

In contrast to previous research on change, this study addresses the issue "Why do organizations develop as they do?" The question how and why some organizations undergo radical frame-breaking or quantum change in the process of development and others do not will be explored. In doing so the nature and direction of change will also be taken into account. Following organizations from their founding, the Hinings and Greenwood theory will be used to explain why it is that organizations develop differently even when they are founded for similar purposes, in the same location, and with similar products in the same stage of the life cycle.

The study will also contribute to our knowledge of managing the change process in new ventures by revealing which conditions and actions are associated with specific developmental patterns.

Rationale for Selecting New Ventures

The choice of new ventures has both a theoretical and a practical basis. First, the creation of an organization is a good place to commence the study of organizational change, since it is generally agreed that the founding of an organization has a significant impact on its later development (Stinchcombe, 1965; Hannan and Freeman, 1977; Kimberly, 1979). In addition, many changes are expected at this time as a result of growth and/or aging. These include an increase in formalization, standardization and

complexity; and a decrease in centralization (Blau and Schoenherr, 1971; Blau, et al., 1976; Pugh, Hickson, Hinings and Turner, 1969; Child, 1972).

As well as increasing the likelihood of access to those present at the founding, the choice of new organizations provides the opportunity to study the development of an organization from its inception to the present while at the same time limiting the time period to be studied since the organization has existed for a relatively short period of time.

The Importance of History

Miles and Randolph (1980) suggest that organizations cannot be understood apart from their history. They argue that different organizing choices and power distributions in organizations lead to different developmental patterns, belief systems, and outcomes even for organizations that began their existence with identical constraints and resources, and regardless of growth which usually occurs in the early stage of an organization's life.

Kimberly (1987) agrees and suggests that the decisions made early in an organization's existence "set the organization on a course from which it is difficult to diverge." He cites decisions about governance, domain, expertise and design as being of particular importance. He argues that history, in the form of an organizational biography, is important in understanding any organization. For example, he suggests that organizations which have undergone significant changes of leadership early in their existence will find it easier to change, than organizations that have been under the leadership of one individual or group in the same time period.

A question that arises from Kimberly's theory is 'how long does the initial founding archetype last or have an effect on the organization?' Studying organizations from

their inception allows us to explore this issue as well as increasing our knowledge of organizational change.

Expectation of Change

The selection of new ventures is also advantageous from a research perspective since the early stages in an organization's development is where continuous change is generally expected to occur.

After reviewing nine different organizational life cycle models, Quinn and Cameron (1983) suggest that although the models are "based on different organizational phenomena", they all suggest that organizations progress through similar life cycle stages (Quinn and Cameron, 1983, p.40). While the timing and sequencing of stages cannot be firmly established, since research suggests that development can be rapid or slow, and may occur in different sequences, there is generally agreement that a new organization must undergo changes if it is to survive a period of growth. Even where an organization does not grow, there is generally agreement that there is a movement towards formalization as an organization ages, since procedures tend to become routinized and established over time.

The choice of high technology ventures is also expected to ensure that changes will occur relatively rapidly because of the nature of the product. Technology is developing so quickly today that organizations in this domain must change at the same tempo, or even more rapidly, in order to survive. Newly developed products must be brought to market before the competition gets there or before the product is made obsolete by an improved product. For example, while it is easily recognized that a drug for combatting AIDS has an enormous market potential, in one Western Canadian city there are two companies who profess to be at a significant stage in the development of this product. In the computer field, while developing a computer which utilizes hundreds

of micro computers in a parallel processing environment is seen as a significant breakthrough, the development of faster and more powerful micros than those used in the parallel machine decreased the machine's credibility in the marketplace.

In addition, the organizations in this study were founded for the purpose of researching and developing a product which they would then produce and market. They believed they had developed a viable product. If they were to produce and or market that product, at the very least a change in criteria of effectiveness would be required; since flexibility and creativity are considered important for research, while manufacturing is generally associated with stability and control.

A study by Quinn and Cameron (1983) used the competing values model (Cameron and Whetten, 1981, 1983) to identify changes in criteria of effectiveness over organizational life cycle stages. They found that although effective organizations maintain some balance or capacity in competing characteristics, such as flexibility and stability, different effectiveness criteria were emphasized in different life cycle stages. "What was defined as effective performance in one stage was contradictory to effectiveness in another stage." (Cameron, 1986) For example, in what they call the entrepreneurial stage, which is similar to the companies in this study at their founding, the emphasis is on flexibility and resource acquisition; while in a later stage, the emphasis is on productivity, efficiency, planning, goal setting, stability and control, attributes which we expect to find in a manufacturing organization. Thus change can be expected in criteria of effectiveness in an organization that moves from researching and developing a product to one which is concerned with manufacturing and sales. This need for change can be attributed to the fact

that the criteria of effectiveness which made the organization successful at developing or innovating are contradictory in nature to those that contribute to efficient production (Cameron, 1986). Since it is expected that when an organization develops a viable product, there will be pressure to change, at the very least, its ideas and beliefs concerning domain, i.e. from research to production, this study will examine whether or not this change occurs and why it does or does not.

Finally, we have chosen new ventures since their failure rate is high. Stinchcombe (1965) introduced the term "liability of newness" to describe the phenomenon that "a higher proportion of new organizations fail than old." (Stinchcombe, 1965, p.148) Recent empirical studies of the liability of newness display relatively consistent support for this argument. Organizational mortality rates have been found to be negatively related with age in newspaper organizations (Carroll and Delacroix, 1982), in labour unions and semiconductor firms (Freeman, Carroll and Hannan, 1983) and in retail, wholesale, and manufacturing organizations (Carroll, 1983). The negative age dependence of death rates persists, despite controlling for liabilities of size (Freeman, Carroll, and Hannan, 1983) and population heterogeneity (Carroll and Delacroix, 1982).

Stinchcombe (1965) suggests that liability of newness occurs because in young organizations new roles have to be developed and learned, methods have to be developed for coordinating these new roles and for dealing with problems of socialization of organizational members. In addition, new organizations must rely heavily on social relations among strangers, and lack stable ties with old customers who are familiar with the organization, its products, processes and people. This explains the low levels of legitimacy associated with young organizations as well as their

inability to compete effectively with established organizations. (Stinchcombe, 1965)

Singh (1986) argues that legitimacy/institutionalization is a factor in determining organizational survival and that the support of the institutional environment can dramatically alter the selection pressures experienced by young organizations. We believe that it is the inability of young organizations to change and adapt that is at least partly responsible for this high failure rate.

An Overview

This study, by examining organizational change in high technology new ventures, will contribute to a general theory of organizational change and increase our understanding of organizational development, as well as assisting managers of new ventures to facilitate a specific developmental direction in their organization through increased knowledge of the change process.

After introducing the research problem and reviewing relevant theories relating to change in Chapter 1, Chapters 2 and 3 present the theoretical approach. Chapter 2 examines the key issues facing researchers studying change in organizations and shows how Hinings and Greenwood provide a comprehensive framework for dealing with these issues. The principles underlying Hinings and Greenwood's theory are discussed as well as the concepts of archetype, prescribed and emergent structures and systems, and tracks. The Founding Archetype for this study is also developed. Chapter 3 deals with the dynamics of change. It includes a discussion of precipitating conditions, enabling conditions and directors of change.

Chapter 4 outlines the research design. The rationale for selecting the case study approach is discussed. Selection criteria and the process of selection are

described. Variables are defined and operationalized and methods of data collection and analyses are covered.

Chapters 5, 6 and 7 report on the case studies of organizations which have followed different tracks. In Chapter 5, the organization underwent a Reorientation. The organization studied in Chapter 6 exhibited an Unresolved Excursion at the time it was dissolved. In Chapter 7, the organization studied followed an Inertia Track since the changes that occurred involved a heightening of organizational values. Each of these chapters not only includes data on the variables, but also includes an analysis and discussion of whether the organization changed and why it followed a particular track.

Chapter 8 analyzes the data further. It compares the research data across the three organizations and draws conclusions on the change process as well as the generalizability and connective quality of Hinings and Greenwood's framework.

CHAPTER 2

THE THEORETICAL APPROACH

Justification for using Hinings and Greenwood's Framework

Organization theories in North America, in particular, are geared to an organization design framework (Hinings and Greenwood, 1988). As Zey-Ferrel (1981) points out, there are weaknesses inherent in all of these theories. She suggests a triangulation of perspectives, levels of analyses, sources of data, and methodologies as a means of eliminating these deficiencies (Zey-Ferrel, 1981). Hinings and Greenwood's theory which incorporates individual and group interests and values, dependencies of power, micro-, meso-, and macro-levels of analysis, as well as an historical perspective provides a framework for organizational analysis which fulfils these requirements.

In the previous chapter several organization theories were examined. None adequately explained organizational change. Hinings and Greenwood's theory, on the other hand, fills the gaps left in each of these theories.

First, as was noted, Stages of Growth theories suggest that all organizations follow the same pattern of growth and fail to recognize that some organizations do not change at all. Hinings and Greenwood's theory provides a framework which includes determinants of the direction of change as well as the possibility of stability or lack of change which is embodied in the inertia track.

Studies which focus on planned change fail to take into account that both planned and unplanned changes have an effect on organizations. Understanding why the latter occur is as significant in developing an understanding of why organizations change as an understanding of how 'desired' changes are implemented. Hinings and Greenwood's theory provides a framework for analyzing both planned and

unplanned change. It takes into account that certain conditions precipitate change, others set the direction and still others inhibit or facilitate the change process.

Finally, while contingency theory explains organizational structure in terms of contextual variables, both internal and external, it is static and makes no attempt at understanding how an organization moves from one state to another nor does it explain why some organizations never make the predicted change. Hinings and Greenwood's theory, with its concept of tracks, provides a framework for examining the change process over time. It also takes into account the commitment of the managerial elite to interpretive schemes, power dependencies within the organization, the capability of members, as well as context.

Not only does Hinings and Greenwood's theory fill the gaps in these theories, it also fits the requirements for a good theory of strategic change as suggested by Van de Ven (1987). Van de Ven based these requirements on standards for a theory of change proposed by Hernes (1976) and Dahrendorf (1959).

According to Van de Ven (1987), a good theory of change should explain how structure and individual purposive action are linked at micro and macro-levels of analysis. Hinings and Greenwood's theory does this by incorporating several levels of analysis. These include the environment, and organization structure and systems as well as interpretive schemes, interests and capabilities of individual organizational members.

Second, Van de Ven states, a good theory of change explains how change is produced both by the internal functioning of the structure and by the external purposive actions of individuals (Van de Ven, 1987). On this point, Hinings and Greenwood take into account how the organization

functions through prescribed and emergent systems as well as the actions of individuals.

Third, Van de Ven (1987) argues as we did previously that a good theory of change explains both stability and instability. In Hinings and Greenwood's theory the concept of archetypes and tracks provides a framework for examining situations in which change occurs, i.e. a reorientation, as well as where it does not, i.e. inertia.

Finally, a good theory of change includes time as the key historical metric since by definition change is a difference that can only be noted over time in an entity (Van de Ven, 1987). Hinings and Greenwood's theory acknowledges the importance of time in the study of change and takes into account not only calendar time but also the concept of precipitating events, linking them to structure and action.

Hinings and Greenwood's theory also measures up to the standards of grounded theory set forth by Glaser and Strauss (1967). They argue that grounded theory must closely fit the substantive area in which it will be used. It must be readily understandable by laymen concerned with this area. It must be sufficiently general to be applicable to a multitude of diverse daily situations within the substantive area, not to just a specific type of situation. It must allow the user partial control over the structure and process of situations as they change through time. (Glaser and Strauss, 1967) Hinings and Greenwood's theory fits the study of organizations, is clearly stated and applies to organizational change of all types, i.e. revolutionary, incremental, inter-archetype and intra-archetype. If a user chooses, they may also through intervention manipulate structure and processes by controlling independent variables.

The field of organization theory is expanding rapidly. In developing a cumulative body of theories of organizations, Bacharach (1989) suggests that some theories will need to be discarded if the field is to avoid sinking under its own weight. In order to decide which theories to include, a clear understanding of how a given theory fits in with other preexisting and apparently related theories is required. He describes two qualitative dimensions to this fit: connective and transformational. Hinings and Greenwood's theory is important, not because it is transformational, but because of its connective quality, i.e. its ability "to bridge the gap between two or more different theories, thus explaining something between the domains of previous theories. In this way, new knowledge is created, and a more nearly continuous mapping of the empirical field is achieved." (Bacharach, 1989, p.511.) By combining several important theories and multiple levels of analysis Hinings and Greenwood's theory facilitates this selection process.

Finally, this study draws on the theory presented by Hinings and Greenwood (1988) because it provides a well defined, comprehensive framework for studying organizational change, i.e.:

- (1) It takes a holistic approach to examining both the organization and the change process
- (2) It takes into account the direction in which change occurs
- (3) It deals with the rate of change
- (4) It deals with the sequence of change and
- (5) It includes the possibility of stability as well as change.

First, Hinings and Greenwood take a 'holistic' approach to studying organizations. As opposed to the 'partist' approach (Miller, 1981) which selects a limited number of

organizational variables for analysis in an essentially discrete fashion, the holistic approach employed by Hinings and Greenwood includes not only prescribed structural variables, but emergent processes as well as environmental and strategic variables. The advantage of using this wider and more inclusive design is that it provides information which may be used to uncover or rule out spurious or intervening variables which may conceal important theoretical linkages (Hambrick, 1983). This information can also be used to rule out nuisance variables (Kirk, 1968, p.7), extraneous variables (Kerlinger, 1973, p.309), and confounding variables (Underwood, 1957, p.90). This lends rigor to the design and increases the validity of the research. In addition, examining not only structural changes, but the underlying ideas, values and beliefs and how they are linked to structure and organizational systems compels the researcher to utilize varying perspectives and provides a multidimensional view. This approach will ultimately lead to a richer understanding of organizational dynamics as well as providing the type of information necessary to answer the questions posed by this research, i.e. "How do organizations develop over time?" and "Why do they develop as they do?"

A second advantage of Hinings and Greenwood's framework is that it addresses the issue of direction and linearity of change. The plethora of literature on change suggests that it is seldom achieved in a simple straightforward manner. (See for example: Bennis, et al., 1984; Kimberly and Quinn, 1984; Pettigrew, 1987, Pennings and Associates, 1985; Tushman and Romanelli, 1985.) Even when change is planned, there are likely to be tendencies to cling to or return to previously established forms and processes. The case of People Express Airlines, Inc. (Hackman, 1984) is an example of a situation where an attempt was made at restructuring

the responsibilities of senior managers to give greater priority to operations. However, even after the resignation of the founding president whose values were embodied in the organization's organic structure, the organization retained its original entrepreneurial structure (Hackman, 1984).

The Hinings and Greenwood framework considers the direction of changes and whether the direction is consistent over time. The concept of tracks is used as a means of representing "the extent to which organizations remain over time within the assumptions and parameters of a given archetype or move between archetypes" (Hinings and Greenwood, 1988, p.26) thereby providing a representation of linearity and direction in the change process.

In developing our knowledge of change, understanding the pace of change, or the rate at which it occurs, is also important. The third advantage of Hinings and Greenwood's framework is that it focuses attention on the time frame of the change process in relationship to significant events or attempts at change and provides a framework for taking into account and analyzing both evolutionary and revolutionary change (Tushman and Romanelli, 1985). Evolutionary change which is change that occurs gradually over an extended period of time, is favoured, for example, by Quinn who argues for 'logical incrementalism' (Quinn, 1982); and by Hedburg, Nystrom and Starbuck (1976) who recommend that an organization should avoid drastic revolution by substituting evolution for revolution. Revolutionary change, on the other hand, according to Miller and Friesen (1984) is both 'quantum' and 'dramatic'. Quantum change occurs when many things change together - that is when structures change in a multifaceted or concerted way. (Concerted change is a form of multifaceted change in which the changes are thematically related or orchestrated (Miller and Friesen, 1984, p.203); while dramatic change is rapid and sudden as opposed to

incremental change which occurs gradually, over time.) The multifaceted approach used by Hinings and Greenwood (1988), provides a framework for examining changes which occur within a given time period and facilitates distinguishing between evolutionary and revolutionary change and discerning not only the difference between them but providing insight into why the change occurred in the manner it did.

Fourthly, Hinings and Greenwood's framework deals with the sequence of change, taking into account which changes occur first and whether the changes are prescribed or emergent. As mentioned previously, change is multifaceted and all elements in an organization are not likely to change simultaneously. In terms of the nature of the change, whether structural, systems or ideological changes occur first in successful transformations is considered. In addition, whether successful transformations arise through managerial prescription or are emergent led, i.e. they arise spontaneously in day to day activities in the organization, is considered. Thus the sequence of change is included in Hinings and Greenwood's framework.

Finally, Hinings and Greenwood deal with the possibility of stability as well as change. In any research, comparisons must be made if the results are to be meaningful. The Hinings and Greenwood framework provides the concept of different tracks as a basis for comparing organizational change processes. In studying change, it is equally important to observe situations which can be described as inertia, where in fact no strategic or archetypal change takes place at all, as it is to study organizations where change occurs. The Hinings-Greenwood approach acknowledges that organizations are in a constant state of flux and considers the possibility of inertia, which is often seen as lack of change but which may include heightening of organizational values through a change in

process or structure, as well as major reorientations or transformations which are more commonly perceived as organizational change.

Hinings and Greenwood's framework, which combines several perspectives and a multidimensional approach, is the most comprehensive theory to date for explaining and understanding organizational change. Testing this theory on different types of organizations in different settings will increase the generalizability of this theory; the choice of new organizations as an alternative type enhances the connective quality of the theory through improving the explanatory and predictive capability of theories of organizational development.

Archetypes

Archetypes are the fundamental unit of analysis in Hinings and Greenwood's framework. They take the position that organizations are captured by archetypes and that while change within an archetype is commonplace, movement between archetypes is much more difficult to achieve and hence is observed less often.

Within their framework, a design archetype "may be formally defined as a particular composition of ideas, beliefs and values connected to structures and systems." (Hinings and Greenwood, 1988) The underlying assumption is that for an archetype to exist, there have to be institutionally legitimated beliefs, that is beliefs that are widely accepted as both appropriate and necessary (Tolbert and Zucker, 1983, p.25), about domain, criteria of effectiveness and principles of organizing; and within a design archetype there is congruence between these ideas, values and beliefs, and organization structures and systems. Thus defined, an archetype represents an institutionally legitimated ideal type since not only are the values and beliefs about domain, criteria of effectiveness and

principles of organizing widely held as being appropriate for a particular organization, but the structures and systems within the organization are consistent with these beliefs.

An archetype, as defined by Hinings and Greenwood, is similar to what Miller and Friesen (1984) call "gestalts", "archetypes", and "configurations". These are defined as commonly occurring clusters of attributes or relationships, common states and processes of the organization as well as characteristics of its situation - that are internally cohesive, such that the presence of some attributes suggest the reliable occurrence of others. (Miller and Friesen, 1984, p.12)

As Miller and Friesen suggest, the variables chosen to describe configurations must vary according to the research problems and the predictive tasks at hand. (Miller and Friesen, 1984, p.7) They point out that there are two main types of configurations - elemental and relational: the first being made up of constellations of elements that are thematically related, and the second being defined not in terms of elements per se but by the nature of the alignment between them. Hinings and Greenwood's approach to studying organizational change, recognizes the importance of both elemental and relational variables to organizational change and their framework takes both of these into account in defining an archetype.

There is a fundamental difference, however, in the concept of archetype as defined by Hinings and Greenwood, and Miller and Friesen's 'gestalt'. As an ideal type, exhibiting coherence between values and beliefs and organizational structures and systems, the former is based on a synthesis of the literature or a theoretical framework, which is defined in advance of the research, as opposed to

the latter which is based on empirically derived configurations.

Hinings and Greenwood look to underlying values and beliefs that have been institutionally legitimated as the basis for archetype definition rather than statistically determined characteristics. As such, an archetype in the Hinings and Greenwood framework can be classified as a 'conceptual configuration' (See Miller and Friesen, 1984, p.4) which represents a theoretical, institutionally legitimated ideal type.

An advantage of using Hinings and Greenwood's concept of design archetype is that it doesn't require organizations to be evaluated according to a set typology, and therefore allows for examination of the unique qualities in an organization. What it does do, is use the concept archetype as a baseline for determining the characteristics of an organization in relation to an ideal of its type and for selecting relevant characteristics to study. In addition, it focuses not only on structure, but also acknowledges the importance of underlying ideas, values and beliefs in an organization and how they are linked to structure and systems. Thus, this definition of design archetype provides a 'holistic' perspective which is useful in capturing the multifaceted nature of the change process.

According to Hinings and Greenwood, the critical components of an archetype are ideas, values and beliefs as well as organization structure and systems. The issue then becomes which ideas, values and beliefs are relevant in determining these archetypes. Greenwood and Hinings (1988) state that "interpretive schemes" (i.e. ideas, values and beliefs) should be considered in terms of their definition of three principal and constraining vectors of activity. These are: (a) the appropriate domain of operations, i.e. the broad nature of organizational purposes or mission;

(b) the appropriate principles of organizing; and
 (c) the criteria of evaluation to be used within the organization for assessment of organizational performance."
 (Greenwood and Hinings, 1988, p.27)

Domain

The concept 'domain' is critical to understanding an organization. Domain reflects the beliefs about the reasons for an organization's existence. In doing so, it delineates boundaries for action.

Drawing on Levine and White (1961), Thompson (1967) suggests that 'domain' appears useful as a concept for the analysis of all types of complex organizations. Domain is defined as "claims which an organization stakes out for itself in terms of..."

- (1) range of products
- (2) population served and
- (3) services rendered.

With an emphasis on consensus, "Domain consensus defines a set of expectations both for members of an organization and for others with whom they interact, about what the organization will and will not do." (Thompson, 1967, p.26) Thus Thompson suggests that using the concept 'domain consensus' implies the consensual nature of domain and suggests that we need not assume that formal statements of goals or ideologies are in fact the criterion upon which organizational actions are based. Generalizing further, Thompson suggests an "organization's domain identifies the points at which the organization is dependent on inputs from the environment." (Thompson, 1967, p.26)

Domain, then, does more than just answer the question "What is the purpose of this organization?" It reflects the beliefs of the managerial elite about the environment.

Domain is of particular interest in this study, since the organizations studied were chosen on the basis that they

were founded for the purpose of researching and developing a product which they would then market. Thus initially the organization was oriented primarily toward research and development with a domain reflecting the dependencies associated with an organization of this type. A product was subsequently developed and the expectation was that the organization would change by adding marketing and/or production to its goals and domain would change accordingly. In particular, change was expected in the state of product development, fiscal pressure and size.

The product, initially in a conceptual state, was expected to be developed into a prototype, and ultimately a viable product which would be produced and sold. Initial financial support was given to allow the organization to pursue research activities which were determined in advance by the researchers. Thus, there was an absence of fiscal pressure on organization direction.

In addition, it is generally recognized that research is a time consuming activity so that there was no expectation of immediate results. (Lorsch and Morse, 1974) As time passes, investors may begin to exert pressure to see a return on their investment. In some cases, the organization may have to turn to other sources of funding which come with strings attached, such as contracts for performing a particular type of research or a deadline for the delivery of a prototype. The latter is an example of how the need for funds can result in pressure on the organization to perform in a particular way. Fiscal pressures are any pressures which arise as a result of acquiring funds.

Principles of Organizing

'Principles of organizing' includes the beliefs underlying structures and processes in the organization. Structure defines how the organization is set up in terms of

roles and responsibilities, and the extent to which there should be specialization and differentiation, as well as centralization and decentralization within an organization. Processes refers to how things are done in an organization: how decisions are made and integration achieved.

Recruitment processes, processes for appraisal and career advancement resource allocation, consulting and bargaining are all examples of organizational processes or systems, as they are often called.

The nature of research and development, to which the organizations in this study were initially committed, involves continually changing tasks. In effective research organizations, there is a long time orientation and strong scientific goals as opposed to techno-economic goals (Lorsch and Morse, 1974). There is a belief that work cannot be standardized nor job descriptions specifically defined and written down or formalized. In contrast, in an effective manufacturing plant, the expectation is that jobs are clearly defined and work is standardized and follows formal (written) operating procedures. There is also a difference in beliefs about hierarchical structuring of an organization. Researchers value expertise and place little importance on titles and formal lines of authority. Assembly line workers, however, expect a hierarchical structure with clearly designated reporting procedures and responsibilities.

In the small, new organizations in this study, recruiting systems, systems for appraisal and career advancement, and systems for resource allocation are not expected to be defined or formalized. They are likely to be personal and emerge on an as required basis. On the other hand, when an organization grows in size and moves into new functional areas, these processes are required more frequently and systems are put in place to handle them.

Criteria of Effectiveness

'Criteria of effectiveness' represents the beliefs as to how organizational effectiveness should be evaluated within an organization. Criteria of effectiveness are generally based on what tasks and functions are seen to be critical in fulfilling organizational goals.

In a research organization, criteria of effectiveness are vague. As one researcher put it: "It is difficult to invent on schedule." When an organization moves into manufacturing, effectiveness is more readily measured in terms of number of units produced, costs of production, etc. However, research suggests that criteria of effectiveness change over time, or as organizations move through various developmental stages (Quinn and Cameron, 1983).

Bart (1988) indicates that in evaluating performance in new ventures, innovation and risk taking are favoured over current profits. Kazanjian produced similar results in his research on high technology new ventures (Kazanjian, 1988) where he found strong support for his hypothesis that in the first stage of these organizations, firms rated the development of new product or technology applications higher than other problems; the main problems being construction of a product prototype (Block and MacMillan, 1985) and selling the product to financial backers (Timmons, Smolen and Dingee, 1977). In the third stage, however, sales and marketing were significantly more important to firms.

An important consideration in determining criteria of effectiveness is isolating which activities or values are seen to be effectiveness criteria as expressed by organizational goals, i.e. those that appear on documentation about the organization and are given lip service by organization members. These are the prescribed criteria of effectiveness since they have been formally set forth, and are to be considered apart from those that are of

concern to different individuals in the organization and even those which receive recognition in the form of rewards given for meeting the relevant requirements. These latter values are what Hinings and Greenwood call emergent. They are also reflected in beliefs about organizational structure and processes.

The organizations in this study were selected on the basis that at their founding criteria of effectiveness were associated with product development. When and if the product is developed, according to the literature (discussed previously), criteria of effectiveness are expected to change.

Structure and Systems

Organizational structure and systems and how they relate to ideas, values and beliefs regarding domain, criteria of effectiveness and principles of organizing, is the final element in Hinings and Greenwood's concept of archetype.

Structures and systems represent the key elements in organization design. Organization structure includes differentiation, both vertical and horizontal, while systems reflect organizational processes, i.e. how things are done in the organization such as the way in which integration is achieved, or the manner in which decisions are made.

Differentiation is "... the state of segmentation of the organizational system into subsystems, each of which tends to develop particular attributes in relation to the requirements posed by its relevant external environment." (Lawrence and Lorsch, 1967, p.3). There are four types of differentiation, according to Miller (1979); functional differentiation, product differentiation, geographical differentiation and vertical differentiation. Functional differentiation reflects the number of groups in the organization performing different functions, such as a

personnel, accounting, manufacturing and sales operations. Product differentiation is the number of distinct products produced by the organization. Geographical differentiation reflects the number of distinct sites in which the organization operates.

Integration is "...the process of achieving unity of effort among the various subsystems in the accomplishment of the organization's task." (Lawrence and Lorsch, 1967, p.4) Integration can be achieved through face to face communication, through liaison persons or committees, or through specific procedures set up to ensure coordination.

Organization charts and formally designated job titles demonstrate prescribed structure and processes, i.e. how the organization is intended to work. Often this is not the same as the way the organization actually does work. In the small, new organizations in this study, structure and processes are rarely if ever defined; rather they develop over time on an as required basis which may or may not conform to the way management initially intended structures and systems to be. Existing structures and processes which differ from those prescribed for the organization are emergent. The prescribed structure can be expected to reflect the values of those empowered to design the organization structure. Whether this structure has been established for some time, or whether it is a recent development provides an insight into the change process in an organization. The emergent structure reflects the values and beliefs of organization members regarding the importance of functions to an organization's well-being and the power of individuals and groups within the organization to affect structure and processes. The relationship between prescribed and emergent (or actual) structures over time, and their relationship to one another, is important in understanding the dynamics of the change process.

As organizations age or grow, formalization and standardization are expected to increase. Formalization may be merely a confirmation in writing of current methods or structures or new structures and processes may be prescribed. In the former situation, structures and processes are emergent led. If, however, prescription sets forth structures and processes which differ from the operative structures and systems, this represents an attempt by the dominant coalition to prescribe change.

There is no ideal design for a small, new organization in the research and development archetype; however, it is generally agreed that an organic structure favours creativity (Burns and Stalker, 1961; Lawrence and Lorsch, 1967). The high level of interaction among organization members in this design is facilitated by the fact that there are few rules and regulations. Combining the small size of the organizations studied with an organic structure leads us to expect a flat design. Following Mintzberg's typology, both the adhocracy and simple structure meet the needs of organizations of this type (Mintzberg, 1983).

An adhocracy, according to Mintzberg, is often preferred in the early years of an organization's life cycle, and is most evident in those industries that are relatively young. These are the industries that developed since World War II, such as aerospace, electronics, consulting and research. The organizations in the present study fall into this category. Also, an adhocracy is generally made up of professionals with a high level of expertise and accordingly has a high level of horizontal differentiation. In the organizations studied, however, functional differentiation is limited by an interpretive scheme which focuses on research and development. Production, marketing, accounting and personnel functions are for all practical purposes non-existent. Since the

number of employees is small and funds are limited, geographical diversification is also generally limited to one location.

Vertical differentiation, as suggested previously, is also low. Decentralization and low formalization contribute to the flexibility and responsiveness of an adhocracy; however, since there is ambiguity over authority and responsibilities, as Miller and Friesen (1984, p.85) suggest, "Many of them either die early or else shift to bureaucratic configurations to escape the uncertainty."

Although an adhocracy facilitates problem solving and provides a developing organization with the ability to be flexible and adaptable, it also requires management to give up control. Thus some founders may prefer the simple organization, depicted by Mintzberg (1983) as a flat organization with an organic operating core. In this type of organization almost everyone reports to a one-person strategic apex where the decision making power is centralized. There is also little formalization in this type of organization. Mintzberg points out that the simple structure meets the needs of new organizations in their formative years, which is the period under examination in this study. He suggests "The new organization tends to adopt the simple structure, no matter what its environment or technical system, because it has not had the time to elaborate its administrative structure." (Mintzberg, 1983)

As was expected, the structure of the organizations in the study differ in the manner suggested by the previous typologies. However, there are also similarities as suggested above, i.e. there is a lack of formalization and standardization which as the organizations grow and/or mature is expected to develop. The structure is flat, so there is little vertical differentiation, if any; and also little horizontal differentiation as well. Although Miller

and Friesen (1984) suggest there may be a high degree of horizontal differentiation in an adhocracy, the criteria for selecting organizations in this study restricts the total number of different functions possible, so that if an organization grows and/or develops in line with the criteria set forth at the outset of the study, the number of functions can be expected to increase to include, at the very least, marketing and production functions which were not present in the research and development archetype. Thus organization design measurements in this study focus on formalization, standardization, vertical differentiation and horizontal differentiation; all of which are expected to increase if an organization grows and/or develops along the path intended at the outset of this study (Pugh, et al., 1968, 1969; Child, 1972; Hinings and Lee, 1971; Blau and Schonherr, 1971; Khandwalla, 1974; Dewar and Hage, 1978). Regardless of whether an organization was originally an adhocracy or a simple structure, the move to production and marketing necessitates adding functions to the organization; while an increase in size can be expected to lead to the necessity for additional specialized functions such as accounting and personnel departments. Also, as an organization grows and/or ages, it is expected to become more bureaucratic; thus formalization and standardization increase as well as the number of levels in the hierarchy (Pugh, et al., 1969; Pugh and Hinings, 1976).

Prescribed and Emergent Structures and Systems

The preceding section dealt with organization structure and systems. Using the traditional approach, exemplified by Chandler (1962), this generally refers to the authoritative, or as Hinings and Greenwood describe it, the prescribed framework (Hinings and Greenwood, 1988, p.8).

However, research has shown that there is often a gap between the formal and informal organization (e.g., Dalton,

1961; Downs, 1967; Homans, 1950). Hinings and Greenwood recognize this gap by including both prescribed and emergent systems in their framework. The formal organization can be equated with the prescribed framework in Hinings and Greenwood's theory. It refers to the "officially intended structure of roles and responsibilities and..pattern of vertical and horizontal integration." (Hinings and Greenwood, 1988, p.8)

Research on formal organizations has shown that these organizations are often loosely coupled (March and Olsen, 1976; Weick, 1976). In such situations structural elements are only loosely linked to each other and to activities, rules are often violated and decisions often not carried out. Where structures and systems arise outside of the prescribed framework, either to augment or replace it, they are considered emergent.

Several reasons have been suggested to explain the emergence of structures and systems which have not been prescribed by management. For example, in designing an organization, management establishes rules which encompass the structure of roles and authorities, both vertically and horizontally, decision systems and human resource systems which they believe are necessary to achieve an adequate level of performance. However, in designing structures and systems for an organization, it is difficult if not impossible to consider every possible situation. When unplanned events occur, employees devise a method of coping with them. When such events occur repeatedly over time, new patterns in structures and/or systems may begin to emerge.

Under other circumstances, Meyer and Rowan (1977) suggest that managers are "driven to incorporate the practices and procedures defined by prevailing rationalized concepts of organizational work and institutionalized in society" (Meyer and Rowan, 1977, p.300) into their

organization. By doing so they "increase their legitimacy and their survival prospects, independent of the immediate efficacy of the acquired practices and procedures." (Ibid., p.300) Organizations so designed may find that these structures and systems impede organizational efficiency. In order to buffer their formal structures from the uncertainties of technical activities they become loosely coupled, building gaps between their formal structures and actual work activities.

In keeping with their holistic approach, Hining's and Greenwood's framework provides for an analysis of both prescribed and emergent structures and systems and their interdependent interaction over time.

In terms of organizational change, they consider the impact of the sequence of prescribed and emergent change. Their findings suggest that in organizations which underwent a transformation, change was more emergent-led than in other tracks and that they showed signs of their prescribed structure 'catching up' with their emergent structure at a later period in their research.

The Founding Archetype

The basis of an archetype is the values and beliefs that have been institutionally legitimated and are consistent with the organization's structure and systems. The emphasis is on a holistic approach which provides information useful in recognizing the nature and extent of change.

The literature dealing with organizational types has focused primarily on differences in internal organizational characteristics across stages (Miller and Friesen, 1984; Smith et al., 1985; Block and MacMillan, 1985); or on problems which organizations in differing circumstances are likely to encounter and the corresponding organizational forms likely to result. (Starbuck, 1971; Greiner, 1972;

Chandler, 1962) A framework involving the holistic concept suggested by the Hinings and Greenwood archetype, which embodies values, beliefs, systems and structures, is noticeably lacking. Thus, it is necessary to develop an archetype which would be appropriate for these organizations at their founding.

Since, as stated previously, the study commences at the founding of each organization, and because of the selection criteria used, each organization was primarily involved in research and development, establishing the founding archetype involves examining literature on new ventures as well as research and development organizations in order to establish what their values will be, and what systems and structures are consistent with these values.

New Ventures and Research and Development

According to Greiner (1972), in the birth stage (or first stage) of an organizations, which he calls 'creative evolution', the emphasis is on creating both a product and a market. The founders are usually technically or entrepreneurially oriented, disdain management activities and are absorbed in their new product. Communication in this stage is frequent and informal. While hours of work are long, salaries are modest and there are promises of ownership benefits. (Greiner, 1972) We would expect to find characteristics of Greiner's 'creative evolution' stage in research and development based organizations.

Bart's (1988) work which focuses on new venture units in large organizations, provides an insight into characteristics of new venture units which are useful in developing a founding archetype for the organizations in the present study since the organizations are all new ventures themselves. Bart suggests that new venture units differ from operating units across several dimensions. In particular, objectives are global (See page 39) in new venture units

rather than specific as in operating units. In line with this global perspective, planning is more frequent but there is little detail, job descriptions are loose in new ventures and detailed in operating units; controls are loose rather than tight; and the span of control is wide in new venture units and narrow in operating units.

Bart also indicates that in evaluating performance in new ventures, innovation and risk taking are favoured over current profits; there are infrequent performance reviews; rewards are also infrequent and involve recognition rather than promotion; and compensation is deferred, e.g. employees are often rewarded with an equity position.

The temperament of life in a new venture unit is also different from existing, mature business units, according to Bart. The environment is dynamic, innovation and experimentation are high, there is little formality, and employees enjoy a great deal of autonomy. What control exists, is carried out on a face to face basis. (Bart, 1988)

Miller and Friesen (1984) used cluster analysis to develop a taxonomy of organizations based on strategy making. A sample of 52 firms was broken into successful and unsuccessful groups on the basis of performance. Using factor analysis they found a cluster which they called the "Innovator" made up 5% of their sample. (Miller and Friesen, 1984, p.119) The "Innovator" is similar to organizations in this study since according to Miller and Friesen:

"These are typically smaller companies whose strategy is to find and occupy a niche of the market that has been left open by competitors. Firms enter interstices of the market where their size and inexperience are not disadvantageous. They typically remain simple and undiversified, ensuring that they continue to dominate their niches through the frequent generation of product innovations." (Miller and Friesen, 1984, p.119)

Describing the features of the 'Innovator' which is similar to the founding archetype, Miller and Friesen (1984) suggest that in 'Innovator' organizations, experts are free to pursue their ideas and to work in a climate that fosters creativity. This requires that they have autonomy and are not encumbered by bureaucratic structures so that these organizations are centralized and directed from the top. They are characterized by informality, extensive delegation, and open communication.

A recent study by Kazanjian (1988) of high tech new ventures provides a description of the first stage of organizations which are similar to those in the present study. However, rather than looking for an explanation of how and why these organizations develop as they do, his approach is to test a theory of stages of development based on problems encountered by organizations in different stages. Although he found support for only the first and third of his hypothesized stages, since we are looking for an archetype which exists when an organization is founded, the first stage, which he confirmed, is useful in developing a founding archetype for this study. Stage 1, according to Kazanjian, is concerned with conception and development. He suggests that before formal creation, as signified by incorporation or by gaining a major source of financial backing that goes beyond initial seed grants, virtually all ventures go through a period during which the primary focus is on the invention and development of a product or a technology. (Kazanjian, 1988, p.263) Structure and formality are nonexistent during this stage, with almost all activity focused on technical issues as defined and directed by the founding entrepreneur(s). During the early days of the firm, activities are implicitly and informally organized around project management principles, with all employees working in one room. According to Kazanjian, problems of organizations

in Stage 1 include construction of a product prototype (Block and MacMillan, 1985) and selling the product and business to financial backers. (Timmons, Smollen, and Dingee, 1977)

Defining the founding Archetype

For the current study, the founding archetype has been defined as a small, new organization devoted to research and development. Within Hinings and Greenwood's framework, an archetype is defined through the values and beliefs which underlie and are consistent with organizational systems and structure.

Some beliefs about domain, principles of organizing, criteria of effectiveness, and supporting systems and structures which are present in the founding archetype may also be generalizable to other types of organization. There may be changes in these areas with or without change in the initial research and development orientation. Thus, defining the founding archetype, for this research must be approached from two perspectives.

First, the interpretive schemes which can be used to differentiate the Founding archetype from other archetypes must be identified. Second, in keeping with a holistic approach systems and structures which support these interpretive schemes must also be identified.

Interpretive Schemes:

Interpretive schemes are defined as reflecting values and beliefs about domain, principles of organizing and criteria of effectiveness. Thus defining the founding archetype involves examining the values and beliefs that have become institutionally legitimated and are expected to prevail in a young research and development organization.

Domain:

The organizations in this study were founded for the purpose of researching and developing a product which they

would then market. Thus at the time of founding, the "appropriate domain of operations" is believed to be research and development. There is no fiscal pressure as the expectation is that funds are and will be available to pursue research activities. By definition, there are less than ten employees in the organization.

Principles of Organizing:

Since the purpose of the organization is research and development, there is a belief that the work being done has not been done previously, is not repetitive, and cannot therefore be standardized. Experts working in these organizations value autonomy (Lorsch and Morse, 1974). Thus, job descriptions and controls are expected to be loose while the span of control is wide (Bart, 1988). In keeping with these values, structure is expected to be characterized by informality, extensive delegation and open communication (Miller and Friesen, 1984). In short, organizations of this type are expected to have an organic structure (Burns and Stalker, 1961).

Criteria of Effectiveness:

In keeping with the purpose outlined in the preceding section on "domain", criteria of effectiveness are global in nature (Bart, 1988). This means there are no specific goals defined for measuring effectiveness other than the final product. In the interim, creativity, innovation and risk-taking are valued (Bart, 1988; Kazanjian, 1988). There is a long time orientation and a high value is placed on scientific expertise (Lorsch and Morse, 1974).

Structures and Systems:

When an organization is within an archetype structures and systems are consistent with the interpretive schemes which define the archetype. However, even when interpretive schemes are the same, supporting structures and systems may

vary. The critical issue is whether they support the interpretive schemes.

In the founding archetype, formalized structures and systems are notably lacking. As Kazanjian (1988) notes, structure and formality are nonexistent during this stage, with almost all activity focused on technical issues as defined and directed by the founding entrepreneur(s). Greiner noted that at this stage integration was achieved informally, through frequent and face to face communication (Greiner, 1972). This is also consistent with the findings of Lorsch and Morse (1974) which suggested that effective research laboratories exhibited less formal structure, a more participative style and greater use of confrontation than effective manufacturing organizations.

The narrow focus on research and development, the nature of research as a task and the homogeneity of employees (who are all technological experts) is supported by a structure with little horizontal differentiation. Vertical differentiation is also expected to be low because of the limited size and the individual characteristics of the employees (scientists) who value independence (Lorsch and Morse, 1974).

Supporting structures and systems are thus characterized by little differentiation (either vertical or horizontal), no formalization or standardization, and a high level of integration which is achieved through face to face communication.

Tracks

While archetypes act as a baseline for comparison in determining an organization's state at a particular time, studying the process of change requires a longitudinal approach. A study of change, must also deal with movement over time. Hinings and Greenwood use the concept of track to represent movement or absence of movement between archetypes

over time. Tracks are formally defined as "maps of the extent to which organizations move from the constraining assumptions of a given archetype and assume the characteristics of an alternative archetype." Thus tracks depict changes in an organization by examining the direction in which an organization changes, i.e. towards or away from an archetype; and provides concepts for addressing the scale or extent of such change.

In fact, what makes Hinings and Greenwood's theory especially valuable in examining change is that it provides a conceptual framework which deals with the degree or extent of change and the periodicity or timing of change as well as the direction of change. Like Miller and Friesen (1984) and Tushman and Romanelli (1985), they acknowledge that all change is not quantum or revolutionary change, i.e. change which involves movement from one archetype to another. However, they also provide a means for analyzing organizational transitions which captures the difference between change within an archetype which involves heightening of existing structures and systems rather than the introduction of new ones, and change which involves the erosion of values and their reemergence or replacement; follows the routing through transitional and intermediate positions between archetypes; and examines whether such change is smooth and linear or is fraught with delays and reversals in direction.

Varieties of Archetype Coherence and Incoherence

For the purpose of analyzing periodicity and the degree of change, Hinings and Greenwood suggest three possible analytical positions which characterize an organization with respect to an archetype and which can be used in mapping organizational tracks. These are archetype coherence, embryonic archetype coherence, and schizoid incoherence.

In archetype coherence "the structures and processes of the organization's design consistently reflect and reinforce one interpretive scheme." (Hinings and Greenwood, 1988, p.28) Thus, an organization operating within an archetype will exhibit a consistency between values and beliefs and organization structures and processes. In general, the literature suggests that if an organization is to be effective there will be coherence among contingency factors and structure. According to Donaldson, whose findings are based on a meta analysis of contingency theory research, there is strong evidence linking strategy, size, technology and ownership to structure (Donaldson, 1985; 1987). Miller and Friesen also (1984) support this view when they develop arguments for configuration, which like archetype coherence, is the most common organizational state.

When organizations are in a state of embryonic archetype coherence, they are not operating entirely within an archetype. According to Hinings and Greenwood these "organizations have structures and processes in which significant design elements are discordant." (Hinings and Greenwood, 1988, p.28)

Finally, in a position of schizoid incoherence structures and processes reflect the tension of two contradictory sets of ideas and values. An organization which sets up a production line for manufacturing its product, but allows research and design engineers to interrupt production in order to introduce changes to the product while it is being produced is an example of how an organization values creativity (since it supports ongoing research and development) but is striving for efficiency as well (with an assembly line). Unless a system for coordinating the two functions is developed, or priorities are clearly defined, the organization will be in a state of schizoid incoherence expressed through internal conflict.

Classifying Tracks

Hinings and Greenwood (1988), suggest organizations may follow many different tracks but use the analytical positions previously described to develop four generic ones (prototypical types), in particular. These are the "Inertia" track, "Reorientations" or "Transformations", "Aborted Excursions", and "Unresolved Excursions".

The "Inertia" track is characterized by "consistent and sustained attachment to one interpretive scheme." (Ibid., p.42) Any changes will be consistent with the prevailing ideas, values and beliefs within an organization and those changes that are not will be suppressed. According to Hinings and Greenwood's initial propositions "most organizations can be expected to gravitate toward a design archetype and remain there for a lengthy period."

Tushman and Romanelli (1985), Starbuck et al. (1978), and Miller and Friesen (1984) support this view. In their research, Miller and Friesen (1984) observed that in most instances change was the adjustment of structures and systems to secure consistency and coherence within an archetype. Their research showed that "momentum" (i.e. the gravitation towards and consolidation within an archetype) was dominant whereas reversals in the direction of change were rare and that essentially, organizations operate within their existing design. This is what happens in the Inertia track. Any change that does occur involves a heightening of existing organizational design. If problems arise, organizations will tend to seek solutions within their existing framework. Thus bureaucratic organizations will set up new departments, rules and regulations to cope with environmental changes, becoming more bureaucratic. On the other hand, creative or innovative organizations operating within an organic framework will retain an organic approach to solving problems.

This suggests that young organizations, like those in this study, which have been operating in an archetype emphasizing creativity and product development, will tend to continue in this archetype despite having developed a product. A change in values and structures, however, is required if the organization is to become effective at producing and selling its product since at the most basic level the organization would have to add production and/or marketing functions to achieve this end.

Alza is an example of an organization that followed an inertia track. (Peterson, 1981) The story of Alza is particularly relevant to the current study, since the company was founded to research and develop pharmaceutical products. The company recognized, however, that profits came not through perfecting products but through marketing and manufacturing them; and that the routine associated with marketing and manufacturing leads to formalization which is not conducive to innovation. Peterson reports that in an attempt to maintain its innovative characteristics, Alza used two devices to contain these formalizing influences. First, they established Alza Pharmaceuticals as a distinct division separate from Alza Research, and secondly, final product development was in several cases contracted out as a joint venture with another firm. Thus Alza attempted to retain its innovative nature through spinning off functions requiring more formalization. The result was that Alza was able to maintain the underlying ideas values and beliefs that led the company to become successful at research and development, resulting in an inertia track.

In contrast to the "Inertia" track, the "Reorientation" or "Transformation" track is evidenced by an organization which changes its underlying ideas, values and beliefs together with appropriate structural and/or systems changes. An example of a "Reorientation Track" is what

Miller and Friesen call 'Entrepreneurial Revitalization'. Transitions of this type made up 32% of the sample they used to study transition archetypes. (Miller and Friesen, 1984, p.133)

In an organization undergoing Entrepreneurial Revitalization:

"A new chief executive attempts to revive his enterprise by increasing innovation, pursuing market opportunities, and devising more adaptive strategies. Power gravitates toward the CEO as he studies markets and primes the structural and information processing apparatus to facilitate the revitalization." (Miller and Friesen, 1984, p.133)

Miller and Friesen suggest International Paper (cited Fortune, March 1969) was in this transition archetype in the 1960's. A new CEO, Edward Hinman, was appointed. He began to expand capacity, modernize equipment and diversify into more lucrative fields to break the organization's reliance on the cyclical, highly competitive paper industry. The diversification strategy required a new structure which was implemented. (Miller and Friesen, 1984)

Revitalization, however, is not a transition that we expected to find in our sample of young organizations. What was expected was that as the firms grew older and larger, or as a product was developed which needed to be produced and marketed, additional functions would develop. We then expected to find a need to delegate some of the decision making tasks to functional and lower level managers and as a result develop a more professional management approach. Using Miller and Friesen's framework, a Maturation transition archetype is more likely to occur. (Miller and Friessen, 1984, p.143)

While Miller and Friesen (1984) classify 'Maturation' as an example of transition, the changes that occur may or may not lead to 'Reorientation' within Hinings and Greenwood's framework. As pointed out previously,

interpretive schemes form the basis of their 'archetype' and it is possible for different structures and systems to support the same underlying interpretive schemes. Thus although there may be changes in structures and systems consistent with Miller and Friesen's concept of 'Maturation', if the underlying values and beliefs about domain, principles of organizing and criteria of effectiveness do not change, according to Hinings and Greenwood, the organization is not considered to be on a 'Reorientation' track.

Change, when it occurs, is rarely, if ever, linear (simple and straightforward) but is more likely to be dynamic and complex. An advantage of the Hinings and Greenwood's framework and the case study approach is that it provides an insight into the complexity of change. Within this framework, Revitalization and Maturation may occur but, the manner in which they do occur is not always the same. An organization may attempt change several times before it is successful. Change may take place in a sequence of positive steps, or an organization may move back and forth between new and old structures and systems. Hinings and Greenwood provide a conceptual framework for examining this phenomena. They suggest "Reorientations" may take more than one form, e.g. they may occur in a track which exhibits a "linear progression", "oscillations", or is "delayed".

A "linear progression" exists, according to Greenwood and Hinings (1988) when an organizations moves away from its original archetype to an embryonic state. This occurs when elements of the existing archetype start to become eroded and/or elements of an alternative archetype begin to appear. For example, the high tech organizations in the present study reach an embryonic state when they recognize the need for marketing or production functions in the organization and an effort is made to establish these functions. If the

organization is on a reorientation track, it continues to move away from its initial archetype and begins adopting a new contradictory set of ideas and values until it is in a state of schizoid incoherence where "structures and processes reflect the tension of the two contradictory sets of ideas and values." (Hinings and Greenwood, 1989, p.28) At this point, organizations in the present study would place equal value on research, development, marketing and production. Typically there is a conflict between research and development personnel who would like to continue improving the product, and the marketing and production personnel who would like to see the product finalized so that they can go into production with assurance of delivering a well defined product on a specific date.

On this track, change continues to occur, as structures and processes relating to previous ideas and values, and the values themselves are abandoned in favour of the new emerging set of ideas and values. This brings an organization to "embryonic archetype coherence", in relationship to the developing archetype, where the sales and production functions take precedence over the research and development function. Ultimately on this track, the organization reaches a state of "archetype coherence" in the new archetype as the "reorientation" is completed. At this point, the organization is clearly in the business of producing and marketing a particular product. Where research and development activities exist, they are conceptually and physically separated from the production oriented organization.

This smooth transformation is perhaps the least common type of change. Although transformations are often perceived to be linear, closer examination will generally reveal this was not the case.

"Oscillations" occur when the movement does not proceed directly, as in the "linear" progression. An organization wavers, moving back and forth between old and new "embryonic archetypes" before a new archetype is established.

A "delayed" transformation occurs when the organization moves to the embryonic form of its initial archetype and remains in this state for some time before completing the transformation to a new archetype.

The "transformation" tracks discussed are only a few of the many possible versions of this track. What characterizes the transformation track is ultimately the adoption of a new archetype.

An Aborted Excursion results when some movement is made towards adopting new structures, ideas, values or beliefs, the change is not completed and the organization returns to its original form. According to Hinings and Greenwood, in this track an organization moves from its initial design archetype to embryonic archetype coherence or a schizoid state, where as mentioned previously, "organizations have structures and processes in which significant elements are discordant." (Hinings and Greenwood, 1988, p.41) In other words, the values and beliefs will not be as consistent with the structure and processes within an organization as they were previously. Organizations which undergo an aborted excursion may move back and forth between greater and lesser degrees of archetype coherence. Thus, patterns within this track may vary, as in other tracks. However, an aborted excursion can be identified when an organization returns to its original archetype. People Express is an example of an aborted excursion studied by Hackman (1984). He reported that the organization showed movement toward restructuring in 1982 but "transcended the conventional dynamics of organizational life cycles"

(Hackman, 1984, p.58) when it returned to its original precepts and management practices.

Since an 'Aborted Excursion' results in an organization returning to its original archetype, it can also be viewed as an oscillation in another track. How it is viewed, ultimately depends on the length of time used in determining the nature of the track. The longer the time span involved, the more likely it is that an 'Aborted Excursion' will be seen as an oscillation within an alternate track. In the case of People Express (cited previously), the 'Aborted Excursion' could also be viewed as an oscillation in a longer 'Inertia Track'. Similarly if a later 'excursion' resulted in a change to an alternate archetype, the first 'Aborted Excursion' could be considered an oscillation in a Reorientation Track.

The final track is an Unresolved Excursion. An "unresolved excursion....involve(s) sustained movement from a coherent archetype without attaining a reorientation." (Hinings and Greenwood, 1988, p.50) According to Hinings and Greenwood, this state is generally the result of competing interpretive schemes within an organization pulling against one another so that the organization fails to complete a reorientation or to return to its initial archetype. Rather, it remains in a state of flux. The problem in identifying this track, is one which is inherent in all studies of change, i.e. the time element (when should the study begin and when should it be considered complete). What appears to be a state of flux may, given sufficient time, culminate in a Reorientation which has followed an oscillation pattern; or an Aborted Excursion. Nevertheless, the concept is useful as a means of describing the processes of change which occur within a given time frame.

Summary

Hinings and Greenwood's theory was selected as the basis for this study because it is the only theory to date that provides a well-defined, comprehensive framework for studying change. Not only does it fill the gaps in existing theories of change, it also fits the requirements for a good theory of change outlined by Van de Ven (1987) since it incorporates several levels of analysis, including emergent as well as prescribed systems and structures, explains stability as well as change, and takes into account the role of time in the change process. In doing so, Hinings and Greenwood's theory combines several important existing theories, which give it the 'connective' quality cited as an important characteristic of good theory by Bacharach (1989).

Hinings and Greenwood's framework takes a holistic approach to examining both the organization and the change process. By taking into account the direction, rate, and sequence of change, and the possibility of stability as well as change, Hinings' and Greenwood's theory is the most suitable framework for providing insight into the development process of the organizations studied.

Archetypes and tracks are the foundation of this theory. According to Hinings and Greenwood, an archetype represents a theoretical, institutionally legitimated ideal type. Interpretive schemes, which embody ideas values and beliefs regarding the appropriate domain of operations for the organization, the appropriate principles of organizing and the criteria of evaluation used within the organization for assessment of organizational performance, form the basis of an archetype. In an archetype, there is consistency among interpretive schemes, context and organization structure and systems.

In the current study, the founding archetype is representative of small, new organizations involved in

research and development. Based on the narrow focus of the organization, the nature of research as a task, and the homogeneity of employees (who are primarily technological experts), supporting structure and systems are characterized by little differentiation, no formalization or standardization and a high level of integration which is achieved through face to face communication.

While archetypes provide a basis for comparison in determining an organization's state at a particular time, Hinings and Greenwood use the concept of tracks to represent the movement or absence of movement between archetypes over time. In order to establish an organization's track, the position of an organization in relation to an archetype must first be determined. Hinings and Greenwood suggest three possible analytical positions: archetype coherence, embryonic archetype coherence and schizoid incoherence.

Four generic tracks are then presented based on these positions. These are: the 'inertia' track in which an attachment to one interpretive scheme is sustained; the 'Reorientation' track in which the underlying values and beliefs are changed together with appropriate changes in structures and systems; the 'Aborted Excursion' in which some movement is made towards adopting new ideas, values beliefs or structures before the organization returns to its original form; and the 'Unresolved Excursion' in which there is sustained movement from a coherent archetype but the organization fails to complete a reorientation.

CHAPTER 3

THE DYNAMICS OF CHANGE

Thus far, the concepts discussed have provided a framework for determining whether change has or has not occurred, the extent of any change, and a means of representing organizational changes over time. However, a framework for answering the fundamental question of this research "Why do organizations develop as they do?" is still lacking. In order to answer this question and to understand the change process, we need to ask what precipitates change, (or as Lundberg (1984) suggests, what triggers change), why change occurs in one direction rather than another, and what conditions facilitate or inhibit change.

Underlying Hinings and Greenwood's framework is the concept that stability in an organization is dependent upon consistency among ideas, values and beliefs, organization structure and processes; and the environment. Since it is essential to effective operation, organizations will strive to achieve this congruence. Stimulus for change exists when there are inconsistencies in the organization. Anything which results in a significant change for any part of the organization, is likely to have a ripple effect on other parts of the organization as attempts are made to eliminate the disruption through the use of existing systems or processes, or adapt by moving towards an alternate congruent state. Increasing our knowledge of why an organization retains its original form or undergoes change as a result of these pressures is the key to understanding organizational change and development.

In their framework, Hinings and Greenwood suggest that changes in contextual constraints and contingencies, as well as changes in patterns of value commitment within an organization exert pressures for change or inertia and are

therefore precipitators of change; while power and organizational capability can facilitate or impede change and, as such, constitute enabling conditions.

While Greenwood and Hinings present the precipitating/enabling distinction, it was not included in their original framework. It arises out of their empirical work and therefore requires further conceptual refinement and empirical testing.

In addition, although the basic premises set forth by Greenwood and Hinings provide a valuable framework for examining change, this framework would be more meaningful if it was devised to answer the questions regarding change that were set forth at the beginning of this section, i.e. what conditions precipitate change, what conditions determine the direction of change, and what conditions facilitate the change process. While Lundberg's (1984) framework is cumbersome to use since it contains too many fine distinctions such as precipitating conditions, triggers, permitting and enabling conditions, Hinings and Greenwood's framework is too parsimonious with only two categories, precipitating and enabling. Discovering the dynamics and analyzing the change process is better served by using an analytic pattern which answers the fundamental questions about change that were stated earlier. Conditions, then, would be evaluated on the basis of their function as precipitators, directors or enablers of change.

Within this framework, precipitators are changes in contextual constraints, patterns of value commitment and contingencies; while value commitment and interests within an organization act as directors of change since they determine whether or not the need for change will be recognized; how that need, if recognized, will be resolved; and, if through change, the nature and magnitude of the change involved. The final category, enabling conditions

i.e. conditions which facilitate or impede the change process, will continue to be the same as in Hinings and Greenwood's framework, and will include dependencies of power and organizational capability.

Precipitating Conditions

Most writers suggest that an organization can be expected to remain stable and pursue an inertia track. Thus, if organizational change is to take place, there must be a change in a major element of sufficient magnitude that there is no longer consistency within the organization. Such a change creates what Hinings and Greenwood (1988), and Lundberg (1984) describe as "precipitating conditions."

Precipitating conditions are seen as exerting pressure on an organization to change. As suggested previously, these pressures may arise from changes in either external or internal conditions. External changes, such as changes in situational context may lead to inconsistency between the environment and organizational beliefs, structures and processes and thus creates pressure to change in order to achieve consistency once again; or internal changes, such as changes in interpretive schemes of organizational members or changes in organization structure and/or systems may also lead to inconsistencies which require resolution.

Changes in Situational Constraints

The literature referred to as 'structural contingency theory' suggests that organization structure is dependent or contingent upon situational circumstances. Thus, when context changes it becomes a pressure on an organization to adapt to the changed conditions. The extent of the pressure depends on the type and extent of the change and the degree of inconsistency it creates within the organization.

Since an organization's domain consists of areas where it interacts with or is dependent upon its environment, changes in these areas can be seen as changes in domain.

Lundberg's (1984) list of precipitating conditions reflect changes in domain. He suggests that environmental calamities such as a recession, natural disaster, or competitor's innovation; environmental opportunities, such as technological breakthrough, new markets, new sources of capital and external revolutions, which could be either political interference or a company takeover, are conditions which exert pressure for change. Within Hinings and Greenwood's framework, these can all be construed as changes in situational constraints or changes in context.

Organizations in the present study have all experienced technological breakthroughs, since this was one of the criteria employed in their selection. The rationale behind using technological breakthroughs as a selection criteria is that if these organizations were to fulfil their original mandate to develop a product, which they would then produce and market, the technological breakthrough of having developed the product implies that the organization will have to change its focus from research and development. This is consistent with Quinn and Cameron's (1983) four-stage model of early development in which they suggest that organizational values shift from one stage of development to the next and that values change as an organization moves from an entrepreneurial stage which involves flexibility and resource acquisition to the collectivity stage or formalization and control stage where the emphasis is on planning, productivity, efficiency and increased control. Technological breakthrough, if it leads to production, becomes a precipitator of this change in focus which also requires a change in criteria of effectiveness since, as Zaltman, Duncan and Holbeck (1973) have shown, factors which facilitate innovation may hinder implementation.

Technological breakthrough also stimulates a change in technology in an organization if it involves a change in

methods of production. Woodward (1965), Thompson and Bates (1957), Thompson (1967), and Perrow (1967; 1970) have all linked technology to structure. Since the organizations in this study started out in research and development, they were operating in a unit or individual production system. When a decision was made to manufacture rather than continue with research and development, the core technology which was based on creating a single unit was expected to change to batch or mass production with the resultant pressures for standardization, specialization and formalization (Woodward, 1965). Although evidence linking technology and structure has not been consistent, Hickson, Pugh, and Pheysey (1969), in order to reconcile findings of the Aston studies which appeared to be inconsistent with Woodward's, hypothesized that: "Structural variables will be associated with operations technology only where they are centred on the workflow. The smaller the organization the more its structure will be pervaded by such technological effects..." (Hickson, Pugh, and Pheysey, 1969, pp. 294-95) Since the organizations in the present study are small organizations (with less than 100 employees), technology can be expected to have a significant effect on structure.

In high tech new ventures, which are capital intensive, the availability and source of funds often plays a significant role. When capital available to founders is no longer sufficient to support the needs of the organization, they must turn to other sources for this resource. Obtaining government grants and venture capital usually requires documentation of plans for spending funds and assurance that results will be forthcoming. Often this need prompts an organization to make its first move towards formalization.

According to Blau and Schoenherr (1971, p.57), size is the most important condition affecting the structure of organizations. The Aston Studies (Pugh et al., 1968, 1969),

the National study (Child, 1972), Hinings and Lee (1971), and Blau and Schoenherr (1971) have all found that specialization, decentralization and formalization were positively correlated with size. The underlying rationale holds that as an organization grows it is able to obtain benefits from increasing specialization which leads to a more differentiated and hence more complex organization. The increased complexity, evidenced by a greater number of subunits creates problems of coordination. In order to solve these, controls, standard rules and policies, and formal procedures are adopted which according to Blau and Schoenherr (1971) allows for more systematic decision-making.

Life cycle literature also suggests that as an organization grows and/or ages inconsistencies develop within the organization which lead to a need for change. For example, Greiner (1972) suggests that in a young organization growth is through creativity which requires frequent and informal communication with management. When growth results in an organization too large for close personal control to be effective, a crisis occurs. The solution comes through the introduction of structures and systems to control the enterprise together with a leader suited to the managerial task. Greiner also suggests that the ideas, values and beliefs of organizational members must be brought into alignment with the new systems if the organization is to be successful at this stage of development.

Miller and Friesen (1980, p.285) in developing archetypes of organization transition, found that 10% of the organizations in their sample underwent a transition which they called 'Maturation'. They suggest that Maturation ".....heralds the transition to a more professional management approach, often from an entrepreneurial one. As

firms grow older, larger, and more complex, there is a greater need to delegate some of the decision-making tasks to functional and lower-level managers, to professionalize and institutionalize the intelligence-gathering and information-processing functions, and to integrate the efforts of decision-makers by formal means (e.g., committees and planning sessions) rather than by charisma alone."

Since the organizations in this study are all young organizations which have emphasized creativity and entrepreneurship, have all grown in size and aged to the extent that they have been in existence for at least ten years, we expect these pressures for standardization and formalization to be operating.

Changes in Internal conditions

While changes in situational constraints create pressures for change, as mentioned previously, Hinings and Greenwood also take into account that pressures for change may emanate from changes in internal conditions, e.g. changes in values or interpretive schemes of organizational members. Such changes may arise when there are changes in the composition of personnel due to merger or acquisition; through hiring to fill newly created functions; or simply through the aging of existing personnel or normal turnover of staff. Sales and Mirvis (1984) provide an example of how consensus on internal values can be disrupted as a result of acquisition. In this case, a multibillion dollar U.S. conglomerate with "an organizational culture dominated by the power of aristocrats" acquired an independent firm "very committed to participative management." (Sales and Mirvis, 1984, p.107) In a developing organization, hiring manufacturing personnel who value efficiency can disrupt consensus in a firm which is concerned with creativity.

Miles (1980) also suggests that maturation among individual members of the system, and the fact that the

challenge, creativity, and intense effort required in a young organization leads to burnout, allows for replacement by people who are willing to usher in the formalization process. Or as Peterson (1981) suggests, personnel with an entrepreneurial organization from its inception, who value creativity and thrive on uncertainty, may as they age, desire security; and rather than supporting the firm in its search for new ventures, may start to look for profits and increased income.

Changes in values and interpretive schemes may therefore lead to inconsistencies in the organization and, along with changes in contextual constraints and contingencies, create pressures for change.

All of the organizations in this study encountered similar changes in situational context or contingent circumstances and internal conditions, as well as aging over the period under consideration. First, they made what they considered to be technological breakthroughs, and encountered situations where they had to acquire new sources of capital. They increased in size, both numerically and in terms of the number of functions that were performed in the organization. In addition early hires have aged, which increases the likelihood that some have left, making room for replacements, while others may have undergone changes in values due to personal maturation. Ensuring that organizations in this study have encountered similar triggers or precipitators of change, increases the similarity of the organizations, and also the likelihood that they will experience change.

Directors of Change

While changes in situational constraints, and changes in values and interpretive schemes, create pressures for change, patterns of value commitment and interests provide an explanation of why an organization responds in a

particular way to pressures for change or precipitating conditions. (Hinings and Greenwood, 1988, p.50) For changes in contingencies or internal conditions, while necessary, are not sufficient to activate the change process. These changes must first be recognized and interpreted in light of prevailing organizational norms, values and beliefs, and then acted upon, for change to occur. (Lundberg, 1984; and Starbuck, 1983)

Patterns of Status Quo Commitment

In the previous section, changes in interpretive schemes were considered to be precipitators of organizational change. The emphasis was on changes in interpretive schemes causing an incongruence or inconsistency within the organization which required further change to resolve it. As a director of change, it is the dominant commitment to prevailing and alternative schemes within an organization that is relevant.

According to Hinings and Greenwood's framework, widespread commitment to the status quo or indifference of the managerial elite is likely to be associated with an inertia track. Thus, in an organization where there is widespread commitment to research and development, even though a product has been developed, the organization is likely to exhibit an inertia track by continuing to operate within the same interpretive scheme, emphasizing research rather than producing or marketing the newly developed product. The literature suggests that the inertia track is the most common track followed by organizations (Starbuck, 1973, 1983; Miles and Snow, 1978; Hedberg, 1981; and Kimberly, 1987). This is due to the fact that when problems are encountered in an organization, they are likely to be solved through the use of prevailing interpretive schemes.

Where there is widespread commitment to an alternative interpretive scheme, or a reformative commitment (Hinings

and Greenwood, 1988, p.51), the organization is likely to undergo a transformation. Starbuck et al. (1978) argue that the replacement of top managers is essential to achieve a reorientation in an organization. Iacoca's turnaround of Chrysler is an example of a transformation achieved through appointing managers committed to reformative values.

(Iacoca, 1984) While purposeful change of management, is one way of developing a reformative commitment, alternative commitments may also arise over time as organizational members age or are replaced (Miles 1980; Peterson, 1981); through merger or acquisition (Sales and Mirvis, 1984); or through the addition of organizational members with different backgrounds as they are required to fulfil the needs of growing and developing organizations. To have a reformative commitment, however, the new ways of thinking about domain, principles of organizing and criteria of effectiveness, have to be widespread in the organization. (Hinings and Greenwood, 1988)

Where competitive commitments exist among the managerial elite or there is indifference towards an interpretive scheme, an aborted or discontinued excursion is likely. Often, organizations which require additional funds, find that they can only be acquired by giving investors representation on the board. These investors generally have different values than the members of an organization which has a research orientation as they are looking for an immediate return on their investment. Influenced by these new values, an organization begins a move towards their adoption; first, by adding an individual with this bias to their board of directors, and often by adding representatives of financial and planning functions to the operating organization. Once the need for funds has been satisfied, an organization may revert to its previous archetype, in effect having undergone an aborted excursion.

In a pilot study for this research, an organization went as far as acquiring a manufacturing facility for its product. The product itself, however, failed to support the facility, as the emphasis on research continued. The facility was used to perform contract work in another area, so that it would not remain idle while research and development on the initial product continued. In this case, the organization acquired facilities and staff for production while still retaining its original commitment to research. An inconsistency existed between the need or commitment to further research and the need to support a production facility. Although the organization appeared to be adopting new values or structures, they were soon abandoned in favour of the previously established manner of doing things.

When competitive commitments (i.e. commitments to more than one interpretive scheme) continue over an extended time period, an unresolved excursion exists. In this state, an organization may oscillate between commitments and will exhibit inconsistencies.

The "Aftermath" archetype, described by Miller and Friesen (1984), is on this track. Miller and Friesen suggest that in organizations operating within this archetype inexperienced managers have no clear strategy. As a result, changes are incomplete. There is no integration of old and new; rather, there is a sharp division between veterans and new managers. The veterans are generally experts in production and marketing while the new people often have backgrounds in finance and accounting. Although the new managers are the designated power holders, the competitive commitment held by old managers thwarts the implementation of new strategies. Until these differences are resolved, changing the pattern of commitment, the unresolved excursion continues.

The organizations in this study were selected on the basis that they had encountered pressures for change. All in the early stages of development, these organizations developed a product which according to their original mandate, they planned to market. Having accomplished what they initially set out to do, i.e. develop their particular products, these organizations were expected to be under pressure to establish new goals if they were to fulfil original expectations. In other words, if the organizations were to produce and market their products, the need for change could be attributed to the fact that the qualities that made the organization successful at developing or innovating are contradictory in nature to those that contribute to efficient production. According to Hinings and Greenwood, the pattern of commitment within an organization will have an effect on what happens to the organization as a result of these pressures.

Thus, Hinings and Greenwood suggest that there is a relationship between tracks and the pattern of commitment to prevailing and alternative interpretive schemes within an organization. Patterns of commitment, together with interests determine how an organization responds to pressures for change.

Interests

While patterns of commitment affect the direction of change, the degree of satisfaction organization members have with the way their interests are dealt with also affects the direction of change. (Hinings and Greenwood, 1983)

Hinings and Greenwood define interests as "the relationship between an individual or group and the distribution of organizational resources. Interests are concerned with the aims of functionally discrete groups to secure a sufficient and fair share of organizational

resources" (Hinings and Greenwood, 1988, p.53) such as finances, personnel and status.

Walsh et al. (1981) argue that within an organization individuals and groups will have competing interests based on personal values and interests rather than articulated organizational goals. These individual or group interests are expressed through a motivation to enhance or defend a particular distribution of organizational resources. Over time, the dominant interests become built into organizational structures and are largely taken for granted as legitimate. Thus questions about them rarely arise.

Hinings and Greenwood suggest that the level of satisfaction of individuals and groups within an organization with respect to allocation of resources affects the change process. In general, they suggest, where there is high satisfaction with interests in the organization, i.e. members are satisfied with the amount of resources allocated to themselves and their groups, an organization is likely to follow an inertia track since they will be motivated to defend the status quo.

Where dissatisfaction with allocation of resources is high, members will seek to obtain more resources for themselves, resulting in pressure for changes favouring their interests, and the likelihood of a reorientation track.

Modest to high satisfaction is expected to lead to an aborted excursion since the impetus for change in a particular direction is not sufficient to sustain change in that direction. While high dissatisfaction may also be associated with an unresolved excursion. When an organization is on a reorientation track in a deteriorating fiscal context, cuts in expenditures result in a rise in dissatisfaction with the pattern of resource allocations (i.e. with interests) and a decline in perceived

organizational performance. Hinings and Greenwood suggest this problem with resources can be interpreted by people in the organization as furthering the relevance of the new system or as triggering a desire to return to tried and trusted traditional arrangements (Hinings and Greenwood, 1988, p.182).

Interpretive schemes and interests are closely linked since commitment to interpretive schemes is likely to follow the belief that particular interpretive schemes support an individual or group interest; however, this is not always the case. It is possible that an individual may knowingly or unknowingly act against their own self interests. For example, a research scientist working in a high tech organization who lends his support to production and marketing activities, may lose the status and access he had to resources as a researcher if the criteria of effectiveness change. If the organization follows a track which leads to transformation from a research orientation to a market focus, the researcher would lose status. The adoption of an interpretive scheme favouring commercialization would work against the scientist's career interests.

One problem with this analytical framework which Hinings and Greenwood point out is that interests are inextricably linked to interpretive schemes despite their analytical independence. In the present study, interests and values are expected to be tightly coupled at the outset since the organizations were founded to reflect the founders' interests. However, as new members are added to the management group, particularly those with expertise in functions which are new to the organization, or as time passes and original founders begin to look for a return on their investment, interests of individual members of the

managerial elite may begin to differ from those established at the founding of the organization.

Enabling Conditions

Enabling conditions are those conditions that facilitate change (Hinings and Greenwood, 1988). Lundberg's (1984) framework suggests that "Enabling conditions" are conditions "external to the organization which increase the likelihood of transition occurrence." However, within Hinings and Greenwood's framework, and the revised format presented in this study, external conditions act as triggers of change. Enabling conditions, then, are conditions within the organization, which when coupled with the perceived need for change, allow or enable an organization to accomplish a transformation. According to Hinings and Greenwood, dependencies of power and organizational capability are the enabling conditions which serve to facilitate or inhibit the change process.

Power as an Enabling Condition

While patterns of commitment and satisfaction with interests point the way to change, enabling conditions, which include the distribution of power and organizational capacity, determine whether movement continues along the desired track. The role of power takes on particular significance where there are competitive patterns of commitment within an organization.

There are many difficulties involved in arriving at a definition of power (Astley and Sachveda, 1984). However, it is generally agreed that power is a capacity of social actors to overcome resistance on the part of other social actors in order to achieve desired objectives or results (Dahl, 1957). In an organizational context, according to Hickson et al. (1971; 1986), power is a capacity to determine outcomes (but not necessarily against resistance, cf. Walsh, et al., 1981).

Hinings and Greenwood (1988) suggest the role of power in organizational change is to ensure that movement continues along the desired track. In so doing, power can be seen as facilitating or impeding the change process both actively and passively.

Whether it facilitates or inhibits the process, depends upon two factors: first, the extent to which power is dispersed within an organization as opposed to concentrated within a narrowly drawn coalition or an elite; and secondly, whether the interpretive schemes held by those in power are reformative. Where power is centralized, the interpretive scheme reflected in the organization will be consistent with the values of the elite. In this case, if change is desired, power holders can impose their direction on the organization which can serve to facilitate the change; or conversely where change is not desired it can be suppressed. (Hage and Dewar, 1973)

According to Hinings, et al. (1974, p.42), "resistance to change or advocacy of change may derive from intuitive understanding of its impact upon power." Thus managers seeking to retain power may use the power they possess to hinder or facilitate change according to how they perceive the change will affect them. Similarly, Salancik and Pfeffer (1977) contend that those in power tend to use their power to retain power. The fact that structures and systems are generally designed to support power holders in organizations can be seen as one of the reasons that organizations most often follow an inertia track.

In the organizations in this study, which start out with an emphasis on research and development, the founders and original members involved in the research process can be expected to exhibit resistance to a move towards a more commercial orientation.

On the other hand, where power is dispersed throughout an organization, it is more difficult to impose change unless there is a widespread commitment to that change among organizational members. Thus, in organizations where power is dispersed among founding members with differing commitments, change requires a more widespread commitment among organizational members. Thus, "the role of power dependencies (in organizational change) depends upon the pattern of commitment within the organization." (Hinings and Greenwood, 1988, p.59)

Organizational Capability

While dependencies of power affect the ability of an organization to achieve a transformation, possessing relevant organizational capability is critical for completing the change. The relevant organizational capability for achieving transformational change is of two types. First, an understanding of what must be done, in the form of knowledge or expertise in technical areas and managerial skills in operating within an alternative archetype, is required. Second, leadership with the skills necessary to generate commitment to change and experience or ability related to organizational change is needed.

Specific abilities are required for directed change. Expertise in activities called for by the new archetype is necessary in order to design the alternative archetype and direct or supervise appropriate activities. For organizations in this study, if change is to be directed toward production and/or marketing, organizational members with experience in these areas are required to provide the understanding needed to facilitate such a change and to fulfil the organizational requirements of the new archetype. Thus, where a change from research and development to marketing and production is desired, skills in the area of marketing and production are necessary to design and

implement the appropriate structures and to direct and/or participate in the marketing and production functions.

In addition to knowledge of and experience in an alternative archetype, leadership is also important. Leadership has been shown to play a significant role in the growth potential of young organizations and sets a pattern which is difficult to change. Filley and Aldag (1980) suggest that through the definition of domain, a leader has an important impact on the growth potential of an organization and upon its vulnerability to external influence. Focusing on small firms, they found that through domain definition and the subsequent causal chain, leadership was the key determinant of the constellation of characteristics (referred to by them as type) which affects the developmental pattern of an organization.

Kimberly (1987) also places importance on the role of the leader in determining organizational outcomes. He states that organizational leaders in new organizations establish the mode of governance, the domain, the types of expertise and the overall design of an organization. Over time, the underlying values become established, and are difficult to change.

Greiner (1972), supports this view by suggesting that the first crisis an organization meets is a crisis of leadership. In his view, "individualistic and creative activities are essential for the company to get off the ground." (Greiner, 1972, p.42) The resulting growth creates a need for increased control which results in "a crisis of leadership". Thus he suggests that "the first critical developmental choice - (is) to locate and install a strong business manager who is acceptable to the founders and who can pull the organization together." (Greiner, 1972, p.42)

The literature on change suggests that for a major change of this type to occur, not only is a change in the

manner of leadership required (i.e. from loose to tighter control), but the ability to lead an organization through such a change is required.

Kanter (1983), Tichy (1983), Peters and Waterman (1982), Tichy and Ulrich (1984), Pettigrew (1985; 1987), Tushman and Romanelli (1985) and Schein (1985) have all suggested that leadership plays a role in organizational change and culture because of the responsibility leaders hold for defining and gaining commitment to organizational values, strategic direction and internal organization. Organizational transformation involves changing values, directions and organizational forms, thus stating the changed values, direction and forms and building commitment to them is essential to implementing organizational change.

Burns (1978) distinguishes between the "transformational" leader who commits people to action and the "transactional" leader who operates in a traditional manner exchanging such things as jobs, money and security for compliance. According to Tichy and Ulrich (1984), a "transformational" leader is required to mobilize an organization to change.

Kimberly (1987) contends that the number of generations of leaders within an organization can determine its adaptability and consequent growth and/or survival. The idea that a change in leadership within the organization somehow gives it the ability to change more readily in the future reflects the concept expressed earlier that understanding what has to be done is important in examining an organization's capacity for change. Experience with the change process is one aspect of this understanding.

Table 3.1 Conceptual framework for explaining change

<i>Precipitating Conditions</i>	
Changes in situational constraints	Changes in internal conditions
- Relationship with environment, e.g. availability of financial support, market	- Interpretive schemes of organizational members, e.g. beliefs about domain, principles of organizing and criteria of effectiveness
- Increase or decrease in size	
<i>Directors of Change</i>	
Patterns of value commitment	
- the extent of commitment to existing or alternative interpretive schemes among the managerial elite	
Satisfaction with interests	
- how satisfied organization members are with the way resources are allocated	
<i>Enabling Conditions</i>	
Dependencies of Power	Organizational Capability
- the degree of centralization and commitment of power holders interacts with directors to enable or impede change	- Transformational leadership
	- Managerial experience in the alternative archetype
	- Technical skills required by the alternative archetype

Summary

Organizational archetypes and tracks provide the basis for studying organizational change. Within this framework, archetypes can be seen as "being held in place or destabilized by one or more of the five dynamics of context, interpretive schemes, interests, power and capacity. It is the interplay between these that will determine the particular track followed by an organization." (Hinings and Greenwood, 1988, p.67) The framework utilized in this study

suggests that changes in external context or internal conditions will place pressure on an organization to change; the pattern of value commitments and degree of satisfaction with interests within an organization will determine the direction of change; while the distribution of power and organizational capacity for implementing change, in the form of transformational leadership, expertise in relevant areas of design and function, as well as experience with organizational change are factors which enable a transformation to take place. (Table 3.1 is a summary of these concepts.)

In order to clarify the presentation of the concepts, the focus thus far has been on individual variables. However, it is the interactions between these variables that is important in understanding the change process. The same pressures can produce different consequences and different pressures can produce the same consequences. This is because it is the interactive effect of external and internal pressures and the ways in which these produce incompatibilities that matter as well as the particular position of an organization at a given point in time and the direction in which it is moving at that time (Hinings and Greenwood, 1988, p.202).

A solution to a problems created by incompatibility will be arrived at on the basis of the pattern of commitment in the organization since an interpretation of a situation will be made in relation to the existing archetype and its perceived effectiveness. However, in order for a solution to be carried out, capacity in the form of appropriate leadership skills (transformational or transactional) and technological expertise is crucial. Power ensures that movement continues along the track. In circumstances, where there is a competitive commitment, power is particularly important in determining the outcome.

Hinings and Greenwood suggest a dominant pattern for each track. In the inertia track, there is fit and a lack of incompatibility between the task environment and the design archetype together with a commitment to the status quo and the capacity to operate the archetype. These features appear to override dissatisfaction with interests.

On the Reorientation Track, changes in interpretive schemes need to be harnessed to relevant structures and systems. Understanding and expertise on how to run the new management approach as well as transformational leadership are required to ensure that a reorientation rather than a discontinued or unresolved excursion takes place. On this track, Hinings and Greenwood suggest that a combination of commitment, leadership, capacity and power are able to generate a high degree of activity at the beginning of the change period with the result that early change is emergent and systems oriented rather than prescribed and structural.

Unresolved excursions are the least compatible with the theoretical ideas of design archetypes (Hinings and Greenwood, 1988, p.201) Because of the large number of different circumstances that can result in an unresolved excursion, there is no clear pattern for this track. However, Hinings and Greenwood suggest that particular elements of a new design archetype may be adopted to solve specific problems and the consequences of incompatibility ignored through the buffering of power (Hinings and Greenwood, 1988, p.201).

CHAPTER 4

RESEARCH DESIGN

Rationale for the Use of the Case Study Approach

The purpose of this research is:

- (1) to contribute to a general theory of organizational change by extending the generalizability of Hinings and Greenwood's framework to organizations of a different type and size, and in a different contextual and geographical situation; and
- (2) to explain how and why high technology new ventures develop as they do.

Hinings and Greenwood present us with a comprehensive theory of organizational change based on their work with large, mature, public organizations. This study tests their theory on high technology new ventures with the aim of extending the generalizability of the theory to small, young, private organizations as well as providing insight into a central question in organization theory: "Why do organizations develop as they do?"

In selecting a methodology for this research, consideration was given to the nature of the research question as well as the nature of the theory and constructs involved. The explanatory nature of both the question and the theory requires a methodology which goes beyond the positivist approach. While nomothetic research design is well suited to developing correlations (See Lammers, 1978; Lammers and Hickson, 1979; Donaldson, 1985, for a comprehensive survey of the developments in the field), a more intensive methodology such as a case study is required when causal explanations are sought.

Comparative case studies are particularly useful for explanatory research as they provide a basis for producing

explanations based on an in-depth study of similarities and differences. As Tsoukas (1989, p.555) suggests:

"For realists, ideographic explanatory studies shed light on the specific contingent conditions under which the postulated generative mechanisms combine and operate." Thus the case study, was chosen as the appropriate methodology for answering the questions set forth as well as for testing Hinings and Greenwood's theory which is explanatory in nature.

Other considerations also favoured the case study. First, organizational change is not expected to occur instantaneously, but takes place over time. Thus any study which seeks to capture the nature of the change process must, of necessity, extend over a time period which is sufficient to detect whether change has occurred and to determine the nature of the change, or to ascertain that there has been a lack of change. One of the advantages of Hinings and Greenwood's theory is that it recognizes the periodicity of change and addresses it by examining the sequence in which changes occur within an organization. In order to capture the essence of periodicity, it is necessary to follow change over time, and thus a longitudinal research design was necessary to test the theory as well as answer the research questions.

Another advantage of Hinings and Greenwood's theory, suggested previously, is its holistic nature. The holistic approach necessitates the use of complex constructs which must be investigated through multiple data sources to ensure validity. The nature of many of the concepts in Hinings and Greenwood's framework is complex and subjective and thus can only be fully understood by using multidimensional sources and in-depth data collection techniques. For example, not only can we expect interpretive schemes to vary among members of the managerial elite, but managers actions may

not be consistent with the values they openly espouse. In-depth interviews and archival data are useful in uncovering inconsistencies as is conducting interviews with managers of different functions and at different levels in the organization. A discussion of how decisions are made provides not only the information on the level in the organization at which particular decisions are made, but also provides an insight into the basis for making decisions as well as the inter-relationship between power and interests, and is another example of the necessity of obtaining the richness of data this methodology offers.

Another reason for using the case study method is that it provides an open-ended approach to selecting relevant variables. Yin comments on a situation where there were too many variables to be considered:

"If a sampling logic had to be applied to all types of research, many important topics could not be empirically investigated..." (Yin, 1984, p.52). Hinings and Greenwood's theory of organizational change falls into this category. The need for intensive study of an organization in order to make a valid assessment of the variables means not only that the time required would make a large scale study impractical; but organizational access is necessarily restricted to organizations willing to provide a researcher with access to management over a significant time period. The case study provides the researcher with the opportunity to properly investigate the many variables in a particular case.

In this vein, Cook and Campbell (1979) suggest that in all research the researcher must determine the order of importance of the different types of validity since "some ways of increasing one kind of validity will probably decrease another kind;" and "the priority among validity

types varies with the kind of research being conducted: (Cook and Campbell, 1979, p.82).

They suggest that in theory testing construct validity is almost as important as internal validity; and that "for investigators with theoretical interests...(their) estimate is that the type of validity, in order of importance are probably internal, construct, statistical conclusion, and external validity." (Ibid., p.83) In Hinings and Greenwood's theory, because of the nature of the variables (discussed previously), the potentially large number of variables, and the complexity of their interrelationships, it is impossible to achieve internal and construct validity without utilizing the intensive approach embodied in a case study. The use of in-depth interviews and the utilization of multiple data sources, which are part of case study methodology, provides the quality of data required to establish the validity of abstract constructs such as interpretive schemes as well as providing information on the interrelationships of such variables as power and interests. At the same time, the richness of data acquired also provides insight into contextual and other factors which may not have been previously considered by the researcher. This makes the case study a particularly suitable methodology for testing this theory.

Testing Hinings and Greenwood's theory on organizations which are polar to the organizations in the study on which the theory is based is designed to expand the generalizability of the theory. According to Cook and Campbell (1979, p.56), with quasi-experimental groups, instead of relying on randomization to rule out most internal validity threats, the investigator has to make all the threats explicit and rule them out one by one. The selection of organizations with similar characteristics, operating under similar conditions, aids in establishing

validity. At the same time, the richness of information obtained through the case study method facilitates identifying spurious relationships. The choice of organizations which differ across significant dimensions from the initial study tests the generalizability of the theory to organizations of this type.

The use of multiple case studies strengthens our findings. Utilizing what Yin calls "theoretical replication", i.e. choosing cases which produce contrary results but for reasons predicted by theory, serves to extend the usefulness of the theory as a vehicle for generalizing to other organizations of this type. If the theory requires modification, the data collected will provide a basis for revising the theory for future tests. (Yin, 1984, p.40)

According to Yin (1984), the case study is appropriate for testing theory when an experimental design is used. Using this approach, multiple different cases are studied and compared to see if their outcomes can be explained by the theory. In this research, multiple cases are used to test Hinings and Greenwood's theory as well as answer questions on organizational development.

Harrigan (1983) supports the use of multiple case studies as a means of developing knowledge of the dynamics in an organization. She compares fine grained and course grained methodologies and points out that fine grained methodologies, such as case studies, capture nuances and details of context, and aid in developing an understanding of forces underlying phenomenon; while coarse grained methodologies, i.e. large statistical studies, although they are generalizable and have statistical significance, provide little knowledge of interacting forces within each observation, occasionally missing important contingencies. She argues for a hybrid methodology characterized by

multiple sites and multiple data sources. She also recommends focusing on company histories rather than a limited time horizon in order to gain greater insights concerning the antecedents of the strategies currently observed. By doing so, she suggests, the benefits of both course grained and fine grained methodologies could be combined to yield benefits these methodologies have not as yet been able to offer.

Since the purpose of this research is not to assess the incidence of the phenomena, as would be the case if we were testing the frequency of particular tracks, but to study the process of change which occurs over time and therefore requires a longitudinal approach; and since the theory employs a richness of data which can only be obtained through in-depth data collection provided by a qualitative methodology, the case study is clearly the appropriate method for this research. The use of multiple case studies strengthens our findings.

According to Robert Yin (1984), a case study is:

"an empirical inquiry that:

- investigates a contemporary phenomenon within its real-life context; when
- the boundaries between phenomenon and context are not clearly evident; and in which
- multiple sources of evidence are used." (Yin, 1984:23)

This research fulfilled this definition of a case study since (a) it examined organizational development and change within the real-life context of three young organizations; (b) change and development involves the interaction between organizational members as well as with the environment, and is a process which continues over time with no clear relational or time boundaries; and (c) multiple sources of evidence in the form of interviews, newspaper announcements, and documents both public and private, were used for data gathering.

Selection Criteria

Organizations were chosen to extend the generalizability of Hinings and Greenwood's theory (Glaser and Strauss, 1967). As Pettigrew (1987) noted, time imposes a limit on the number of cases which can be studied in depth. Therefore, following his suggestion, small, high technology, private sector, new ventures were selected as a polar type to the large, established, government bureaucracies on which Hinings and Greenwood's theory was based. Not only do these organizations provide an extreme opposite to the organizations in the original study, they also provide situations in which the change process is transparently observable.

The potential for rapid change in new organizations, as well as in high tech industries, provides a setting in which rapid and framebreaking changes are generally expected. Empirical research also supports the view that organizations are most open to change at founding and reorganization and most likely to fail at these same points. Since the organizations selected were all less than thirty years old based on their date of incorporation, there was a high probability that they would undergo change during this time period. Even if organizations do not grow, the literature suggests that formalization and standardization will increase over time. However, selecting organizations that were small, i.e. they employed less than ten people at their founding, increased the likelihood that any growth would have an impact on organizational structure, since an increase of ten employees would effectively double the founding size.

The likelihood of change was also increased by selecting organizations which had developed a product as planned, so that if they were to carry out their original mandate the company would have to develop new goals

involving marketing and production. At the very least this would necessitate a change in structure through the addition of two new functions, marketing and production, if not additional personnel to carry out these new tasks.

Selecting organizations that had been in existence for a relatively short time period, less than thirty years, provided the added advantage of a limited and meaningful time frame for the study. In large organizations, such as Cadbury's and ICI, it takes decades rather than years for transformation processes to be achieved. In addition, it is often difficult to determine the boundaries for studying change processes since transformation passes through several stages with no clear beginning or end. The choice of young organizations provides us with boundaries, in the form of a time frame, since the organization's entire existence is of limited duration.

Studying new organizations also provides a unique perspective on values and beliefs of organizational members. Researchers often assume that nothing has happened prior to the point, or time period, that is subject to investigation (Hinings and Greenwood, 1988, p.194). By studying organizations from their founding, and interviewing the founders about their experiences and beliefs prior to founding, a more comprehensive understanding of organizational beliefs and events is assured.

Selection was also designed to control extraneous variation (Eisenhardt, 1989). Organizations were chosen on the basis that they had similar backgrounds and missions at the time of founding, i.e. that they were founded for the purpose of researching and developing a new high tech product which they would then produce and market. An analysis of the workforce showed that most personnel were involved in research and held graduate degrees or had high levels of technical expertise related to the development of

the proposed product. Selecting organizations from a specific population, such as this, not only served to extend the generalizability of Hinings and Greenwood's theory, it provided a control for extraneous variation (Eisenhardt, 1989) as well as a common basis for comparison.

Having established a common basis to control for extraneous variation, organizations were chosen on the basis that they had followed different tracks or developmental directions. This was established through interviews with key personnel within each organization as well as through interviews with people outside the company who were familiar with the industry and the company. Choosing organizations that followed different tracks ensured that there would be differences, at the very least, in the direction of change, since the concept of "track" maps the movement of an organization from one archetype to another. Selecting organizations which have followed different tracks, is based on Yin's (1984) rationale that multiple case studies are appropriate where the cases provide contrary results which contribute to the development of a theoretical framework for generalizing to new cases.

The Selection Process

A list of potential cases was obtained by interviewing a Deputy Minister of Technology and Research, the head of a Research and Development Park Authority, business professors and local businessmen. Further information was gathered on 24 organizations which appeared initially to fulfil the requirements for this study, i.e. they were small organizations which had started out researching and developing a product and had made a transition to producing and marketing it. These organizations spanned a wide range of products including computers and computer software, laser technology, chemicals, pharmaceuticals, ore refining, all-

terrain vehicles, telecommunications, aerial photography, farm equipment and consulting.

Multiple methods were used to determine the suitability of these companies. Where possible, published information was used as well as interviews with organization members and industry experts. This resulted in the elimination of seventeen of the original twenty-four organizations which did not meet the initial selection criteria. Several started as spin-offs of larger firms to market a specific product which had been developed within the original firm, several were consulting firms and thus knowledge rather than product based. Firms over thirty-five years old were also eliminated as well as other firms which were never involved in research or had a product which could not be considered high technology.

Of the seven remaining firms, three were in chemicals or pharmaceuticals, one was in telecommunications, one was in the computing industry, one was in laser technology, and one developed and manufactured electronic instruments.

The final selection process involved in-depth interviews with the chief executive officers of the seven remaining firms as well as with the key current managers. These interviews probed not only the current status of the organization but also covered historical background. Information was also gathered from both external and internal publications.

Access was surprisingly easy; perhaps because of the enthusiastic nature of the people involved. Most of the people approached were eager to talk about their ventures. What was more difficult, was finding an organization which followed a reorientation track. This should not be surprising, given that organizations tend to remain on an inertia track (Hinings and Greenwood, 1988); and that evolutionary change is more frequent than quantum or

revolutionary change (Tushman and Romanelli, 1985; Miller and Friesen, 1984). Although, to the outside world, many of the organizations which were suggested appeared to have gone through a transformation from research and development to commercialization; under closer scrutiny, it was difficult to find an organization which had experienced this reorientation.

Ultimately three organizations were selected for in-depth study. These particular organizations were chosen because they represented different patterns of development which provided a basis for comparison as well as for testing the applicability of the theory to different situations. The first organization, Supertech, was chosen because it clearly followed a Reorientation Track. In fact, it was the only organization of the twenty-four organizations investigated which did.

The second organization, Ultratech, followed a track which resulted in an Unresolved Excursion. Since the study began at the founding and concluded with the dissolution of the company, there is no doubt that increasing the time period of the study would not alter the outcome. The organization was studied over a period of five years and served as the pilot study for this research. When we began the research we were advised that the company had just achieved a technological breakthrough and had acquired a manufacturing facility. Based on the information we were given, we believed that the company was about to undergo a major reorientation which would result in the manufacture and sale of this new product. However, this transformation did not materialize. As time passed, the initial interpretive schemes became frayed and finally the organization was shut down. Again, this provides a clear example of the track, an Unresolved Excursion, as well as lends support to Hinings and Greenwood's argument that an

organization in the private sector which followed this track would not survive (Hinings and Greenwood, 1988).

The third organization, Hitech, followed an Inertia Track. This organization did not conform to the founding archetype. It was included in the sample not only because it followed a different track from the first two organizations, but also because it represents a group of organizations that were perceived by their industry, as well as the local business community and government officials involved in promoting technology in the province, to have undergone a transformation. This particular organization was, in fact the organization most frequently suggested as a good example of an organization that had changed and would make an excellent subject for a study concerned with organizational change. As indicated previously, the organization did not conform to the founding archetype. While changes in structure and systems did occur, they supported the founding values and thus resulted in a heightening of the archetype rather than change.

Data collection

Multiple methods were used for data collection in order to obtain more than one perspective. Wherever possible, printed data on the organization in the form of newspaper or magazine articles, company reports or promotional materials issued by the company, was studied first. Data was also gathered through interviews with management, directors, and employees as well as other individuals acquainted with a particular organization and/or industry in order to provide triangulation of perspectives. (Denzin, 1978)

Case studies were carried out using an historical approach. Each study began by obtaining a significant event chronology for the organization (Kimberly, 1987). According to Kimberly (1987), this involves identifying key events in the creation and development of the organization, events

whose existence can be fully and unambiguously chronicled. The result is an historical record which should not in itself produce controversy. This was done by asking three or four people in each organization (or outsiders who had knowledge of the organization), what major events they believed would influence the organization's history. While the object of this approach was to look for events on which there was consensus, those events which were controversial were not necessarily excluded. Where there was a lack of consensus, further investigation was carried out to determine the cause of differences of opinion. The object was to determine which events most members of the organization believed would result in change. The purpose of selecting significant events is to provide a basis for establishing time periods in the study. Thus, events were chosen on the basis of consensus among those interviewed with regard to their expectation of change rather than by associating the events themselves directly with subsequent changes.

There were three reasons for adopting this approach. First, significant events were used to demarcate time periods and were of necessity defined prior to carrying out the complete analysis. Secondly, this approach provided an opportunity for comparing situations in which predicted change occurred to situations where predicted change did not occur. Finally, problems arising from events occurring so close together that their results overlapped were circumvented.

The founding was considered the first significant event, T_0 , for all organizations. Subsequent significant events which were identified were used to denote the beginning of later time periods.

Data was collected at the end of each time period on the six variables suggested by Hinings and Greenwood's

framework, i.e. interpretive schemes, structures and systems, situational context, interests, dependencies of power and organizational capability. Data was gathered through interviews with key management personnel who were present for each time period. In addition, data was gathered from interviews with people outside the organization who were familiar with the industry as well as from public documents, such as newspapers, magazines and stock prospectus, and private documents where available.

Operationalizing Concepts

Hinings and Greenwood's framework provides a general outline of elements to be used in examining change. The first step in studying change is examining what it is that changes. In operationalizing the concepts for this study, special attention was paid to the nature of the organizations in order to facilitate the selection of variables which were likely to change.

Six conceptual areas were subject to measurement. These were:

1. Interpretive schemes
2. Structures and systems
3. Situational context
4. Interests
5. Dependencies of power
6. Organizational capability

Interpretive Schemes

The key characteristic which distinguished the founding archetype in the present study was a functional emphasis on research and development. As a result organizational goals and values favoured research and development. Two sets of values were measured: commitment to research and development; and commitment to developing a self-supporting business enterprise which produces and sells a product. These values are not mutually exclusive and are expected to

coexist in a mature successful high technology firm. However, at the Research and Development stage, where the product is not yet viable, research and development is expected to preempt other values.

In studying change, Hinings and Greenwood suggest that while uncovering interpretive schemes is important for determining archetypes, the nature of commitments to the interpretive scheme in an organization are the key to understanding what track an organization might follow in the future.

Interpretive schemes were evaluated by asking directly (and indirectly) what the goals of the organization were, what the commitment of the respondents were and what they believed the commitments of other key personnel in the organization were. Documents, when available, were subjected to latent content analysis to establish the overall position of the organization.

The results were evaluated on a five point rating scale where (1) represents an organization solely committed to research and development, (3) represents an equal balance between research/development and production/sales; and (5) represents an organization totally committed to commercialization.

As noted previously, Hinings and Greenwood's framework requires that we establish how the interpretive schemes espoused by the managerial elite, are related to the interpretive scheme of the relevant organizational archetype. Since we have defined the interpretive scheme for the founding archetype as a total commitment to research and development, commitment of the managerial elite to research and development is commitment to the existing scheme or a status quo commitment. Commitment to establishing production and marketing functions, or promoting activities other than research and development, is seen as a reformative

commitment. Indifferent commitment is where there is a recognition that research and development is not sufficient to sustain the organization, but there is a lack of commitment to (or knowledge of) a preferred alternative form for the organization. Finally, competitive commitment is where commitment to more than one interpretive scheme is found among the managerial elite.

Structure and Systems

Organization design measures were based on:

- (1) differentiation;
- (2) integration; and
- (3) formalization and standardization.

There are four types of differentiation, according to Miller (1979); functional differentiation, product differentiation, geographical differentiation and vertical differentiation. The first three were considered in measuring horizontal differentiation. Vertical differentiation remained separate, although considered in the overall measure of differentiation, as it reflects a fundamental difference in organizational structure from a flat to a hierarchical organization.

Horizontal differentiation was measured by a count of the number of functions or areas in which an organization employed at least one person full time. It also included a count of the number of geographically different locations from which the organization operated, as well as the number of units that could be separated because of their dedication to different products.

Vertical differentiation reflects the hierarchy in the organization. It was determined by counting the number of levels in the organization.

Two dimensions were used to assess integration. As suggested previously, these include the manner in which integration was achieved or the style of integration as well

as the degree of integration in the organization. Ratings on integration were assigned by the researcher taking into account both subjective and objective responses of those interviewed. If subjective comments of respondents describing integration conflicted with the researcher's evaluation, further investigation was carried out to determine why this difference existed and to reevaluate the rating.

The style of integration was assessed on the basis of whether integration was personal or bureaucratic. Integration was rated as personal where it was achieved through face to face communication on an as required basis. Typically, in a small, new organization problems are solved in this manner. Where systems were put in place for integration, and communication was through specified channels and/or in writing, integration was considered bureaucratic. On the scale used to measure integration, (1) represents a personal style and (4) represents a bureaucratic style.

The degree of integration reflects the extent to which organizational activities are coordinated. The number and type of integrative mechanisms relative to the number of functions in the organization provided the basis for the researcher's assessment of degree of integration. The highest level of integration exists when an organization operates as a single unit and everyone is involved in all aspects of decision making. An example of this is an organization involved in developing a single product where everyone participates not only in developmental activities but in administrative activities as well. Ultimately, this is management by consensus. On the opposite end of the scale an organization is characterized by a high level of differentiation with few integrating mechanisms. An example is where an organization consists of administrative group

and units involved in producing diverse products which are not dependent upon utilizing common resources.

On the integration measure, (4) represents the highest level of integration and (0) represents a lack of integration. Finally, formalization and standardization were also measured. Formalization was measured by examining documents which described the operation of the organization, functions and duties of personnel, and procedures. Since the potential for variation is great in this area, the study used an open-ended approach to obtain a list of organizational documents and examined them. The organization was then rated on a scale of (0) to (4) where (0) represents a total lack of formalization and (4) represents a highly formalized organization.

Standardization was measured by examining the areas in the organization in which activities were repetitious. Again, standardization was measured on a scale of zero to four where (0) represents a total lack of standardized procedures and (4) represents an organization where all activities are standardized.

As well as looking at differentiation, integration, formalization and standardization, the issue of whether these characteristics were prescribed or emergent was considered. Differentiation was considered emergent when it arose through organizational members at lower levels in the organization perceiving a need and developing a differentiated role for themselves. Thus emergent horizontal differentiation occurred when an individual assumed a role or function without specific instructions from management while prescribed differentiation occurred as a result of a managerial appointment. Emergent vertical differentiation occurred when an individual assumed responsibility for a number of employees who came to that person for advice and/or guidance in doing their job; while

prescribed vertical differentiation was a result of management appointing a supervisor or manager and charging them with responsibility for other employees.

Emergent integration is the norm for the founding archetype. Since a high level of interaction is expected among the small number of organizational members, specific mechanisms for integration are rarely, if ever, prescribed. Thus when a pattern of integration appeared to be repeated, though it may be expected because of the informality and organic nature of the organization, when it was not specifically prescribed by management it was considered emergent.

Formalization was considered emergent when managers drew up operating guidelines or other documentation in response to a need which they perceived rather than in response to a request from senior management; while formalization was prescribed when documentation was developed in response to directives from the managerial elite, the board or the president.

Similarly, where activities became repetitious over time, standardization was considered emergent. Where, on the other hand, tasks were set up by management to be repetitive either for efficiency and/or coordination, standardization was rated prescribed.

Table 4.1 Chart used for analyzing structure and systems

	Prescribed	Emergent
Horizontal differentiation		
Number of functions		
Number of geographical locations		
Number of distinct product lines		
Vertical Differentiation		
Number of levels in the hierarchy		
Integration		
Style of integration		
Degree of integration		
Formalization rating		
Standardization rating		

Situational context

Based on the literature and interviews conducted for the present study, situational context for high tech new ventures consists of three significant elements. These include the state of development of the product, fiscal pressure and the size of the organization. In the case of one organization in the study where the organization had four different types of owners, ownership was also considered in situational context.

Product development was measured on a four-point scale. A rating of (1) was given when the product was in the conceptual or idea stage. A rating of (2) was given when a working prototype had been developed. A rating of (3) was allocated on the basis that a sale had been made. Finally, a rating of (4) indicated that multiple units were being produced and sold.

Fiscal pressures are related to the availability and sources of financing. This study examined the source of

financing on the basis of whether it was obtained through the issue of equity, government grants, contract work, debt, or the sale of products. It was not the type of financing itself however that was critical but the degree of influence or pressure that was put on the organization as a result of a particular financing arrangement. Thus where an investment was made which did not impose conditions on the organization based on performance, such as initial equity issued at start-up to allow the organization to pursue its stated goals without interference, there was no fiscal pressure. This, of course is ideal for an organization in the research and development archetype. Ratings of fiscal pressure reflect the degree to which financial interests influenced the organization. Fiscal pressure was rated on a scale of (1) to (4) where a rating of (1) indicates the organization operated independently and a rating of (4) means the organization was controlled by financial interests.

The organizations in the present study all employed less than ten people at their founding and have shown an exponential increase in the number of employees. This increase in size can be seen as a significant change in the organization since, according to the literature, an increase in size has been correlated with other changes such as increased formalization, standardization and complexity or differentiation. This study measured size by counting the number of full-time and part-time employees. The number of part-time employees were used rather than a full-time equivalent measure since administrative complexity is increased by the number of employees managed rather than the number of hours worked.

Interests

Hinings and Greenwood suggest that interests are inextricably linked to interpretive schemes despite their analytical independence. What different groups within an

organization value depends to a considerable extent upon their interpretation of the congruence of their interests with the likely resource consequences of alternative ideas. (Hinings and Greenwood, 1988, p.55) Thus, they find defining interests as having a materialistic base is useful in distinguishing between values and interests.

Interests in this study were established through interview data which examined the satisfaction of the managerial elite and board members with the distribution of organizational resources in terms of personnel and equipment; as well as their satisfaction with the extent of their inclusion in organizational decision making activities. On the basis of the response of those interviewed regarding their personal satisfaction as well as their comments about the satisfaction of others in the organization, a general rating on satisfaction with interests was established by the researcher. Satisfaction with interests was rated on a four point scale where (1) represents a high level of satisfaction among all organizational members, and (4) represents a situation where dissatisfaction prevails. (2) and (3) were used to represent situations where satisfaction with interests varied between groups and/or individuals in the organization. A rating of (2) indicates that a greater number of the managerial elite were satisfied with the allocation of interests; while a rating of (3) indicates that a greater number were dissatisfied with the allocation of resources.

Dependencies of Power

Dependencies of power were measured along two dimensions. The data were collected by interview. Respondents were asked to describe how decisions were made and who was involved in specific decision making situations. A distinction was made between the centralization of power and the coherence of power.

Centralization is a measure of the hierarchical locus of power and was arrived at by determining at what level in the organization decisions were made, e.g. the board, the president, the vice presidents, the founders, department heads and other employees. The analysis took into account the type of decisions made according to whether they related to policy, technology or resource allocation.

Coherence was measured separately and was based on the extent to which decisions were made by a small number of people or units rather than by a large number. Where decisions were made by a particular individual or groups of individuals acting together, the organization was rated as highly coherent. Where a larger number of individuals and/or groups were involved in independent decision making activities, the organization was rated as less coherent.

Although Hinings and Greenwood combine centralization and coherence to produce a three fold classification of concentrated, intermediate and dispersed power structures (Hinings and Greenwood, 1988, p.98), they also suggest that there are two different kinds of intermediate: decentralized and coherent and centralized and non-coherent. Using more specific description, rather than the suggested rating, provides deeper insight into the power structure and provides a more detailed basis for comparing within and between organizations. In order to retain the benefit of the in-depth data collection techniques used in this study, this more detailed descriptive approach will be used to identify power dependencies.

Organizational Capability

Within Hinings and Greenwood's framework, organizational capacity has two aspects: "the nature of leadership and the knowledge and expertise available to an organization." (Hinings and Greenwood, 1988, p.98) In examining an organization's capacity to change, knowledge

and expertise were measured in two ways: first, by knowledge and experience of management in an alternative archetype and second, through knowledge of and/or experience with organizational change. The first, knowledge and experience in an alternative archetype, was measured through examining the backgrounds of management for individuals with skills and experience in areas other than research and development; i.e. in sales, production, personnel, etc., as well as for managerial experience in a large corporation. The second, was determined by looking for managers who had experience with or knowledge of organizational change.

In the research and development archetype, management has experience and expertise in a research and development environment and high levels of technical expertise or education. Generally they have had no experience in other types of organizations and no experience with the process of organizational change. Measures accordingly reflect the presence or absence of knowledge and experience in the above areas.

Leadership was measured on a collective basis and included the extent to which managerial abilities and predilection for change were shared by the dominant elite. The assessment of leadership was based on the extent to which transformational attitudes and visions were shared and exercised by the dominant elite. Leadership was rated on a four-point scale. A rating of (1) represents transactional leadership, while a rating of (4) represents transformational leadership. Ratings of (2) and (3) indicate that either transformational attitudes and their implementation varied among leaders, or, in the case where an individual retains control, that the leader exhibited an inconsistency between his stated beliefs and managerial actions. The ratings of (2) and (3) reflect this mixture and indicate which type of leadership predominates.

Leadership was considered transactional when attitudes and activities of management were concerned with maintaining the current mode of operations. For example, if an organization was involved in research, activities which facilitated research projects were considered transactional. Similarly, if an organization was involved in production and marketing, activities which promoted sales or increased efficiency of production were classified as transactional.

In the present study, transactional leadership existed where the need for change was not specifically part of the leader's vision of the organization; although the vision, itself, may have included a vague view of a different type of organization in the future. Thus, a leader who focused on research and development when discussing the organization was classified a transactional leader. On the other hand, if management activities promoted changes in operations, through adding or deleting functions, or changing the nature of the predominant tasks in the organization, leadership was considered transformational.

In the present study, particularly at the founding, values, structures and systems were being established. It was expected, at that time, that the founder(s) would have, at the very least, a vision of the organization in the near future as a research and development organization. Unlike organizations in the Hinings and Greenwood study, where transformational leadership was based on the vision of changing the organization from its present state to a changed state, e.g. from a professional bureaucracy to a corporate bureaucracy; transformational leadership in the present study took into account whether the long term vision of the founders included transformation. Even while they were establishing organizational values, systems and structures for the research and development organization, transformational leaders in this study were the ones who

foresaw the need for change in the future, understood the cultural and behavioural implications of change, gave thought to how this change would be carried out, and were able to gain commitment to the need for future change. The transformational leader was identified by the emphasis he/she placed on transformation in open-ended discussion of organizational goals.

Rating the Founding Archetype

Six conceptual areas were used to determine whether an organization was in an archetype. These were interpretive schemes, organization structures and systems, situational context, interests, dependencies of power and organizational capacity. Based on the discussion of characteristics of new ventures and research and development organizations, the founding archetype was rated on these variables as follows:

Interpretive Schemes

Since interpretive schemes form the basis for archetypes in Hinings and Greenwoods framework, uncovering the interpretive schemes in an organization is the most important factor in determining whether an organization is in an archetype. In the founding archetype, interpretive schemes reflect the belief that the primary purpose of the organization is research and development (1) and little importance, if any, is placed on sales and production.

Structures and Systems

The key to research and development is the belief that an organization is doing something that has never been done before. Because of this, organization members believe that the required structures cannot be determined in advance, i.e. there is no way of telling the best way of organizing when tasks cannot be determined in advance. This means that work cannot be prescribed or measured so that formalization and standardization are non-existent. Thus, the organization design is characterized by a lack of prescription in both

structure and systems as well as a lack of formalization and standardization.

This is reflected by the criteria of effectiveness in this archetype which are indefinite, or global in nature (Bart, 1988). Although in the long run, a finished product is viewed as a measure of success, in the short run a process orientation prevails and there is a lack of concrete measures. In their place, more abstract values favour innovation and risk taking (Bart, 1988) with difficulty to evaluate concepts such as generation of new ideas and the acquisition of patents used to measure results. Thus decision making criteria are not prescribed. In addition, the fact that an organization is both new and small, reinforces the informality as roles have not yet been fully thought out and prescribed, so that there is little if any differentiation of roles and responsibilities since all employees are involved in the research process; nor is there an urgency to prescribe roles and responsibilities since integration is easily achieved informally through face to face communication. Decision making patterns and systems are also not prescribed although the founder or founders assume control resulting in centralization of decision making. This centralization may rest in an individual or in the dominant coalition or elite. The concept of centralization in a group is possible when the nature of the group is such that members believe decisions should be made on a consensual basis rather than delegating responsibilities.

The small size and the nature of the work means that integration is achieved through face-to-face communication (1) and the organization is highly integrated (4).

Situational Context

For the ideal research and development organization there are no external pressures so that the organization is free to pursue its interests in research. In terms of fiscal

pressure, this means that the organization does not have to be self supporting. In the ideal situation funding would be provided in unlimited amounts with no strings attached. Fiscal pressure is rated (1).

The product is in a conceptual state (1). A prototype has not been produced.

There are less than ten employees.

Interests

The organizations were founded to further the interests of the owners who control the resources, thus in the founding archetype, there is a tight coupling of interests and values, which means that there is a high level of satisfaction in relation to interests.

Dependencies of Power

In the ideal organization, consistent with the organization design (see above), power is centralized and equally distributed among the dominant coalition or organizational elite.

Capability

Organization members have high levels of technical expertise or education as well as experience and expertise in a research and development environment. As a result, they tend to reproduce that type of organization. They have no experience in other types of organizations and no experience with the process of organizational change.

TABLE 4.2 Organization measures for the Founding Archetype and expected changes

	Founding Archetype	Evidence of Change
Interpretive Schemes	Focus on research and development (1)	Includes production and/or marketing in organizational goals (>1)
Organization Design	Little differentiation Integration style personal (1) Integration rating (4) No formalization No standardization	Increase in differentiation Integration style (>1) Integration rating (<4) Increase in formalization and standardization
Situational Context	Product in conceptual state (1) No fiscal pressure (1) Size <10	Viable product (4) Financial sources make demands on the organization (>1) Increase in size
Interests	High satisfaction with deployment of resources	Differences in level of satisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Power is becoming less concentrated (i.e. less centralized and/or less coherent)
Capability	Experience and expertise concentrated in technology, research and development	Experience and expertise reflects knowledge of an alternative archetype

Data analysis

The first step in analysis was discussed in the section on data collection. It involved obtaining a significant event chronology for each organization. From the significant event chronology, three or four events were selected, based on the impact those interviewed believed they would have on the organization, to demarcate time periods. (See Data collection, p.83)

T_0 through T_n were used to define points in time used for comparing organizational variables. The first point of reference for all organizations was the founding which is indicated by T_0 . T_1 is just prior to the first significant event following the founding; T_2 is just prior to the second significant event. This pattern is continued through to the last significant event for each organization.

In the next step, information on variables collected for the founding period was compared against measures established for the 'Founding Archetype' (See Table 4.2) to determine the state of the organization with respect to the archetype, i.e. was it within the archetype, embryonic, or schizoid. The analysis included an explanation of how an organization differed from the archetype.

Next, the characteristics of the organization were examined to determine whether there was coherence among interpretive schemes, values, interests, situational context, power dependencies and organization design. Where there was a lack of coherence, the inconsistencies were explained. This procedure was repeated for each chronological reference point, T_0 through T_L .

Then the variables at the founding were compared with the variables at the end of the study for a particular organization to determine whether the organization had changed. At this point, an evaluation was made of the track the organization had followed. (See Table 4.2)

The next step involved comparing the variables at specific points in time with the variables in the same organization at a later point in time to determine whether there was any change at that particular time. Thus the variables at T_0 were compared with the variables at T_1 , the variables at T_1 were compared with the variables at T_2 , the variables at T_2 were compared with the variables at T_3 , and the variables at T_3 were compared with the variables at T_4 . The direction and nature of any change(s) was noted. In addition, distinctions were made between prescribed and emergent changes.

The final step in analyzing change in each organization was to examine how significant events affected organizational coherence and the six organizational measures; and how coherence, or lack thereof, and each of the six variables related to organizational change or lack of change.

The final analysis compared the three organizations in the study. Each organization was unique, but there were also powerful similarities. A comparison was made of the organizations at their founding, noting similarities and differences. We then looked at how these similarities and differences affected the organization's track, the timing of change(s), and the archetype adopted.

Some of the issues studied were:
Why do some organizations follow a course towards strategic change, whereas others apparently facing similar opportunities and pressures do not?

How did these organizations handle technological breakthroughs? And how did the past (expertise) influence how a technological breakthrough was handled?

What effect does power have on determining an organization's track?

Were the organizations really the same at the start in the key areas? They had the same stated goals but how were these manifested?

Where change occurred, was it prescribed or emergent led?

Where change occurred was there a clear pattern in the sequence of structural and systems changes?

Our aim was to confirm the generalizability of Hinings and Greenwood's theory to these organizations while at the same time illustrating its capacity to explain theories of organizational development and to answer the question at the core of this research: Why did these organizations develop the way they did?

CHAPTER 5
SUPERTech - A REORIENTATION

Significant Events

This organization proved to be the easiest in terms of access to organization history since four of the five founders were available to provide information on the early days of the organization; and two of these were still deeply involved with the organization. Not only was it easy to obtain a history of the organization from several sources, there was a high level of consistency among those interviewed. This can be attributed to the fact that the organization operated on a consensus basis, particularly during the early stages. Even though two of the founders were forced to leave the organization, accounts of this occurrence were strikingly similar from both sides, i.e. the members who left and the members who remained. The consistency in the stories of the respondents and the significance they attached to various happenings simplified the process of identifying significant events.

There was general agreement among the respondents on three events that significantly affected the organization. These were the founding, the first injection of venture capital, and the appointment of a venture capitalist as the company's Chief Executive Officer.

By definition the founding was the first significant event. Supertech was founded eight years ago as a result of a series of 'get togethers' initiated by two long time friends, a technician and a Ph.D. who worked in a related field. They had what they believed was a unique idea for a new product. Anyone expressing an interest was invited to these 'get togethers' which lasted until "the wee hours of the morning."

The second significant event, for Supertech, was in the words of everyone interviewed "the first injection of venture capital" two years later. From the founding up until that time a number of things happened, none of which were judged to be significant by those interviewed. The resignation of the first president and the appointment of a new president five months after the founding was one of these. It was not deemed significant because at the time the organization operated on a consensual basis and little importance was attached to the position of president. Also, although the new president was brought in because the founders believed he had expertise in business, in fact he had no managerial experience. Rather he had an academic background in economics and made no changes in the organization, managing by consensus as the previous president had.

Shortly before the venture capital deal was agreed upon, a representative of the government visited the organization and expressed an interest in their product. Although the visit ultimately led to a contract, those involved at the time said that the decision of the venture capitalists to invest in the company had nothing to do with this event since arrangements for the venture capital were underway prior to its occurrence.

It was therefore generally agreed that the second significant event was when the two venture capital firms provided the first "injection of venture capital". This had several ramifications primarily due to the fact that the deal provided each investor with the right to appoint a director. The two new directors were the first 'outsiders' (and business people) to hold positions on the board and as such were committed to obtaining a return on their investment.

A number of events occurred after this injection of venture capital and before the new CEO was appointed. However, these events were a direct result of the venture capitalists exercising their influence. They included appointing a Chairman of the Board with industry experience, obtaining a research and development contract from the government, a strategic planning meeting, the departure of two founders and the completion of a prototype.

The appointment of an experienced business person as Chairman of the Board was undoubtedly important. Everyone agreed that he had a significant impact on the organization. In the words of one of the founders:

"I think [the new Chairman of the Board].. the addition of [the new chairman] to the board.. I'm not sure it was very visible to the people around here as a pivotal milestone but to my way of thinking it was..."

"He provided an awful lot of the business direction for the company even though his involvement was at the time pretty meagre.. we got a week of his time out of every couple or three months.. He was well connected.. he knows a lot about the business and he seems to have a good understanding of emerging companies.. of the problems that emerging companies have.."

The appointment of the new chairman to the board was not selected as a significant event, as was his later appointment to the position of Chief Executive Officer, because limitations on his time and role curtailed his impact at this point.

The second president attributed the development of formal and detailed planning to the government contract and to a meeting with government representatives to review the contract. He claimed this was one of the most significant events because they let him know they intended to withdraw their support unless results were forthcoming. In his words:

"The most significant event in terms of my period as president of the company was when we

secured the contract and we held our first project review meeting with them..."

"At the end of the meeting the senior (government) people laid down the law... When we come back in three months you've got to have plans.. and plans that you can deliver on.. You've got to tell us what you are going to do.. if you don't do that we'll pull our funds.. we're not prepared to put our money into something that we don't understand.. you've got to tell us.. I didn't feel I had a lot of choice.. so next day I called a meeting and told them that we had no choice.. that we had to become planning driven and open with our sponsors or we may as well pack up."

That same month, the company held its first strategic planning meeting. This contract and the resulting meeting were not designated significant events since although the president suggests that he was stimulated by the meeting to initiate formalized planning, in fact it was the venture capitalists who brought in the outside planning consultant. It was also suggested by the respondents that although some change may have occurred as a result of obtaining the contract, more significant changes were implemented in order to obtain the contract.

While the departure of two of the founders was seen as symbolic by many of those interviewed, it was generally agreed that it was not significant in determining the future of the organization. Instead, it was a reflection of the influence the venture capitalists possessed and were exercising. These founders had lost their influence prior to their actual departure. They were not, in fact, notified in time to attend the meeting which precipitated their leaving. Thus the departure of the two founders was looked upon, by those involved in management, as a confirmation of what had already happened in the organization rather than a signal of a new direction.

The completion of a prototype was also not considered a significant event since that particular product, was not

delivered, "It stayed in house". It did, however, enable the company to obtain the additional financing they required to continue operating.

Everyone interviewed agreed that the next significant event occurred six and one half years after the founding when the chairman of the board was named CEO and agreed to assume a proactive role in the organization. He rapidly initiated a number of critical and sweeping changes. These included the closing of the American sales office and firing the Vice President of Sales and Marketing; appointing a "marketing and sales boss" with industry experience who became Vice President of Marketing before assuming the presidency three months later; appointing an experienced outsider as Head of Research and Development and another as Vice President of Marketing; expanding geographically by opening an American sales office and a manufacturing plant in eastern Canada; and instituting cultural changes such as celebrations for productivity.

A month after he took over, the new Vice President of Marketing announced the new product to the market and finally, just over six years after the organization was founded, the first product was delivered.

As established by the parameters of the study, the founding was the first significant event for Supertech. The second significant event was the injection of venture capital, two years later. The third and last significant event selected for Supertech was the appointment of the chairman of the board (who represented the venture capitalists) to the position of Chief Executive Officer five and one-half years after the founding. The bankruptcy of the company was not included as a significant event for this study since it occurred after the study was completed.

The Founding

This section describes the status of the organization on all measures at its founding.

Interpretive Schemes

When the founders reflected on the goals they had for the organization at its founding, they focused on technology and on the process of researching, developing and ultimately building an interesting product. This is illustrated by the comments of the first two founders:

"Well, the initial goal was to harness the horsepower of enormous [magnitude]... to make a Mac truck by welding together 400 Volkswagons."

"I would say the goals of the group were roughly to produce [a product which was technologically superlative]."

In expressing their goals for the organization, all founders placed an emphasis on the process of developing something new. Only two of the five founders interviewed mentioned the possibility of sales. Those that did indicated that notion of sales was vague and emphasized the recognition they expected to receive for having built a "good product". In fact, in the early stages, the company attracted people on the basis that they would have an opportunity to take part in the development of a revolutionary product, for example another founder stated:

"At the start I was personally excited by the prospect of what we would produce.. I was still rather intrigued by the process by which we would produce it.. I've always had more of an interest in science."

Research and development was seen to be the single most important activity in the organization at this time. The same founder described the founding interpretive schemes as follows:

".. and that was where I saw us to begin with.... THE RESEARCH COMPANY.. We didn't know what we were going to do... really we knew what the goal was... we didn't know what we were going

to do and how we were going to do it.. we didn't know how long it was going to take.."

All of the founders, in fact everyone in the organization, was committed to research at this time. On this basis, interpretive schemes received a rating of (1). This is consistent with the interpretive scheme of the founding archetype defined for this study.

Organization Design

There was very little sense of organization structure at the founding. There was no prescription other than the belief that everything would be worked out by the group. Using Mintzberg's typology, the organization was an adhocracy.

In retrospect, one of the founders suggested:

"One of the biggest mistakes....made was that we didn't attach much importance to form.."

Differentiation

Horizontal Differentiation:

There was little horizontal differentiation at either a prescribed or emergent level. Roles were not defined clearly and everyone was expected to participate in whatever activities were required to maintain the organization's viability. The following statement by a founder describes how things were done:

"Well at the very beginning, everybody did everything... and we've been in a steady evolution from everybody doing everything to people doing specialized functions."

"So, for instance, the construction of the office spaces was done by the founders themselves.. "

There was one distinct element of horizontal differentiation. It was generally acknowledged that one founder's role was to raise capital for the organization.

"So, [his] contribution to the company during the first year of its existence was bringing in money.."

However, even with one acknowledged fund raiser, everyone else also participated in this activity.

"... and the rest of us worked at raising enough money and bringing in enough people to make it even conceivable that we could actually build this thing."

In terms of organizational design measures, there were two functions in this period. These were (1) research and development and (2) fund raising. Since there was no attempt at prescription, this horizontal differentiation was emergent. There was one geographical location and one product line. Thus, the organization was consistent with the founding archetype on this measure.

Vertical differentiation:

There was no vertical differentiation in the organization when it was founded.

"There was this feeling at the founding that there was this kind of brotherhood equality kind of thing that [the initiating founder] was very anxious for us to have.. that we not be a hierarchical or autocratic organization.. That everything be consensus and that we were in some sense blood-brothers or something."

Of course, the legal requirements of founding a company necessitated naming a president but it was acknowledged by all, including the president himself, that the position was essentially that of a figurehead and part of the nuisance involved in establishing an organization. There was no authority or prestige attached to the position. As the first president said:

"Being president meant that I dealt with the guy who was leasing the photocopier, I signed the rent cheques but there was no decision making authority vested in the president at all."

And the other founders agreed:

".... was the president but you know I came from an environment where the ideal job

description was 'performs necessary tasks'... and so I didn't really perceive much structure.. There was technical leadership in the sense that some of us were running along in front while others were following."

"We all regarded the president at that point as a figurehead.. There wasn't anything sort of associated with the office."

The president represented a prescription for vertical differentiation. In practice, this difference was non existent. Consistent with the founding archetype, there was no vertical differentiation at this time other than the nominal role of the president. Prescribed differentiation was rated (2) and emergent differentiation (1).

Integration

With few employees, a high level of integration was achieved through face to face communication. The organization which started out with all night "Yak-yak" sessions, continued these meetings on a weekly basis.

"Basically at that point management was done by weekly meetings of all five of us and everybody would say what was going on."

All communication in the organization took place through face to face conversations. A rating of (1) was placed on style of integration to reflect the personal manner in which it was carried out. Everyone in the organization was aware of everything that was happening. Nothing was done without the approval of the entire group. The organization acted as a unit and was, therefore, given the highest rating possible for degree of integration: (4).

Formalization

The only documents at this time were the articles of incorporation; otherwise, there were no written documents. Even the research data remained in the heads of the researchers. A zero score was therefore allocated to formalization.

Standardization

"There is a saying in the organization - you can tell you are at the development stage when you are doing something that you have done before. In other words, it may need to be done differently , but you have been through the process and are not working by trial and error."

With tasks continually changing, standardization was non-existent (0).

The people who were involved in making decisions also had the responsibility for carrying them out which they did virtually simultaneously. In order to satisfy institutional requirements, a president was appointed. In practice however, the president was equal to other members of the founding group. Thus, although prescribed vertical differentiation was higher than emergent differentiation, there was no other distinction between prescribed and emergent structures at this time and the appointment of the president had no significant effect on the organization..

Situational Context

At this time, the product was in the conceptual or idea stage (1) since it existed only in the minds of the founders.

The company was initially owned and financed by the founders. As one said:

"That's when we passed the hat around for some money. I think we each threw in a thousand dollars at the start. There were six of us there.. and we talked about how we'd split up the shares.."

There was no revenue at this point, either from sales or contracts. All financing was done by issuing equity, either for work performed or cash invested. There was no fiscal pressure on the organization to produce as equity came from friends and organization members who were sympathetic to the creative process. The rating for fiscal pressure was (1).

In terms of size, there were five people in the organization at the founding.

Interests

At the founding, all five founders operated on a consensus basis and were equal partners in all company decisions. Interviews indicated that they were all satisfied with the direction of the company and the way resources were allocated. The rating of (1) reflected this satisfaction.

Dependencies of Power

The founders' group made all decisions at this time. They believed that everyone had a right to participate and included all employees in the early days. The founders described decision making:

"The decision making authority was in these evening meeting groups... which was consensus of all of the founders and one or two of the employees. I don't think authority devolved from that group until quite a bit later."

"So we went through '83 with basically no structure or a structure that was kind of an Athenian democracy where some folks get more than others of course.. but we never actually came down to voting on anything until some crises hit later in the company.... I guess when planning became a serious issue was when we started going out looking for serious investment which was throughout '83."

"Any time somebody made a decision on his own, the authority was questioned and the decision was second-guessed and discussed and picked apart and usually let stand. So it was in a sense all wasted motion but we did have to somehow get used to this notion that individuals could have authority."

There was no distinction between decisions involving policy or resource allocation. One of the founders pointed out that at this stage, even decisions relating to the type of soldering iron to purchase were made by the founders group.

There was no formal planning. Most decisions were made as the need arose:

"Basically at that point we had sort of a consensus basis. When you walk into some place expensive, you say well no.. and when you walk into some place that's real cheap you say 'yes'. They're sort of decisions that were easy to take. The harder decisions were sort of technical ones... And those were also done by consensus.. convincing everybody that was the way to go."

Decisions on hiring and firing were carried out in the same way. The pattern in dealing with organizational members, was the same one that permeated all organizational decisions, i.e. the attitude that everything should be done informally and on a consensual basis.

"In '83 we picked our salaries.. it was more or less by happenstance. My salary set the tone. My salary was set at equivalent to what I would be getting at the university.. So we more or less arbitrarily picked [a figure]... a year as what all of the founders got as their salary. It was all pretty flat. Among that group. Now the other group, the guys we hired into the company, it was the consensus group who set the salary for those people. That persisted for quite a while."

If a founder met someone he thought was suitable, could contribute to the organization and was willing to do so at little or no cost, he would be introduced to the founders' group who would generally approve. Thus hiring decisions, at this stage, were arrived at through consensus consistent with other decisions. The criteria were technological or academic expertise and little cost. The founders description is as follows:

"....before the first big investors came in.. up until that time we paid people in shares.. If people were willing to work for a little bit of cash and some shares it was relatively easy to get some consensus to hire them." If I went in and said "Look, I've got somebody who's going to work for shares and we don't need cash", which is a scarce thing at this point "and he's got good credentials" getting consensus is easy. The other

way things would go is somebody might say "I think we desperately need someone to do this sort of a task, this sort of a job" and then people would say "OK, try and find somebody." The person whose area that was under would find somebody... Almost everybody that we were hiring was somebody who was known to at least a few of the people, so it wasn't anything formal. It was just sort of if a few people said he's a good guy, then it was OK. There weren't sort of formal interviews and stuff as such. So it was all very informal."

These quotations reflect the nature of power dependencies in the organization at this time. Decision making rested in the founding group where decisions were made on the basis of consensus.

To sum up, in the word of one of the founders:

"We were completely consensus driven in '83."

Decision making was centralized since all decisions were made by the founding group. It was also coherent since the group made these decisions as a single unit. Thus, the power structure was concentrated.

Capability

Expertise

At the founding there were "four technical people and [one other]." The four technical founders were made up of a technician, two scientists who worked at the university and a self-described "theoretical physicist". The other founder was an engineer with experience in accounting who had worked as a "rates analyst" and "floated bonds" for a local utility company and was looked upon by the founders as having a background in business.

One of the founders described the organizational capability as follows:

"None of us were what you would call professional managers... none of us had any business training per se.. [the rates analyst] was the closest we had to that and really his academic training was as an engineer.. however, he'd spent all his life doing, first, chartered accountant

work and then fiscal management, I guess. That's the way he put it... He had a CA at one point. I think it's lapsed.... and what he did at [the company he worked for] just prior to joining Supertech was he floated bond issues. That was what attracted me was that he was involved in the financing of an organization as large as [that]."

From these statements, it was evident that scientific and technological knowledge and expertise dominated the organization. The managerial elite were experienced in research and development, primarily in academic situations. While the second president had a Ph.D. in Economics, and was hired because of his perceived business expertise, he had no real experience managing a commercial concern. Thus, no one in the organization had any managerial experience in the private sector.

There was no knowledge of an alternative archetype and there was no expertise in functional areas found in an alternative archetype.

Leadership

The vision of the managerial elite focused on research and development. While the managerial elite stated that they believed their product would be sold, the idea was vague and the time required and the means for achieving these ends were not developed. No thought was given to the cultural or behavioural changes required to become a commercial organization.

"In the cold hard light of day, I would say that what we had was a vague idea of what we wanted to do. We didn't really have goals and plans."

All members at the founding were strongly committed to the vision of developing a product which would be considered a significant achievement in its field. In retrospect, two of the founders suggested that it was their commitment to getting the product to market from the outset that enabled the company to arrive at the stage where it is presently.

However, in earlier discussions of the organization's founding values, they echoed the goals of all the founders which emphasized the creation and development of an outstanding product. No one at the founding understood the cultural and behavioural changes that would be involved in taking the company from a development orientation to a commercial orientation. The leadership was therefore rated transactional (1) at this time.

Summary

At the founding of Supertech, the managerial elite were committed to research and development, the interpretive schemes suggested by the founding archetype.

Organizational structures and systems were consistent with these interpretive schemes. There was little differentiation, either horizontal or vertical. The consensual approach to management resulted in a high level of integration which was achieved through face-to-face communication. Formalization and standardization were non-existent. This congruence of values, structures and systems led us to the conclusion that the organization was in the founding archetype at this time.

The high level of satisfaction with the distribution of organizational resources and organizational expertise which was limited to the functional requirements of this archetype, coupled with transactional leadership, suggested there were no internal or external pressures on the organization to change. On this basis, we expected there would be little if any change in the organization (i.e. that it would follow an inertia track) unless something happened to disturb this equilibrium.

Table 5.1 Organizational Measures for Supertech at T_0

	Founding Archetype	T_0
Interpretive Schemes	Focus on research and development (1) Commitment to the status quo	Focus on research and development (1) Commitment to the status quo
Organization Design	No differentiation Integration style personal (1) Degree of integration (4) No formalization No standardization	Very little differentiation (0) Integration style personal (1) Degree of integration (4) No formalization No standardization
Situational Context	Product in conceptual state (1) No fiscal pressure Less than 25 employees	Product in conceptual state (1) No fiscal pressure 5 employees
Interests	High satisfaction with deployment of resources (1)	High satisfaction with deployment of resources (1)
Dependencies of Power	Concentrated power structure	Concentrated power structure
Capability	Experience and expertise concentrated in technology, research and development Transactional leader (1)	Experience and expertise concentrated in technology, research and development Transactional leader (1)

The organization conformed to the norms suggested for the founding archetype at this stage.

Table 5.2 Organization design of Supertech at T_0

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	2	1
Number of geographical locations	1	1
Number of product lines	1	1
Vertical differentiation		
Number of levels in the hierarchy	2	1
Integration		
Style of integration	1	1
Degree of integration	4	4
Formalization	0	0
Standardization	0	0

T₁ - The First Injection of Venture Capital

This section describes the status of the organization on relevant variables at the time of the first injection of venture capital, T₁, two years and three months after the founding.

There were very few changes to the organization during the time leading up to this period. Nevertheless, a new perspective was added to interpretive schemes when venture capitalists were given positions on the board, there was an increase in horizontal differentiation through the addition of an administrative function and an increase in formalization brought about by the creation of an organization chart.

Interpretive Schemes

The dominant coalition still retained its focus on research and development with the exception of the president who acknowledged financial motivation. The addition of venture capitalists to the board added a competitive commitment to profit realization. As one of the founders suggested:

"...the venture capitalists clearly wanted us to become a profitable company. They said that was their only goal. It's not their only goal. There are other goals. They want to be associated with a Canadian winner... Nonetheless, they have to turn a profit or they look like fools."

And another echoed this viewpoint:

"...I guess the investors' goal was to get the company to a position where it looks good to the public, makes lots of money, and get out."

Since the competitive commitment was limited to two members of the board and one of the five members of the managerial elite, the rating on interpretive schemes did not change significantly. The rating of (1+) acknowledges this change but also indicates that it was not strong enough to

move the organization significantly away from the interpretive schemes of the founding archetype.

Organization Design

Differentiation

Horizontal Differentiation:

Shortly after it was founded, the company acquired a part-time general manager. His duties, loosely defined as office administration and fund raising, added a prescribed element of horizontal differentiation to the organization.

Vertical differentiation:

In the middle of the first year, the founding president resigned and the general manager became the second president. However no real change in operations or responsibilities took place at this time.

"When [the economist] became president, it was a titular role.. very much the same as the one that I had prior to that."

In fact, two years later the new chairman of the board gave the following description of the organization:

"The organization was clear.. it was a handful of peers and a guy called [the second president] whose job it was to do the administration and to raise money and nothing else.. in other words that they were quite happy to call [him] the president but not for a minute did he have the authority that went along with being president.. His job was very clear.... to do the administration.. order desks, order computers, get [the janitor] to clean the floors, raise money and we will do all the important things.."

Thus, there was no change in vertical differentiation within the previously existing group. Two or three employees were hired during this period to assist with the research. Since they were responsible to the individual in the managerial group who hired them, a level of vertical differentiation emerged. There were now two levels of prescribed vertical differentiation, i.e. the president and the other employees, and two levels of emergent vertical

differentiation, the founding group and technical assistants.

Formalization

The second president drew up an organization chart. Documenting organization structure was a move towards formalization; however, the chart was not taken seriously by organization members. It was not looked upon as an attempt to prescribe structure, nor as an attempt to formalize an emergent structure. Rather it was looked upon as a document that was required for the purpose of raising funds and was necessary for appearance to the outside world but had no meaning within the organization. One founder saw it this way:

"The very first org chart [the second president] put together.. it was during the financing and I guess the culture at that time was 'Ya, we've got an org chart and all the titles but it didn't change the way we did anything.' It wasn't until the system actually broke. When people stopped coming to the meetings, when it was hard to hold one of these meetings or it was impossible to get a timely decision out of the meeting, that the titles on the org chart started to actually mean something. It was a contentious time."

And another founder suggested:

"That [the development of an organization chart] was not an act of an authoritarian president, that was an act of a money raiser trying to build a tool to raise money. NONE OF US BELIEVED THAT [the president] HAD THE AUTHORITY TO TELL US HOW TO RUN THE COMPANY."

At this time, there was one formal document, the organization chart, to which no one attached any importance. Drawn up, as it was, without any prior management decision to do so, this document was classified as emergent.

The existence of an organization chart was the basis of a score of (1) on emergent formalization.

Standardization

Everything was still being "done for the first time" so Standardization was rated (0).

Integration

The dominant coalition made all decisions by consensus. The style of integration was still through face-to-face communication (1) and the degree of integration was high (4).

Other than the emergent formalization resulting from creation of the organization chart (discussed under formalization), there was no distinction between prescribed and emergent structures and systems at this point.

Situational Context

There was no change in the stage of development of the product. It was still in a conceptual state (1).

Founders and friends were no longer able to support the company so they turned to venture capitalists for financing and negotiated a government contract. The rating on fiscal pressure increased to (2).

The organization also increased in size from five to twelve employees.

Interests

The venture capitalists acquired seats on the board for their representatives in order to ensure that their interests were served. Since their interests lay in profit realization, they were dissatisfied with the concentration of resources on research activities and the lack of awareness of budget, business and market considerations.

Dependencies of Power

Decisions were still made by the founding group on a consensual basis. Thus power was still concentrated, i.e. both centralized and coherent.

"The entire group of senior people would meet once a week... That group included me from the time I joined... I actually came on board [two years after the founding]... Once a week that

group of people would sit together in an evening at a meeting and all issues confronting the company were dealt with at those meetings and the meetings lasted until consensus had been achieved on all things. So it was management by consensus.. There was nobody telling us what to do and people agreed..."

Capability

The new president had a degree in Economics but no previous managerial or business experience. Like the founders, he had an academic background. His appointment made no real change to organizational capability. On the other hand, the two new directors who represented the venture capitalists on the board changed capability by contributing their considerable business experience as well as access to industry expertise. However, this capability was limited to the board at this time. Organization members still had no expertise in managing a business or in the alternative archetype.

Leadership remained focused on research and development as it was in the previous period and was thus rated transactional (1).

Summary

Supertech, at its founding, was operating within the founding archetype. There was congruence among interpretive schemes, structures and systems. It was predicted from Hinings and Greenwood's theory, that the organization would follow an inertia track and remain within the founding archetype. As the chart comparing organizational variables at T_0 and T_1 illustrates, there was little change during that time. The competitive commitment to profit realization was not strong enough to be considered a new interpretive scheme and there were no significant changes in structures and systems which led to the conclusion that the organization was still in the founding archetype.

A change in context, i.e., a scarcity of funds, led the company to an association with venture capitalists. In return for financial support, the venture capitalists demanded two seats on the company's board of directors. Described as 'outsiders' by the founders, the venture capitalists' representatives were committed to building a profitable organization. This was seen as a competitive commitment by the founders whose main concern was the development of a technological masterpiece. This change in commitment was precipitated by fiscal pressures since it was the need for funds that led to the addition to the board of stakeholders with competitive commitments.

The organization more than doubled in size during this period (increasing in size from five to twelve members). As administrative tasks increased, the need for a person qualified and willing to perform the administrative function was recognized and the company acquired a general manager.

At this time, organization design and dependencies of power differed only slightly from the founding form. The new general manager did not change organizational capability. Experience and expertise remained concentrated in technology, research and development and recognition was based on academic background. The two new board members had corporate experience.

There was also an important change in context. The lack of availability of funds led to venture capitalists obtaining seats on the board and influencing company policy. A competitive commitment to profit realization began to emerge. Consistent with this competitive commitment, the board members who favoured rapid profit realization were dissatisfied with the extent of resources deployed on pure research as opposed to development and marketing efforts.

At this stage, the lack of consistency emerging in interpretive schemes and the accompanying dissatisfaction

with interests, resulted in an erosion of the original archetype. The discrepancy was minor, so the organization was still classified as operating within the founding archetype. Hinings and Greenwood's theory suggests that changes will occur as an attempt is made to return to the founding archetype, or to move towards a new archetype in order to restore consistency.

Table 5.3 Organizational Measures for Supertech at T₁

	T₀	T₁
Interpretive Schemes	Focus on research and development	Focus primarily on research and development (1+) Competitive commitment to profit realization
Organization Design	Little differentiation Integration style personal (1) High integration (4) No formalization No standardization	Little increase in differentiation Integration style personal (1) High integration (4) Little increase in formalization or standardization
Situational Context	Product in conceptual state (1) No fiscal pressure (1) 5 employees	No change in product state (1) Fiscal pressure (2) Approximately 12 employees
Interests	High satisfaction with deployment of resources (1)	Some dissatisfaction with deployment of resources (2)
Dependencies of Power	Concentrated power structure	Concentrated power structure
Capability	Experience and expertise concentrated in technology, research and development Transactional leadership (1)	No change in active managerial capability Board now has expertise in operating a business Transactional leadership (1)

Table 5.4 Organization design of Supertech at T₁

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	2	2
Number of geographical locations	1	1
Number of product lines	1	1
Vertical differentiation		
Number of levels in the hierarchy	2	2
Integration		
Style of integration	1	1
Degree of integration	4	4
Formalization	0	1
Standardization	0	0

T₂ - The Appointment of a New Chief Executive Officer

This section describes the status of Supertech on the relevant organizational variables at the end of the period leading up to the time when the Chairman of the Board became the Chief Executive Officer.

Interpretive Schemes

In April, 1985, the new Chairman of the board believed the organization lacked concrete goals. In his words:

"I don't think there was any goals at all as you and I would understand goals.. The goals were to do something very interesting, technically interesting... and somehow magically that was going to result in this incredible commercial success.. and that was all going to happen by itself.. The world will beat a path to the door.."

In 1989 (i.e. after T₂), the new president described interpretive schemes as follows:

"I think there's a very important factor here and it's part of the ongoing academic culture of Supertech that they had been funded to develop a prototype system so they were in fact executing a research contract and being funded for it and the company for many of the people was an extension of university. They had come out from university to do research. The company was called Supertech Research, they were doing a research project and that leads to an entirely different headset from a group of people that are trying to build a [product] to compete in the market.. and the difference is that the goals are that - you work at a project and you work very hard at it and in the end you write a paper and that's the end...."

"and so there's a rather genteel atmosphere and still with a very significant group of people there's a tendency to do what you're told to do and then go home.. That is not like the attitude in most of the companies in the United states where they're conscious of very tight deadlines, time to market is critical, if you lose your window in the market your technology is all over and you've lost your chance."

At this point, the interpretive schemes held by the founders and their employees remained focused on research

and development. The venture capitalists were committed to becoming a profitable company which was seen by the founders to be a competitive commitment. The competitive commitment was stronger than in the previous period since it was now held by the chairman of the board who had been given power and was willing to exercise it to further these goals. However, since this commitment still existed primarily at the board level and had not permeated the organization, the rating on interpretive schemes remained as it was in the previous period, (1+).

Organization Design

Differentiation

Horizontal:

The minutes of the strategic planning meeting run by an outside consultant in 1987 listed those present as follows: President, Vice-President of Sales, Director of Software, System architect, Director of Engineering and Hardware, and Director of Planning. Assigning the administrative function to the president at this time meant that there were six distinct functional areas in the organization from both prescribed and emergent perspectives.

There was no manufacturing function. During this period, the company contracted with an American company to "turn out their next unit."

In 1987, the company opened a sales subsidiary in the United States which was run by a recently appointed vice president. This meant the organization had offices in two locations increasing the measure of geographical differentiation to (2).

Vertical:

The appointment of a Chief Executive Officer added a level of prescribed vertical differentiation as did the hiring of a Vice President of Sales in October 1987.

In other areas the need for management was being felt and managers began to emerge.

"When did we actually have managers that managed? I guess that would have been '85. The first of those saw the need for first level line managers in the company when we hit about 15 or 20 people and a lot of those were [in his area]... He made a decision at that time to not attempt to be a technical person but instead to work on and be a manager. He's always had an interest in management. He watched what happened at [the company he had worked for previously] and how that organization worked very closely. It was sort of a hobby of his, watching the organization. And he learned a lot of lessons from there and he applied many of them at Supertech. But I would say that he was the first honest-to-God real line manager we had."

The hierarchy, at the end of this period, included chairman of the board, the president, the vice president, the founders group and other managers as well as other employees. This means that there were five levels of prescribed vertical differentiation.

In reality, no one reported to the vice president. As Vice President of Sales and Marketing, he was responsible for the sales function in the same way other managers were responsible to the group for their operations. In practice, there was also no difference between the president and the founders' group at this time since all major decisions were still made by consensus. Thus there were only three emergent levels: The chairman of the board, the founders' group and other managers as well as general employees.

Integration

The organization remained highly integrated since consensus decision making still prevailed. For example:

"During '85 through '87, hiring decisions - all the key ones - were made by a relatively large group. A different group each time... our advice from... [the planning consultant], and I think it is good advice, is that you should have about eight people make a decision on a hire, and that

if anybody said "no", you don't do it because de-hiring is a whole lot more expensive than hiring."

"So we instituted a hiring process that involved at least eight interviews with associated score sheets and following meetings among the people interviewed a recommendation would be made to the hiring manager... the person who ultimately made the offer would be the person to who the position reported.. but it was with the advice of this informally constituted group that the decision would be made. And a manager, of course, had the authority to do so, if he chose, to override objections from the recommendation committee. But each committee was put together ad hoc."

Integration was still carried out on a face-to-face basis, through a large number of 'ad hoc' (emergent) integrating committees. These resulted from the underlying beliefs that there should be consensus on all decisions and committees were developed as the need for decisions arose. The architectural council was prescribed as was the planning committee. Thus integration remained high although not quite as high as in the previous period since some decisions were now being made by individuals or smaller groups. For example, the Chairman of the Board pointed out that he and the president made the decision to fire two of the founders. A rating of (3+) on degree of integration reflects the fact that the level of integration decreased slightly, while the style remained highly personal (1).

Formalization

In August 1988, according to the president:

"There was no documentation, there was no conceptual expression of what the [product] meant in the market... all of that was still to be created..... None of the basic marketing groundwork had been done and there were no people."

However, the Chairman of the Board suggested that there was some documentation in the planning area which he established when he became chairman:

"Anyway, the first thing that I said was necessary was that we had to plan.. business plan.. we had to set out to do a plan that we could use to raise money"..... "and there was no agreement by anyone that planning had any role to play in the evolution of the company."

The second president made the following comment on formalization:

"In 1984-85 we had our first formal strategic planning weekend. We repeated that planning exercise once a year but we had a horizon of three years with a more detailed horizon at one year.. that was at the corporate planning goal level. At the project planning level the planning process.. and since we were in the development phase, all that mattered was the development.. if you can't get the product developed nothing matters.. at the product level we were very formal.. we had a one year planning horizon with three periods of four months each.. in the coming four month period the plan for the project was done to one week so in the coming four month period we know what each person is going to do on a week by week basis.. the second four month period is a month to month planning level.. we know who's going to be doing it and what they're going to be doing ... and the last three month period on the horizon we know what the goals are and at the end of every four month period we sit down and replan adding another four month period at the end so we are always looking a year out... We track those plans in detail at the management level once a week and at the whole company level once a month.. so in development terms we were very much plan driven although we didn't always deliver on the plans..."

In this time period, there was a formal planning session with a documented plan as the outcome. This was the first real attempt to measure performance against predetermined goals. An organization chart was also produced as part of the planning process. Formalization measures were thus rated (2) on both prescribed and emergent levels.

Standardization

The only standardized operation at this time was the hiring process (described under integration), which involved the creation of a unique committee for each hire. On this basis standardization received a rating of (1).

With the exception that prescribed vertical differentiation was higher than in the emergent structure, there was no other distinction between prescribed and emergent structures and systems at this time.

Situational Context

According to the Chairman of the Board:

"We built a prototype at the beginning of '87.. which by the way was not supposed to be a prototype.. it was supposed to be the production machine.." but "it was totally inappropriate for commercialization and so it had to be done again.."

The existence of a prototype raised the rating for product development to (2).

Fiscal pressure led to the company's involvement with venture capitalists and a research contract with the government. The venture capitalists continued to exert pressure on the company to market their product so that they would realize a return on their investment. The government contracts exerted pressure on the company to complete the research project and show results with a viable product. Therefore, the rating for fiscal pressure was (2).

The organization employed approximately 60 people at this time.

Interests

There was a growing dissatisfaction with the deployment of resources. The chairman of the board, and the representatives of the venture capitalists on the board were anxious to complete development and commence marketing. The founders' group believed that marketing was not as important as their research and development activities and that

resources should be devoted to research and development. A rating of (2) was assigned to reflect emerging dissatisfaction.

Dependencies of Power

Firing the two founders who were the visionaries in the company was a significant management decision. The decision itself, was an indication of a change in the power structure of the organization since it was not made by consensus. The Chairman of the Board described it as follows:

" [he] was the visionary.. and we said "Hey, how can we.. could we really afford to not have him..and the conclusion was "We can't win with him so we'll have to take the risk..."

"There were just two people (making that decision)... [the president] and I."

Power was still highly centralized but the centre shifted from the founders' group to the Chairman of the Board who was exercising his power. Some decentralization occurred where functional heads were making decisions for their area without first consulting the founders' group. Power was therefore less concentrated at this time than it was at T_1 , as it was both slightly less centralized and slightly less coherent.

Capability

Knowledge and Expertise

The new Chairman of the Board provided the organization with its first practical knowledge of business. One of the management group described him as follows:

"He was well connected.. he knows a lot about the business and he seems to have a good understanding of emerging companies.. of the problems that emerging companies have..."

According to the president:

"[the chairman] was the first person with real... experience in the ... business to be added to our board.... The first thing he did that started to bring about change in the organization

was to put us in touch with a strategic management consultant."

A member of the board commented that in 1987:

"The only two people in the company who had any real experience were the then newly hired VP of sales and marketing.....[and the] director of engineering..."

The managerial elite now had experience in sales as well managing a large organization. As a result, the organization now had capability in managing a business and sales, as well as in the alternative archetype.

Leadership

The new chairman of the board was able to foresee what was required to transform the organization and knew that the change would not be easy. He began to plan for the change and was making an effort to gain commitment to it. Since he was new in the organization, and in a relatively distant position (in town only periodically) there was not an immediate response. The vision was not, at this point, shared by other members of the management team although several recognized the need for something more than they had but were not certain how to set their goals and how to go about attaining them. The chairman however, saw his role as transformational:

"So anyway when I came on the scene, it was about four years ago, now representing the [venture capitalists] and essentially coming to a visit here every couple of months and playing two roles - one as the chairman of the company which in itself was just another director but it was deemed to be in the company's interest because of my presence in the industry - to be a good thing to have me as the chairman..... and secondly, I was playing a role as coach.. [the president's] coach... that was the sort of a job that I had defined for myself.. and the major dimension of it..."

On the firing of the founders, he was aware of the symbolic effect this had on the organization:

"...and that was a watershed event of course because it brought on a whole new set of disciplines for now the company was not going to tolerate other than setting goals and delivering on those goals."

Based on his vision and his actions, the chairman of the board was considered a transformational leader. Since he functioned at the board level and was the only member of the organization to possess these qualities (the founders did not), leadership was rated (2) to reflect this mix.

Summary

At T_1 , we suggested that the lack of consistency in interpretive schemes and the accompanying dissatisfaction with interests would precipitate change. This change would be directed either towards a return to the founding archetype or towards an alternative archetype in order to restore consistency. A comparison of organizational variables at T_1 and T_2 indicated that changes did occur. These changes included a strengthening of the competitive commitment to profit realization, an increase in differentiation and formalization, the completion of a prototype, an increase in size, less concentration of power, the addition of expertise and transformational leadership.

The movement away from the founding archetype towards profit realization was a result of the venture capitalists commitment and their dissatisfaction with the resources allocated to research. The centralized power structure increased the influence of the venture capitalists' positions on the board enabling them to effectively initiate change in the organization's direction. At the beginning of this period they used their influence to introduce a new chairman of the board and to empower him. This strengthened the competitive commitment to profit realization since the chairman not only held a competitive commitment to profit realization but had knowledge and experience in an

alternative archetype. He also had experience implementing organizational change and was seen, by himself and others, as a transformational leader. While the centralized power structure provided the venture capitalists with the ability to appoint a new chairman of the board and thus influence organizational commitment at the upper level of the organization, the introduction of transformational leadership enabled the organization to proceed with change.

Most of the changes that came about during this period were initiated by the chairman. These included formal planning sessions which resulted in an increase in differentiation as individuals were assigned responsibilities and functions were defined; an increase in formalization as decisions were documented and comparisons made to determine if goals were met; and the introduction of a business orientation.

A major change in this period was the decision to fire the two founders. As an act of transformational leadership, the "firing" was important for two reasons. It indicated a shift in the locus of power and symbolized the change in interpretive schemes from research and development to commercialization.

In "Dependencies of Power", it was pointed out that this was the first decision made outside the founders' group and without consensus. The chairman was emphatic in taking responsibility for this decision with the president. Up until this point, the president had made decisions only after consulting with and obtaining consensus from the founders' group. As a transformational leader, the chairman had laid the groundwork for this event well. Evidence of this was clearly and consistently provided by all who were interviewed. Everyone, with the exception of the two founders who were fired, expressed frustration with the initial founder's failure to produce on schedule and provide

documentation for his area of responsibility. They suggested his creativity and perfectionism, at this time, were a hindrance to the organization since it made it almost impossible for the organization to meet deadlines imposed by financial backers.

Even the founder's version of the firing was very similar. He suggested that the product was not ready for the market and needed further research and development. He did not want to release a product that he believed would not live up to his standards and felt extremely pressured to produce. He pointed out that he did not work well under pressure, worked extremely long hours, and ultimately became ill. He was planning to take time off, which he believed was owed to him, when he received notice that he would no longer be on the payroll. It was also suggested that, because of his actions, the founder had been distancing himself from others in the organization for some time and arrangements had been made to familiarize others with his work and to have another person document his research so that his leaving did not disturb operations, even though the "firing" had symbolic value.

The "firing" made a statement to the organization members that the founders who initially had the vision and were the creative core were no longer part of the company. This was a clear indication that the company was moving from a research and development orientation to a business orientation.

There was now clearly a lack of consistency in the organization. There was conflict over organizational goals. The original founders were still concerned with research and perfecting the product while the board was interested in developing sales and producing a product. Both groups were dissatisfied with the distribution of resources. There was also a lack of consistency in structures and systems.

Although there were prescribed structures and responsibilities, the founders' group was reluctant to give up their power and the old way of doing things. The belief remained that they were to be consulted, at the very least, on major decisions. As one member of this group suggested, often members of this group were not ranked highly on the prescribed hierarchy. Nevertheless they believed they should be consulted on significant matters. This lack of consistency led us to expect that change activity would escalate in the next period in order to achieve equilibrium. An alternative would be for the organization to return to its original archetype. Without the presence of the founders, and with the change in locus of power, this seemed unlikely.

Table 5.5 Organizational measures for Supertech at T₂

	T ₁	T ₂
Interpretive Schemes	Focus primarily on research and development Some competitive commitment to profit realization (1+)	Focus on completing development Some competitive commitment to profit realization (1+)
Organization Design	Little differentiation Integration style personal (1) Degree of integration (4) Low formalization No standardization	Increase in differentiation - horizontal and vertical Integration style (1) Degree of integration (3+) Slight increase in formalization and standardization
Situational Context	Product in conceptual state (1) Venture capitalists profit oriented (2) 12 employees	Prototype completed (2) Venture capitalists continue to exert pressure (2) 60 employees
Interests	Some dissatisfaction with deployment of resources (2)	Some dissatisfaction with deployment of resources (2)
Dependencies of Power	Concentrated power structure	Power is less concentrated
Capability	Board has expertise in operating a business Leadership (1)	Managerial elite had practical business experience Leadership (2)

Table 5.6 Organization design of Supertech at T₂

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	6	6
Number of geographical locations	2	2
Number of product lines	1	1
Vertical differentiation		
Number of levels in the hierarchy	5	3
Integration		
Style of integration	1	1
Degree of integration	3+	3+
Formalization	1	1
Standardization	1	1

T₃ - The Present

This section describes the status of the organization on relevant variables after the Chairman of the Board was appointed Chief Executive Officer and agreed to assume a proactive role.

Interpretive Schemes

At this stage, a clear, new direction was readily discernible. According to the CEO:

"The next phase of the company... is to commercialize what we've got."

This change was acknowledged by one of the early technological experts who had become a manager himself:

"And perhaps the biggest change yet.. has really been recent.. with the whole new slate of management who are really conscious of the goal that says 'Let's put a stake in the ground and figure out what's required to get there.' "

Still not all organizational members were committed to these goals. One of the founders stated:

"Oh, there's another evolution going on which is becoming a market driven organization. Not so much market driven as market conscious, I guess. There's a debate going on in the company as to whether we should be market driven or technology driven."

The founder who provided this perspective was involved in technology development, and while his technological expertise and long term involvement with the company lent him a position of credibility, he no longer held a senior management position in the organization. Thus, the "debate" existed in the minds of those with the company since its inception as opposed to the current managerial elite. The new managerial elite actively promoted interpretive schemes which favoured "commercialization".

Interpretive schemes were rated (4), reflecting the dominant commitment to profit realization. The commitment to

technology development was now a competitive commitment held by those who were no longer in power.

Organization Design

Differentiation

Horizontal:

There was a sudden increase in complexity on a very large scale. An organization chart, dated April 12, 1989, showed twenty-one distinct functional areas.

There was also geographical separation of sales, manufacturing and research functions. The new president, described the situation as follows:

"We have really a three-cornered hat here... We have Supertech corp. in [the U.S.]... hardware engineering in [the east]..... and [here]. The brief for each of them is:
Supertech Corp. is responsible for sales, marketing and service worldwide.
Supertech Research Corporation is responsible for R and D and manufacturing and
[the east] is the hardware development part of the Supertech Research role."

Thus geographical differentiation increased to (3) reflecting the three geographical sites.

Vertical:

Vertical differentiation did not increase even though the number of people operating at different levels increased significantly. According to the chairman of the board:

"... in sort of one fell swoop we brought in the senior management team last November...."

The senior management team referred to here were a group of people brought into the organization at the vice presidential level. Since there was one vice president in the previous period, this did not increase vertical differentiation.

The organization chart for April, 1989 showed the position at the top of the organization was that of Chairman and CEO. Below that there was the president. Under him, the

company had two vice-presidents who came from outside the organization, Vice President - Operations and Vice President - Finance, as well as a Manager of Applications and a Director - Business Development who was previously the second president) at the same level as the vice presidents.

Another layer of management was shown below this. For example, the Vice President - Operations had five directors or managers reporting to him. These included the Director Manufacturing, Director systems Development, Director Planning, Director Software Development, Manager Architecture and Manager Systems Test. The organization chart also showed that the Director of Software Development had three managers (who supervised other employees) reporting to her. Thus there were six levels of prescribed vertical differentiation in the organization.

It was also significant that organizational members saw the organization chart not only as a prescription of the way things should be in the organization, but also as a reflection of the way things were done.

"They're [the organization chart and the way things are done] are moving closer together over time.."

Integration

Integration was becoming more difficult to achieve and to measure as the organization increased in complexity. The original founders' group, under another name, continued to play an integrating role. It was made up of key people at different levels and in different functional areas and was consulted primarily on major technological decisions.

A hiring system which required key members from diverse areas and different levels in the organization to interview prospective employees was also a means of integration as was the president's practice of holding meetings designed to bring in all members of the organization over a period of time.

In all these areas, face to face communication continued to dominate. Thus the rating for style of integration remained (1) while the degree of integration decreased to (3).

Formalization and Standardization

There was a strong push to formalize and standardize organization systems and procedures.

" We have a salary handbook that we produced in February (1989) and that has details of how the salary mechanism works.. We publish every salary level within the company through the company, through all the technical levels up to the director so that everybody knows what salary they can hope to get if they get themselves promoted."

"The next one we have to do is the stock option plan. We have to regularize the way we're handing out stock options to new employees and relate it to a set of guidelines.."

When the new president joined the organization as marketing head he found no product documentation. In his words he:

"began trying to write a brochure that we would have to give out to prospective customers that would say something about the [product]. Behind the brochure, there was no technical documentation at all and the first real documentation was only just beginning to emerge. I'm just reviewing one document the brochure has been out since February (1989). The brochure had to serve a dual purpose. The first was how do you explain the technology and its advantages to the user and second is how do you put enough technical detail in it so people will have some understanding of what it's made of because there was no other technical literature to give out."

Organizational documentation at this time included the product specifications developed to ensure continuity after the two founders left, an organization chart, documents prepared for and resulting from planning meetings, a sales brochure, a house newsletter and the salary handbook. The measure on formalization increased to (3).

Standardization also increased. With twenty-one distinct functional areas, three geographical locations and six levels in the hierarchy, work was being broken down into units that could be defined and were repetitive. An example was the salary handbook which defined how salaries were determined. Manufacturing, also required increased standardization to ensure coordination and quality. The rating on standardization increased correspondingly to (3).

Emergent differentiation caught up to the prescribed structure during this period. There was no distinction between prescribed and emergent structures by the end of this period.

Situational Context

According to one of the founders, the product had been delivered to a customer:

"There was one (a milestone) shortly after that.. April 20th (1989).. DELIVER OUR FIRST [product] out of house. And we met that one.. It went out on time.. so that machine has just been turned over to the customer today."

"That's the first [product] that ever went out the door.. There was a sale associated with the first deal, the contract, but it never left the premises.. They own a part of the prototype that's down the hall here but it was never shipped... And we'll be doing another one of those some time in the next month or month and a half.. so we are in business shipping product and that's a major milestone as well."

And the president concurred:

"The machine that Supertech has produced is now... working"

The product had been tested, proved workable and delivered to a customer. Product development was rated (3).

The company, still not financially viable, continued to rely on venture capitalists and government grants although there was some sales revenue. The rating on fiscal pressure

rose to (4) reflecting the control exerted by financial interests.

The organization had 110 employees.

Interests

The two founders who were highly committed to continuing research and development resigned in 1986. The locus of power shifted to the new managerial elite who were committed to marketing and production. They controlled the resources and were satisfied with the way they were distributed. Organization members who were with the company at its founding still believed that more resources should be allocated to research and development. The rating on interests remained at the same level as the previous period, (2), even though there was a change in the areas where dissatisfaction was manifested.

Dependencies of Power

Dependencies of power changed rapidly after the chairman assumed the role of CEO. While the founders still believed they should have a say in major decisions, the CEO was clear about his role in initiating and implementing changes.

One of the founders expressed his view as follows:

".... but it was this opinion leading group of founders and their close associates who really were the cabal of the company and any major decision of the company had to either originate there or at least be approved. To some extent that's still true today. A major decision in the company has to be supported...."

And:

"Of course it's ultimately the board's decision to appoint a president and the mechanism that was followed in that case was - [The CEO] had the idea.. He ran it by the various people individually who could veto it.. and collected no vetoes and implemented the decision. And that is in fact a pretty accurate statement of how major decisions are made now. There is a champion who creates the idea probably with input from others

and carries it around the company to the various players who could veto it and if it doesn't get vetoed, then it gets implemented."

However, he also acknowledged the major role now played by the CEO particularly in the hiring of the new Vice Presidents.

".. But I think in both of those hires.. [the CEO] was a major player. He brought them forward. He was the champion..... But clearly [the CEO] does not have the right to hire a VP.. That's the president's position."

On the other hand, the CEO was emphatic about his role in hiring the new VP level of managers. In his own words:

"They were all my hires, every one. All my decisions. Nobody else had any say in those decisions. To some extent the board had said "Hey, it's your game! We put you in charge last June so do what you want to do."

The new president also took on the responsibility of making decisions on his own rather than by consensus:

"So having decided what I want..... I started the search seriously about two weeks ago and got three outstanding candidates.. I interviewed all three of them.. [The CEO] happened to be in Boston last week so he interviewed two of the three and it's one of those who's coming up this week. We both like him and now he'll be interviewed by the Supertech people but not from the standpoint that they will select him... [The CEO] AND I WILL PICK THE GUY... "

Professional management also delegated responsibility. The new president stated:

"I like to let people run with their responsibility and I have defined objectives for all the guys that work for me..... and I've tried to define in those, those aspects of the job that are most important and what I like to do is leave them alone to do that..."

This approach permeated the organization:

"[before] .. people who were early employees (new hires) had no role at all in decision making.. which is not the case now. A new employee after he becomes employed.. now it's very limited

in scope.. but our newest hired technician has to decide what stuff we've got to stock in the lab... [Before] the heavyweights would all just get together and decide.. about the most outrageously petty things... like what kind of soldering iron we ought to buy.."

Power was still highly concentrated and decentralization increased as decisions were delegated to new managers. However, the measures on the variables do not adequately describe the most significant change which was a result of the interaction of dependencies of power and the values and interests of the powerholders. Power rested in the hands of the CEO and the new layer of management that he brought into the company. Even the head of R and D was brought into the organization by the CEO, so that decisions formerly made by consensus of the founders' group were now made by The Vice President of Research and Development who was hired by the CEO and reported directly to the president.

Thus while power was less concentrated over some things, particularly in areas where the president delegated responsibility, there was also more concentration in areas which he chose to dominate. Overall, power was less centralized as a result of the president's willingness to delegate authority; and less coherent as decisions began to be made without first achieving consensus.

Capability

Expertise

According to the Chairman of the Board and CEO:

"If you look at everybody that we've brought in for the management team, they're all guys who've done it before. They are all seasoned pros with very closely aligned responsibilities."

And the older employees agreed:

"The new senior people were all people who had taken products to market."

The change in expertise was noticeable. The organization started out as a group of scientists with no

business experience. At this time, the managerial elite all had business experience and particularly experience developing and marketing new products on a large scale. This means the organization possessed capability in all aspects of the alternative archetype.

Leadership

The CEO and the new president worked hard at gaining the commitment of both old and new management to their values. According to the CEO:

"That's part of building a culture.. it's time well spent. What I would say is that Supertech has not had is an identifiable culture like that..."

The new president set up management training sessions which he insisted upon attending himself:

"I want to be in each of the training sessions to articulate my view of the way I want to see things happen in the company.. So I intend to attend every management meeting.. answer for my sins and also lay on them the way in which I want them to operate."

He also initiated a program which allowed him to communicate with other organization members and gain their commitment as well:

"I also have a series of informal meetings going by the way. I'm having informal lunches with groups of ten employees at a time and every time I come back to Edmonton I have another ten people.. I'm gradually working my way through the whole company so that I have an hour with each of the individuals so that they can ask me anything they want about the way the company is developing, what are the problems and how do I see the thing unfolding."

The organization now had transformational leadership and was rated (4).

Summary

At T₂, when the new CEO was appointed, conflicting interpretive schemes and a lack of consistency between

interpretive schemes, structure and systems led to the prediction that these inconsistencies would precipitate change. A comparison of organizational variables at T_2 and T_3 revealed that as predicted, change did occur.

The competitive commitment to profit realization which existed at the managerial level spread throughout the organization. Horizontal and vertical differentiation increased as did formalization and standardization. Power became less centralized.

Changes in context also took place. The product was tested and delivered while the organization doubled in size.

Once again, the strength of the commitment of the new managerial elite and their dissatisfaction with the allocation of resources to research and development provided the direction for change to an alternative archetype. The presence of a transformational leader within the managerial elite was an important factor facilitating this change. A centralized power structure enabled him to install management supportive of his interpretive schemes and experienced in the desired archetype. Thus, the combined interaction of directors and enabling conditions resulted in an escalation of change.

Since the organization appeared to be operating within an archetype, unless something occurred to upset the equilibrium, significant change was not expected. Changes that might occur, would be expected to support existing values, and heighten existing structures and systems.

Table 5.7 Organizational Measures for Supertech at T₃

	T ₂	T ₃
Interpretive Schemes	Focus on completing development/ Competitive commitment to profit realization (2)	Managerial commitment to profit realization/ Competitive commitment to technology (4)
Organization Design	Increase in differentiation Integration style (1) Degree of integration (3+) Little formalization No standardization	Large increase in differentiation Integration style (1) Degree of integration (3) Increased formalization and standardization
Situational Context	Prototype completed (2) Fiscal pressure from venture capitalists (2) 60 employees	Product tested and delivered (3) Fiscal pressure for survival (4) 110 employees
Interests	Some dissatisfaction with deployment of resources (2)	Some dissatisfaction with deployment of resources (2)
Dependencies of Power	Concentrated power structure	Power less centralized and less coherent
Capability	Management has some business experience Transformational leadership on the board (2)	Managerial elite had extensive business experience Transformational leadership (4)

Table 5.8 Organization Design of Supertech at T₃

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	21	21
Number of geographical locations	3	3
Number of product lines	1	1
Vertical Differentiation		
Number of levels in the hierarchy	6	6
Integration		
Style of integration	1	1
Integration rating	3	3
Formalization	3	3
Standardization	3	3

Did this Organization Undergo a Transformation?

Observers both within and outside the organization agreed that Supertech underwent major changes since its founding. The founders described these changes as follows:

"We started out as a think tank.. and then we became a research organization - not necessarily a well developed one but a research organization. Then we became a development organization and we are now becoming an industrial concern..."

"The company has changed a lot.. we haven't changed our vision.. our self image.. what we've changed is what we are and what we're doing... Any product line goes from concept to detail design to implementation to manufacturing sales and after sales support... well, were adding each of those phases to the company as time goes by and we get closer to achieving that phase of product. But the product that we've built and that we're shipping now is not very different from the one we conceived back in '82."

A comparison of current interpretive schemes and those present at the founding revealed a marked difference. At the founding, the company directed its efforts towards research. In contrast, at T_3 , the company focussed on marketing and sales as well as production. These activities did not exist in the founding period. Clearly, there was a change in interpretive schemes.

Just as significant, however, were the changes in structures and systems. At the founding, the organization was undifferentiated to the extreme. Everyone was involved in the research process and all decisions, from the design of the product to the purchase of a soldering iron or leasing office space, were made by consensus. Formalization and standardization were non-existent and were believed to be detrimental. Structures and systems supported and were consistent with interpretive schemes. Thus, the organization was operating within the founding archetype.

Table 5.9 A comparison of Founding and Final organization measures for Supertech

	T_0	T_1
Interpretive Schemes	Focus on research and development	Managerial commitment to profit realization/ Competitive commitment to technology (4)
Organization Design	Little differentiation Integration style personal (1) High integration (4) No formalization No standardization	Highly differentiated Integration style personal (1) Less integration (3) Increase in formalization and standardization
Situational Context	Product in conceptual state (1) No fiscal pressure (1) 5 employees	Product tested and delivered (3) Fiscal pressure for survival (4) 110 employees
Interests	High satisfaction with deployment of resources (1)	Some dissatisfaction with deployment of resources (2)
Dependencies of Power	Concentrated power structure	Power less centralized and less coherent
Capability	Experience and expertise concentrated in technology, research and development Transactional leadership (1)	Managerial elite has extensive business experience Transformational leadership (4)

Data on the most recent structures and systems indicated a marked change had taken place. There was a significant increase in differentiation in all areas of the organization. Functional differentiation had increased from almost none at the founding (1 prescribed; 2 emergent) to 21 functions. There were three different geographical locations (as opposed to one at the founding). There were six levels in the hierarchy. Formalization and standardization increased as well (from none to a rating of 3). Decisions were no longer made by consensus. Although power was still concentrated, there was less coherence as professional management began to delegate different aspects of decision making. The organization was operating within an archetype as the systems and structures were consistent with interpretive schemes. Since the current interpretive schemes, structures and systems differ significantly from the interpretive schemes, structures and systems in the founding period, the organization underwent a reorientation.

Analysis of a Reorientation

At T_0 , Supertech operated in the Founding Archetype. No apparent inconsistencies existed between the environment and organization beliefs, or between interpretive schemes and the structures and systems which supported them. Thus, unless a precipitating event occurred, change was not expected at this time. Organizational members believed, however, that when the product was developed, the organization would realize a profit from manufacturing and selling the product. Thus the development of a prototype was expected to precipitate change in the organization.

At T_1 , the state of product development had not changed even though the situational context of the organization had. Raising funds became more difficult. Friends, relatives and interested participants who originally provided the organization with capital were unwilling to invest further.

This change in situational context resulted in an inconsistency between context and the commitment to pure research. In order to resolve this inconsistency, the organization looked for alternative sources of financial support.

Ultimately, Supertech found two sources: a government contract and a venture capital firm. The contract with the government required the development of a prototype, while the venture capitalists demanded equity and the right to appoint two members to the company's board of directors.

Before awarding the contract, the government required documentation of the organization's structure and detailed plans, including deadlines, for development of a prototype. The managerial elite recognized the importance of the contract for organizational survival and complied with these requirements even though they still believed the organization chart and deadlines were unnecessary nuisances. Nevertheless, obtaining and fulfilling the contract precipitated an increase in formalization and changed patterns of commitment as the president began to recognize that commercialization was necessary for organizational survival.

The appointment of two venture capitalists to the board of directors had an even even greater impact on the pattern of commitment to interpretive schemes in the organization. Previously, the board consisted solely of founding members who were committed to research and development and the president who was aware of the need to move to an alternative archetype. The commitment of the two venture capitalists to obtaining a return on their company's investment increased the commitment to change to an alternative archetype.

Thus at T_1 , fiscal pressure precipitated a change which introduced a competitive commitment at the board level, as well as a move towards formalization.

The commitment of the new board members to making a profit meant that they were dissatisfied with the allocation of resources. Because they believed their interests would best be served by generating income as soon as possible, they favored funding goal oriented activities rather than research. This set the direction of change for the organization.

The new board members also represented the first real change in organizational capability since they had expertise in operating a business. Although the founding members believed the second president had business acumen because he held a graduate degree in Economics, he had no real experience operating a business. His appointment was consistent with their interpretive schemes which stressed academic knowledge and the belief that being smart (i.e. well educated) was more important than experience in operating a business.

Although decisions were still being made by consensus, as members of the board, the venture capitalists were able to utilize the centralized power structure to further their interests by suggesting a candidate for chairman of the board. The founding group (who were the dominant coalition) agreed that it would be useful to have an individual who was well known in the industry associated with the company. On this basis, the venture capitalists' candidate was named Chairman of the Board.

Everyone interviewed agreed the new Chairman of the Board made a significant impact on the organization. His major contribution was expanding the organization's capability. He not only had expertise in the industry and managing an alternative archetype, he had also had

experience managing organizational change. He was viewed by himself and others as a transformational leader. Even when his role was limited to spending a few days per month on site, the centralized power structure enabled him to have a powerful impact on the organization. By T_2 , when he was appointed Chief Executive Officer (as well as continuing to be Chairman of the Board), the organization had completed a prototype, quintupled in size and increased in complexity.

Power remained concentrated although the locus of power shifted to the Chairman of the Board when he assumed control.

Since the organization was so highly integrated, and decision makers were also responsible for implementation, it was difficult to differentiate between prescribed and emergent structures and processes. The appearance of middle managers provides an example. When one of the consensus group found his responsibilities growing to the extent that he felt managing required his full time attention, he placed this suggestion to the group who then agreed and he assumed his responsibilities simultaneously. Also, when the Chairman of the Board decided the company needed a sales manager, he created the position and hired someone to fill it. While the first could be considered an example of an emergent led structure and the second preceded by prescription, in actuality, the time lag was so short between decision and implementation as to be considered negligible.

As suggested previously, most of the changes implemented during this period were initiated by the Chairman of the Board who was able to gain the commitment of organization members. These changes included formal planning sessions which resulted in an increase in differentiation as individuals were assigned or assumed responsibilities and functions were defined; an increase in formalization as decisions were documented and comparisons

made to determine if goals were met; and the introduction of a business orientation.

When the Chairman of the Board also became the Chief Executive Officer, he continued to exert control over the organization. As his role changed from 'coach' to leader, he introduced a layer of middle managers from outside the company who had previous experience in the industry. These people were committed to his goals of commercialization and as they joined the managerial elite they increased the commitment to profit realization. As a result, the commitment to technology development became the competitive commitment and moved to a lower level in the organization.

The change in interpretive schemes together with the supporting changes in structures and processes led to the conclusion that the organization had undergone a change.

Summary

Fiscal pressure, i.e. the need for funds, produced a change in context. As a result, interpretive schemes were no longer consistent with the environment.

The managerial elite recognized their lack of ability to deal with problems resulting from this lack of consistency. They willingly took the advice of the venture capitalists who suggested a new Chairman of the Board. The addition of the new chairman changed the pattern of commitment in the organization only slightly since the two venture capitalists held the same commitment. More significantly, the capability of the organization changed as the new chairman not only had industry experience but also had experience managing organization change. The concentrated power structure gave him control over the direction of the organization. By introducing a layer of management committed to his interpretive schemes, he changed both commitment and capability in the organization.

Little change occurred in the first time period. As commitment to the alternative archetype increased and expertise in operating the alternative archetype was added, the pace of change increased.

At the end point of the study, Supertech was committed to manufacturing and selling their product. Structures and processes supported these interpretive schemes. The organization had undergone a major transition.

CHAPTER 6

AN UNRESOLVED EXCURSION - ULTRATECH

Significant Events

Ultratech was officially founded in 1967 to research and develop a knowledge based business. It wasn't until 1979 that the company began to pursue the acquisition of rights relating to its current product. Until that time, the president and the secretary were the only employees. Therefore, the founding, T_0 , of this organization refers to the entire period up to and including 1979 when the company hired a third full time employee.

At the end of 1981, the company obtained an exclusive worldwide license to manufacture and sell a high technology product which was not fully developed and the intellectual property and technology relating to a similar product.

Although these events were cited as significant in a stock prospectus, in reality, they were a continuation of previous technology acquisition activity. The same prospectus stated the company controlled and maintained a large number of internationally registered patents; yet none had been produced or marketed.

It wasn't until 1983-84 that the organization encountered what organizational members perceived to be a significant event in terms of change. Then two events occurred within an eight month period. The company entered into a Joint Venture Agreement with an American firm and leased a local manufacturing facility (which had been used to manufacture components for another industry) for a three year term. These events were expected to be significant because of the immediate and visible impact they had on the organization.

The Joint Venture Agreement between Ultratech and the American company established a business in the United States

utilizing equipment produced by Ultratech as well as a two year research and development program in which the partner company's personnel performed research and development work for Ultratech. This meant that the product was no longer in a conceptual state but was operating in a commercial environment. Also, when the American research personnel began to interact with Ultratech personnel, the lack of integration in Ultratech became apparent. Ultratech workers saw their efforts being duplicated and believed their work was not receiving sufficient recognition.

When the company leased the factory, they agreed to retain the plant manager and thirty-five employees who had previously worked in the plant. As a result, the size of the company increased significantly and the company gained a facility for manufacturing their product, but they also had the expenses associated with supporting such a facility.

Both of these events were expected to result in changes in the organization. However, since they occurred so close together that their results overlapped one another, T_1 is used to represent both.

The second significant event occurred in 1987. In need of funds, Ultratech shareholders sold 11.5 million non-voting preferred shares to the government and gave them the right to appoint four of the company's seven directors.

Two events occurred in the next two years which could have been significant. These were the appointment of a new president and selling a piece of equipment to a major American manufacturer. However, since the new president was appointed by the government to carry through their program of financial restraint, any changes he implemented are directly attributed by those interviewed to governmental influence. Secondly, while the sale of the product was looked upon as a breakthrough into a new market, further sales failed to materialize. Accordingly the changes

that increased sales were expected to bring did not materialize. Thus, those interviewed did not consider either event significant.

Everyone interviewed agreed that from the time the government assumed control up until the time the company was unable to obtain further funding and was dissolved, there were no other significant events.

T₀ - The Founding

Interpretive Schemes

The intention of the founder was to develop a business that was not resource based. The main thrust of the organization throughout this period was the investigation and acquisition of patents or rights to technology and applications.

Interpretive schemes were rated (1) because of the president's commitment to research and development.

Organization Design

In the words of the president:

"You can't have structure in a research and development organization... you can't constrain knowledge.. You must have free flow so we have always had no structure or very little structure."

In the founding period, consistent with these beliefs, the organization had a simple structure. Everyone did whatever was required at the time. There was no functional differentiation and no product differentiation. In fact there was no product. There was one geographical location which consisted of the corporate office. With three employees, there were two levels of vertical differentiation. The two employees reported to the president. Integration, rated (1), was achieved through face to face communication. The size of the organization and the limited working space resulted in a highly integrated organization (4). Formalization and standardization were non-existent.

Since, the two employees complied immediately with any instructions issued by the president, there was no distinction between prescribed and emergent structures and systems at this point.

Situational Context

The product was in a conceptual state. A manager who joined the organization shortly after this time described the early days of the organization as follows:

"They were doing research... trying to get something together."

The state of product development received a rating of (1) as the president had many ideas, was researching potential products, and although he had obtained several rights and patents, a specific product had yet to be defined .

Fiscal pressure was minimal. The president had the ability to convince people of the potential to make money by investing with him. A long time friend and colleague who had once worked for him suggested:

"[He] has ideas and somebody put it to me once, many years ago.. it was back in the days of that smaller board.. because I got to know most of those people.. as they put it, they said '[He] is terrible for detail, and for financial control and everything else.. but' they said 'if you sit him down in a room with about a dozen people around a table, before you're finished he will have thrown out ideas that if they all go out and follow up, they will each make a million bucks out of those ideas.'"

It was this ability to build confidence in investors that generated the financial resources to pursue activities that were of interest to the founder. At this time, the backers were not worried about seeing results; thus, there was no fiscal pressure on the firm.

The company employed only three people throughout this period.

Interests

Satisfaction with interests was high as the president, the only manager, was able to pursue his interest in acquiring patents for high technology applications.

Dependencies of Power

"[The president] held the reigns of power very close for years."

This statement by one employee, was echoed not only by other employees, but also by outside observers who were familiar with the organization. Power was concentrated. It was clear the president controlled the organization.

Capability

Expertise

The background of the president was outlined in the first stock prospectus dated 1984:

"[The president] obtained a Ph.D. in the social sciences.."

"[For a period of time he] served as Special Consultant to the Government..... During this period he directed research projects in social and economic areas, and initiated the implementation of various government policies and programs."

The president had no experience managing a business, carrying out technological research or in another archetype. The other two employees also had no experience in these areas since they were the secretary and a person Friday. Thus, expertise was limited to the president's experience in raising funds and acquiring the rights to technology.

Leadership

Although the president talked about creating a business, he spent his time acquiring the rights to various types of new technology. He indicated, to the researcher, that one of the main problems with high technology ventures is that 'they' force them out on the market when the technology is not mature. Since the president directed his

efforts towards maintaining the organization's focus on acquiring the rights to new technology, his leadership was classified as transactional (1).

Summary

Throughout the first ten years of its existence, the organization conformed to the founding archetype in all respects. There were only three people in the organization during this time and there were no changes in any of the variables studied. The organization was clearly on an inertia track. Because there were no changes, T_0 was used to represent the organization from its founding in 1967 up until 1978.

Interpretive schemes were consistent with supporting structures and systems as well as with situational context. Therefore, unless something unusual happened, the organization was expected to remain on an inertia track.

Table 6.1 Organizational measures for Ultratech at T_0

	Founding Archetype	T_0
Interpretive Schemes	Focus on research and development (1)	Focus on research and development (1)
Organization Design	Little differentiation Integration style personal (1) Degree of integration (4) No formalization No standardization	Differentiation in products (0) and hierarchy (2) Integration style (1) Degree of integration (4) No formalization No standardization
Situational Context	Product in conceptual state No fiscal pressure Less than 25 employees	Product in conceptual state No fiscal pressure 3 employees
Interests	High satisfaction with deployment of resources	High satisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Concentrated power structure
Capability	Experience and expertise concentrated in technology, research and development	Experience and expertise concentrated in acquiring the rights to technology Transactional leadership

Table 6.2 Organization design for Ultratech at T_0

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	1	1
Number of geographical locations	1	1
Number of product lines	0	0
Vertical differentiation		
Number of levels in the hierarchy	2	2
Integration		
Style of integration	1	1
Degree of integration	4	4
Formalization	0	0
Standardization	0	0

T₁ - The Joint Venture and Leasing a Manufacturing Facility

This section describes the organization after the founding period, which ended in 1978, up to the time of the Joint Venture Agreement in mid 1983. The leasing of the manufacturing facility, which occurred shortly afterward and was independent of the Joint Venture Agreement is also used to mark the end of this time period. As suggested previously, although both events occurred at different times and the results from each were different, the time periods in which the results unfolded were overlapping. For this reason, both are used to mark the end of this time period and the beginning of the next.

Interpretive Schemes

Up to this time the organization continued acquiring patents and rights as well as researching and developing previously acquired technology and applications.

In the words of one of the Ph.D.'s who joined the company in 1981:

"Well basically what we wanted to do was get a [product] that we could sell into the industry. At that time we were looking at [a particular product] but at the same time [the president] was scouting around looking at all the different technologies that were available..."

The rating of (1) reflects this commitment to research and development.

Organization Design

Differentiation

For an organization of this size, horizontal differentiation was extremely high. The organization employed ten people and operated out of four different locations performing different tasks at each location. While the president and his support staff worked out of a house near the core of the city, research was carried out under three different scientists at three different locations. Two operated from laboratories on the university campus. One

conducted experiments in his own department at the university. The second worked in a research facility on campus. Finally, a third scientist worked out of a lab provided by the government for research purposes in a building in another part of the city. On this basis, geographical differentiation received a rating of (4)

Functional differentiation followed the same pattern. Although the function of all three labs was research, each worked independently of the other on a different project: one worked on product design, another worked on the development of a related product, and a third was involved in researching product safety. The administrative functions were carried out at a separate location. On this basis, functional differentiation was also rated (4).

Vertical differentiation was more in line with what is expected in a research oriented organization of this size. There were three levels in the organization. The president, who was also chairman of the board, controlled both the board and the research staff. The research staff had lab personnel working for them. Accordingly, vertical differentiation was rated (3).

"[A specialist] and I looked after the scientific areas.. but it wasn't a tight organizational chart.. It was just a group of people working together more than anything else, trying to get something done.. but really [the president] very tightly controlled everything that went on..."

As previous quotes suggested, integration was carried out on a personal level (1). The high level of differentiation and geographical separation meant that integration was not as high as it would have been in a single location. Therefore, integration was rated (3).

Consistent with the casual approach to organization, standardization and formalization were non-existent.

At this point, the president tightly controlled the organization. The employees complied with his requests and consulted him often. Thus, there was no distinction between prescribed and emergent structures and systems at this time.

Situational Context

The product was in the research stage (1) at this time and was not considered ready for the market.

There was no fiscal pressure as the president was able to obtain financial support from private investors. However, it was evident that his sources were dwindling and new sources would have to be found.

The organization employed ten people.

Interests

There was a high level of satisfaction with the distribution of resources. The availability of funds made it possible for the president to continue acquiring new technology and to provide researchers with the equipment and supplies they requested. The researchers had a rapport with the president and confidence in his willingness and ability to provide them with whatever resources they required.

Dependencies of Power

An early research manager described organizational operations as follows:

"[The president] controlled almost everything at that time. He was in charge of the managing, really the scientific stuff, he was always in the lab himself.. he spent a lot of time bringing up new products to be tested, looking at new ways of doing things... so [the president] was very much involved in the primary stage, you know, of the developing stuff... He and myself and [the specialist] worked very closely together on anything we could..."

"[The president] was always above.. he did all the financial stuff.. he brought a lot of the ideas in.. so [the president] was very influential in the development of the company..."

"[An accountant] was brought in as VP Finance at one stage.. was back.. probably before [1984]... but he didn't get along with [the president] at all.. he had very much an accounting mind.. you know he wanted to organize things in a very structured way and [the president] didn't like that at all.. So (he) was shuffled aside into basically a bean-counting role somewhere else..."

As illustrated above, power remained concentrated. The president controlled all aspects of the organization.

Capability

Expertise

New managers held university degrees in science which added expertise in researching and developing technology to the president's expertise in acquiring the rights to new technology. Thus, there was still no expertise in managing a business or in the alternative archetype.

Leadership

The president enjoyed the role he set for himself. He continued to seek out new technology while at the same time controlling all aspects of the ongoing research. Research managers were involved with carrying out their individual research projects. While the president claimed that someday the company would be a commercial success and his investors and employees believed him, there was no evidence of plans for production and marketing. Since managers focused on their daily activities, leadership was rated transactional (1).

Summary

As predicted, between T_0 and T_1 the organization remained on an inertia track. There was no change in interpretive schemes. Although the product remained in a conceptual state, there was a marked increase in functional and geographical differentiation as specialists, hired to carry out specific research projects, were given lab space in different locations. This functional differentiation

resulted from the president's perception of research he wished to pursue, while geographical differentiation came about as a result of the ability of the president to acquire space at little or no cost, i.e. in government research facilities. The large increase in differentiation which resulted in less integration, was the first indication that the initial archetype may be fraying.

Fiscal pressure remained unchanged and there was a high degree of satisfaction with the allocation of resources as funds were allocated to research activities when they were required.

Because of the strong commitment to research and development by the president and scientists he employed, the high level of satisfaction with the allocation of resources, and structures and systems (or rather a lack thereof) which support the existing interpretive scheme, it appeared likely the organization would continue on an inertia track.

Nevertheless, organization members and industry observers perceived that the two events which mark the end of this period would precipitate changes in the organization. The joint venture agreement meant that the product would be used in a commercial setting. As a result the product status would change from a concept to a usable product. Collaboration with the Americans on research and development was expected to bring industry experience to the research team. The factory lease meant the company had facility for manufacturing the product and company news releases suggested to the industry that the company would soon begin producing multiple units.

In spite of the inertial forces suggested previously, the researcher was convinced from interviews with company executives at that time that the organization was on the verge of a major transition. For this reason, the Joint

Venture Agreement and the leasing of a manufacturing facility were selected as the next significant event(s).

Table 6.3 Organizational Measures for Ultratech at T_1

	T_0	T_1
Interpretive Schemes	Focus on research and development (1)	Focus on research and development (1)
Organization Design	No differentiation except for vertical (2)	High functional (4) and geographical (4) differentiation Vertical differentiation (3)
	Integration style personal (1)	Integration style (1)
	Degree of integration (4)	Degree of integration (3)
	No formalization	No formalization
	No standardization	No standardization
Situational Context	Product in conceptual state (1) No fiscal pressure 3 employees	Product in conceptual state (1) No fiscal pressure 10 employees
Interests	High satisfaction with deployment of resources	High satisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Concentrated power structure
Capability	Experience and expertise in acquiring the rights to technology	Experience and expertise in research and development as well as acquiring rights to technology
	Transactional leadership	Transactional leadership

Table 6.4 Organization design of Ultratech at T₁

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	4	4
Number of geographical locations	4	4
Number of product lines	0	0
Vertical differentiation		
Number of levels in the hierarchy	3	3
Integration		
Style of integration	1	1
Degree of integration	3	3
Formalization	0	0
Standardization	0	0

T2 - Sale of shares to the government

This section describes the variables following the Joint Venture Agreement and the acquisition of the manufacturing facility up to the time when the company sold a large block of shares to the government.

Interpretive Schemes

According to a long time employee, after the acquisition of the manufacturing facility:

"... there were subsequent changes as well because we were entirely focused on manufacturing [our product] but having hired a bunch of [other production] people, the focus became even split and there seemed to be power struggles in that they seemed to say "Hey, we're [from another industry], we don't know how to build [the company's product] necessarily.. we'd rather just get into building components for [the industry we're familiar with] ... and so there began to be this major division of focus of the company into [the previous product] manufacturing and [the company product]..."

When Ultratech leased the manufacturing facility, they retained the services of the plant manager and thirty-five employees. These people were skilled in the production of the previous product and took pride in their work. Accustomed to the routine of an efficient manufacturing plant, they were frustrated by the constant alterations demanded when they built Ultratech's new product. They believed that the company's best interests would be served by obtaining contracts which would allow them to continue manufacturing products with which they were familiar.

After Ultratech acquired the manufacturing facility and its employees, the company employed approximately one hundred people. This meant that roughly one-third of the employees in the organization had a strong commitment to obtaining contracts which would allow them to continue their previous manufacturing operation

The remaining staff, i.e. those who were involved in research, looked upon the manufacturing facility as a tool for building the technology they were developing and as a means of producing their product when they were ready to market it.

The rating of (2) on interpretive schemes reflects these competitive commitments.

Organization Design

Differentiation

A list of employees in an interior document prepared in 1986 noted six different functions not including administrative personnel. These included scientists, engineers, computer professionals, technologists, production, and quality assurance personnel. At the same time, according to a stock prospectus published by the company, there were six directors/managers: Director of Manufacturing, Manager of Corporate Accounting, Director of a Technology Lab, Director of an Engineering Lab, Director of Human Resources and a Director of Special Projects. On this basis, functional differentiation is rated (7).

At that time, the company operated out of five geographical locations. These included the manufacturing facility, labs at the university and in government owned research premises, corporate offices in a downtown highrise office building, and the development and production facility in the United States. Geographical differentiation was rated (5).

Vertical differentiation was lower. In line with the president's bias against structure, the organization had few layers of management. The president was also chairman of the board. While the 1986 stock prospectus listed two vice presidents, a Vice President Finance and a Vice President Corporate Development, there was no authority attached to these positions. Managers and directors reported directly to

the president with professionals under the managers supervising technologists. The vice presidents' roles were outside this line, functioning as staff positions. Thus there were five levels of prescribed vertical differentiation and four levels of emergent vertical differentiation.

After acquiring the manufacturing facility, the company had two distinct products. One was the technology which they were developing and the other was manufacturing parts on a contract basis for firms in another industry.

The president's insistence on controlling all aspects of the organization meant that he was the sole prescribed means of integration. He was strongly opposed to any means of formalization and carried out all communication on a face to face basis. Therefore, prescribed integration received a rating of personal (1) for style.

A lack of integration was noted by everyone interviewed except the president. The following comments are typical:

"The [product research] people were sort of insular and they carried on with their program... the [other research] lab... the same.. they carried on with their thing.. developing ideas and things like that because once we got the rest of the manufacturing we put together the whole system ..."

"So [the plant manager] had his own organization within the plant.. based on what it was like at [the old firm] probably.."

"..it was in '86... in which the [research] personnel from [the United States]... came .. for two weeks I think it was.. and hashed out what we thought was the grand plan on what should happen with the [product] side of things and presented that proposal to upper management and of course... nadda... nothing has changed.. the only... we went ahead with our own development issues as we could.. once we had those definitions worked out and we've implemented many of them.. but what happened then was is that there was a functional split between Ultratech and [the American partner].. that the [research] that Ultratech had

and was using on a daily basis had reached levels and had capabilities greater than what [the American partner] was doing..."

"We couldn't get the okay to make that the standard in our companies.."

A rating of (1) on degree of prescribed integration reflects the lack of integration illustrated above.

As managers found they needed to coordinate their efforts to complete their work, efforts at integration began to emerge:

"...as the group grew, I needed to know what everyone was doing.. so we had these monthly meetings.."

"It was an internal thing that we decided was necessary and just to keep track and work out where we were going and what we were doing, yes, so it came from within rather than being imposed."

A 1985 document which recorded the first of these meetings read as follows:

"It was agreed to have regular weekly meetings of group managers to review status of various projects for a general exchange of ideas. The meetings are to take place every Tuesday at 9 a.m. at the plant boardroom with [the plant manager] acting as chairman."

A manager described the meeting as follows:

"This was the first meeting, and it was the first of a series of formal meetings and it arose from the need of the person in charge of manufacturing to do that sort of thing."

Emergent integration was primarily personal, although the memos and documents prepared for meetings as well minutes taken at meetings increased the rating for style to (2). The degree of emergent integration was higher than prescribed integration and was also rated (2) for this period.

The foregoing also illustrates the lack of proscribed standardization and formalization. Documents were often being created to compensate for this. For example, one manager stated:

"Well in '83 and '84 I'd started getting.. you know.. making sure people wrote.. I guess I started from the scientific point of view.. I said "Look, we've got to get organized meetings, and we've got to get our thoughts and everything down.." So I was the one who initiated that.. Making sure.. and it became very important as we went down the line because you know.. you go back.. and go back to the tax department who could say "Now what did you do?" Now I can go back to all my reports and I can go through them very systematically and say this is the research we were doing in that period and these are the people that were involved in it."

The following quote further supports the emergent nature of formalization:

"In fact [the president] didn't like reports... ..he didn't even like me writing that stuff down, believe it or not. He was very sort of funny about that.. So really it was a thing I needed because I needed to keep track of where everything was going, what we were doing and to do that, you need to have reports written and so that's why we got into that sort of function."

Thus standardization and formalization were emerging even though prescribed standardization and formalization were still (0). Emergent standardization rose to (1) because of the standardization that existed in the manufacturing facility. Emergent formalization was rated (1).

Situational Context

State of product development

During this period a major Canadian firm purchased the product for their manufacturing facility. Ultratech expected this sale to stimulate future business for Ultratech in that industry. However, in day to day operations, the product proved unreliable. As a result, projected future sales were not realized.

A local newspaper quoted the president:

"We now have technology available for sale to the world."

The same article suggested:

"...sales are rising and the sales mix is shifting from contract research to high-technology products and services."

"In recent months (the company) announced a new industrial [product].

"[the president] says [the company] soon will announce another new product."

As a result of the joint venture agreement, the company installed its product in the American plant.

After acquiring the manufacturing facility, the company took on manufacturing contracts to support it. It continued to do contract work for companies in another industry.

The rating for state of product development (3) reflects the conflict in the organization. While the president announced the product was ready to market and one unit was sold, he also commented on others that were still being developed. Manufacturing contracts were also part of the organization's product mix at this time.

Fiscal pressure

Fiscal pressure increased as the company's need for funds grew. The company now needed to support the manufacturing facility as well as provide a machine (which they were planning to sell for \$2 million) for the Joint Venture Agreement. These funds were in addition to those required to support ongoing technology acquisition and research activities. Previous financial backers were beginning to become impatient waiting for a return on their investment and were no longer as free with their support.

In order to obtain financing, the company entered into an agreement with the government. In return for \$15 million, Ultratech gave the government 11.5 million preferred shares and the right to appoint four directors on the firm's seven

member board. On this basis, fiscal pressure received a rating of (3) for this period.

Size

The acquisition of the manufacturing facility added thirty-five employees. According to a 1986 stock prospectus, Ultratech employed approximately one hundred people compared to ten at the end of the previous period.

Interests

The discussion of interpretive schemes revealed a competitive commitment. The scientists were eager to continue their pursuit of an ideal product. The president also wanted to continue accumulating patents and rights to new technology. On the other hand, the Manager of the Manufacturing Facility was interested in obtaining contracts and continuing to manufacture products for the industry in which he and his employees had both knowledge and experience. Investors were interested in seeing a return. Fiscal pressure, i.e. an extreme shortage of funds, meant that there were not sufficient resources to satisfy the interests of any of these competing factions. Thus there was a high level of dissatisfaction with the distribution of resources, i.e. funds, facilities and employees.

Dependencies of Power

Two managers who had been with the company for over ten years described the power structure as follows:

"You could feel the hand of [the president] in everything you did until about the end of '87."

"Before that [i.e. when the government brought in a Chief Financial officer], we had financial people in here but they really didn't have any power... no power at all.. [the president] ran the whole show. He ran the whole show.. Our first financial person was in 1984. He came in when we were over at [our first location] and helped put reports and things together for government and everything else... But he didn't have any real financial clout.. from a decision making point of view.. none at all really.. "

No one was able to give a comprehensive description of power dependencies in the organization; however, one clear pattern emerged in all discussions. The president insisted on having the final word in all decisions. Those interviewed expressed frustration with the extensive control exercised by the president and by the lack of a clearly defined authority structure.

On this basis, power was rated as concentrated (1), since the president tightly controlled all aspects of the organization.

Capability

Expertise

A Chief Financial Officer and Vice president Finance joined the firm in March 1986. He had a degree in finance and economics. Although he was not the first Chief Financial Officer, his predecessors were not considered part of the managerial elite and those interviewed indicated that there was a high turnover rate in this position. This was attributed to a conflict over financial control between the president and the financial officers, which was in all cases resolved by the replacement of the financial officer. However, the presence of a Chief Financial Officer who is now a Vice President reflects the presence of expertise in this area at a managerial level.

A Manager of Manufacturing and Production joined the company in November 1983, at the time the manufacturing facility was acquired. His previous experience was as Senior Production Manager with the firm that had previously owned the plant where he was responsible for production. He was listed as Director of Manufacturing in the 1986 stock prospectus. He brought expertise in the management of a manufacturing facility to the organization.

It was noted in the 1986 prospectus that the company was "actively seeking additional executive personnel

including a Vice President, International Marketing." However, the position was not filled at this time so there was no marketing expertise in the organization.

During this period, Ultratech added managerial and technological expertise in manufacturing, and financial expertise at a managerial level to the capability of acquiring, researching and developing technology which was present in the previous period. The organization still had no expertise in managing a business or in the alternative archetype.

Leadership

Although the president acquired the manufacturing plant ostensibly for the purpose of manufacturing the product, no plans were made to sell the product. A public relations representative of the firm told the researcher at that time that there was no sales staff. The president believed that if you 'built a better mousetrap, the world would beat a path to your door.' The plant was used to assist the researchers build and improve upon experimental models rather than manufacture the product. The president continued to direct his effort towards research and development of the product and acquiring patents and rights to related technology.

The acquisition of the plant gave the impression that manufacturing was viable in the near future. The need to obtain contract business to support the plant also provided the firm with a more commercial orientation. Thus leadership exhibited some degree of transformational activity which led to a rating of (2) for leadership at this time.

Summary

The acquisition of a manufacturing facility with thirty-five employees including a plant manager introduced a competitive commitment to acquire and carry out production contracts. It also increased functional differentiation as

the jobs in manufacturing differed from those in research. In addition, the facility, located as it was at a different site, increased geographical differentiation. The joint venture operation in the United States also added to geographical diversity.

A tenfold increase in size, from ten to one hundred employees, also led to an increase in vertical differentiation as a director of research was made responsible for all research activities and the plant retained its former structure.

The product was no longer in a conceptual state as the joint venture operation was using one and another was installed at a manufacturing plant in Eastern Canada.

However, funds were running out and the president, who up until this time had no difficulty raising capital, was encountering financial problems. The shortage of funds and competing interest also resulted in a high level of dissatisfaction with the deployment of resources.

Power remained concentrated. The president was unwilling to give up control. However, with the increase in size, it became apparent that he was no longer able to control and integrate the organization by himself. Frustrated with the lack of communication and recognizing the need for integration, managers responded by developing systems and structures to fill these needs which is reflected in the emergent led increase in integration and formalization during this period.

The manufacturing facility was acquired by the president as a signal to the institutional environment that the organization was preparing to manufacture and sell its product; however, there was no marketing plan and no personnel were assigned to sell the product. The president and research personnel were still committed to acquiring, researching and developing new technology. The competitive

commitment to manufacturing was emergent led - a result of the commitment of the manufacturing staff who were acquired along with the facility.

These changes which were emergent led, moved the organization from the founding archetype to an embryonic position. The resulting inconsistencies lead us to expect further change.

Table 6.5 Organizational measures for Ultratech at T₂

	T₁	T₂
Interpretive Schemes	Focus on research and development (1)	Competing interpretive schemes - research and development and manufacturing contracts (3)
Organization Design	High functional (4) and geographical (4) differentiation Vertical differentiation (2) Integration style (1) Degree of integration (3) No formalization No standardization	High functional (7) and geographical (5) differentiation Product differentiation (2) Vertical differentiation (4) Integration style (1) Degree of integration (2) Emergent formalization (1) Standardization (1)
Situational Context	Product in conceptual state (1) No fiscal pressure 10 employees	Product sold (3) Fiscal pressure (3) 100 employees
Interests	High satisfaction with deployment of resources	Dissatisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Concentrated power structure
Capability	Experience and expertise in technology, research and development Leadership (1)	Manufacturing and financial expertise are added Leadership (2)

Table 6.6 Organization design of Ultratech at T_2

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	7	7
Number of geographical locations	5	5
Number of product lines	2	2
Vertical differentiation		
Number of levels in the hierarchy	5	4
Integration		
Style of integration	1	2
Degree of integration	1	2
Formalization		
	0	1
Standardization		
	1	1

T₃ - Receivership

This section describes the variables following the sale of shares to the government up to the time the company went into receivership. During that period, the government appointed a Chief Financial Officer, an accountant who had earlier consulted for them on the viability of the company. Shortly after, they appointed a new Chairman of the Board and made the Chief Financial Officer president.

Interpretive Schemes

At this time there was no dominant interpretive scheme; rather there were competitive commitments to pursuing the development of high tech products and building up the contract manufacturing side of the business.

At the end of 1989, a local newspaper reported the following:

"Ultratech is a publicly traded company that makes [high technology components under contract] and [its own high technology product].

"The [manufacturing under contract] operation is expanding [the president] says.

"Our game plan has been...picking up the niche market in that's what we're concentrating on."

"Employment has expanded on the production side while the research staff has shrunk slightly."

Early in 1990, a magazine stated:

"With the government's considerable backing, Ultratech continued work on its [unique product], concentrating on developing [a product for use in a specific industry]."

These quotations reflect an ambivalence in interpretive schemes. While those involved with the new product were committed to research and development, the president and manufacturing staff were committed to increasing the company's manufacturing contract business.

One manager expressed it as follows:

"The manufacturing people had a bias toward [their product] and they wanted to implement procedures and practices that they knew they were comfortable with... that they knew they had to jump through the hoops in order to get [qualifications to produce their products]... and meet those specifications in order to be able to bid on jobs.. They had that as their goal.... They knew that from their previous experience."

"On the other side it's brand new. This is the side that's diversifying the economy of Western Canada. The [contract manufacturing] was here years ago and it just became unprofitable in the boom and bust cycles of the industry and the industry may go bust in a few years. Who knows if some big company's going to cancel their contracts.. Ultratech will probably be one of the first to be dumped from ..[the] manufacturing list. But in terms of the goals of the company to develop knowledge base industries, the [new product] side has the broadest range, the broadest future because it has a very bright future and one that grabs the enthusiasm of bright people.."

The new president's mandate from the government was to make the company profitable. Sales for the high technology product failed to materialize. As a result, the president saw the development of contract manufacturing business as a source of cash flow and profit for the company and encouraged an increase in contract manufacturing. At the same time, he cut expenditures on research and development.

The president, the board, and manufacturing personnel were strongly committed to contract manufacturing. While some of the research personnel recognized the need to pursue contract manufacturing business to support the company, along with their colleagues, they still believed that developing a high technology product was the way to ensure the future of the company. The president's commitment to contract manufacturing represents a shift in commitment among the managerial elite which results in a strengthening

of the commitment to commercialization. On this basis, interpretive schemes were rated (3).

Organization Design

Differentiation

Horizontal:

The new president made few changes in structure. He continued his policies as former Chief Financial Officer which were aimed at cutting expenses. In an effort to increase revenue, one functional area was added during this period. Salesmen were hired specifically to pursue manufacturing contracts. On the high technology side, a project leader was named to coordinate the development of a product for a prospective customer. Members of his group were not solely responsible to him but belonged to other functional areas in the organization. The addition of sales personnel increased functional differentiation by one to (8).

In order to minimize expenses, corporate offices were moved to the plant as was the research activity. The development and production facility in the United States continued to operate as before. Thus geographical differentiation was reduced to (2).

Vertical:

As suggested at the beginning of this section, the positions of Chairman of the Board and President are now held by two different people. After assuming control, the new president appointed a Vice President to manage research and development. Although, there were Vice Presidents in the organization in the last period, they operated as staff personnel and the president retained direct control over all aspects of the organization. The new president delegated authority to the vice presidents allowing them to manage activities in their respective areas. The hierarchy has thus been extended. The following is an example of the chain

of command in the area of Research and Development: Chairman of the board, President, Vice President of Research and Development, Project Manager, scientists, technologists. On this basis, vertical differentiation was rated (6).

Integration

Research managers complained:

"We had [done work] but it was significantly different than [the Americans'] and so [the Americans] didn't want to shut down and suffer any... "

and

"but what we couldn't understand is why management wouldn't support the [local development] group to the extent of producing that product ready and we're still..."

Integration was still achieved primarily through face to face communication. However, the complexity of the organization and the need for coordination in order to meet the deadlines imposed by the contract to supply their product to an American manufacturer led to meetings on a regular basis and an increase in the number of reports and memos. Thus integration became more bureaucratic (2) although there was no measurable difference in the degree (2).

Standardization and Formalization

The following comment made by one of the managers is typical of this period:

"They're increasingly getting formalized..."

The preceding discussion of integration reveals emerging formalization. In addition, an increase in the power of the Chief Financial Officer enabled him to implement formalized budgeting systems.

Situational Context

State of product development

The new president emphasized the contract business and was quoted as saying contract business was expanding. The company also sold their product to an American company and believed that they had a product that made commercial sense for this new market. A rating of (3) represents a combination of the new product status and the contract business.

Fiscal pressure

With mounting debt and a negative cash flow, the company made a deal with the government in the spring of 1987. The government provided the company with \$15 million in return for preferred shares and the right to appoint four of the company's seven board members.

In spite of this substantial injection of capital, the company was under fiscal pressure before the end of the year. In a last ditch attempt to save the company, the government removed the president, who was also Chairman of the Board, and replaced him with a new president as well as a new Chairman of the Board. Fiscal pressure is the main concern of the organization at this time and is thus rated (4).

Ownership

By the fall of 1987, the government owned 53% of the company and thus effectively had control throughout this period.

Interests

The new president's cost cutting program was particularly severe in the research and development area which had the largest number of employees in the company. The managers in this area believed that the future of the company rested on the success of their research and were

angry over the limitations imposed on them by the financial restrictions imposed by the president. The manufacturing personnel wanted to upgrade their facilities so that they could qualify for larger and more complex contracts. Limiting their funds, meant they were also dissatisfied with the allocation of resources. Thus, the financial restraints imposed by the new president in response to mounting fiscal pressure exacerbated the dissatisfaction with the allocation of resources which was already high.

Dependencies of Power

The following comments were made after the government appointed a Chief Financial Officer, but before he became president:

"People in functional positions hire the people they need.."

"All the reports and everything go directly to [the CFO]... [the president] might not even get a copy of it.."

"And [the CFO] has gradually taken over more and more control... in fact he really controls the company."

A manager from the computing side described his experience in gaining approval for hiring new personnel and getting a raise for himself. Both commentaries reveal that power is still centralized with the government appointed president and financial officer in control:

"...in the fall of '87 we got approval to hire some people - to hire a person. It was from [the CFO].. I think ultimately that the purse strings.. held them close.. Our groups have been saying for a long time that we need more people and even just a few months ago - a month ago - we laid off people. So even though, at my level we need people, we're laying off people."

"And I thought I jumped through enough major hoops and performed admirably over the years.. I demanded a major increase of salary.. from [the founder]. The way I work, something like that, I go to [the founder] because he hired me in the

first place, ten years ago, OK? There's no one but... In a way that's sort of subverting the system really now, I think in the future I'll be going through [the CFO]. He's now the kingpin... but again it's rather confusing to me, even now, as to who.. do I have a supervisor... I mean.. do I really... I don't know who to report to.. it's confused.. and so a memo came around a little while ago that said four people report to me.. and no one had told me that and I had to read it from the memo myself. So how that was determined...."

Interviewer: "Who signed the note?"

Response: "[the CFO]"

Thus power is still concentrated at the presidential level within the organization. However, the new president takes directions from the board and is willing to allow individual managers make decisions which are not directly related to financial expenditures; as opposed to the founder who maintained a hands on approach in all aspects of the organization. Power is therefore highly centralized but slightly less coherent than at the previous stage even though the overall rating is still concentrated.

Capability

Expertise

When the CFO gained control, this was the first change in leadership the company had experienced. His experience in accounting firm and consulting for the government to assess situations where the government had either previously made investments or were thinking of making an investment meant that his experience was with financial matters rather than hands on operations; and he had no experience with high technology industry. Since the company previously had financial officers, the new president did not really change the existing expertise.

One of the new board members was a past executive of a large company. Although he brought the first corporate expertise into the company, since he was not actively

involved in management, his expertise had no effect on the organization.

Expertise within the organization remained unchanged from the previous period. There was still no expertise in managing a business or in the alternative archetype.

Leadership

With a background in accounting, the new president was concerned with control and cutting back expenditures as opposed to developing a new focus for the company. On this basis his leadership was rated transactional.

Summary

In this period, the organization underwent its first change in leadership. The new Chief Financial Officer and later president, as an accountant and consultant, had no experience managing a large corporation nor in either of the two industries in which the company was involved. His primary focus was on cutting expenditures and gaining control over the organization.

In contrast to the founder, the new president was concerned with documenting organization activities. Thus not only did formalization increase, emergent systems and structures became prescribed as well. At this time, there was no difference between prescribed and emergent structures and systems.

Up to the time of the last interview, interpretive schemes remained conflicting. There was no real change in organization structure or design. The state of the product had not changed. One system had previously been sold but no further orders were forthcoming. At this time, the company was installing their product in an American factory. Product sales were limited; and the company was maintaining its contract business. Power was still concentrated although somewhat less coherent as the Chief Financial Officer controlled financial decisions and was not directly

concerned with technical decisions or marketing practices as the founder had been when he was president.

The increase in prescribed formalization and tighter financial control as well as the existence of competitive commitments to further research, develop and market the new technology as opposed to expanding contract business resulted in inconsistencies which led us to classify the organization as schizoid.

Table 6.7 Organization measures for Ultratech at T_3

	T_2	T_3
Interpretive Schemes	Competing interpretive schemes - research and manufacturing contracts (2)	Competing interpretive schemes (3)
Organization Design	High functional (7) and geographical (5) differentiation Product differentiation (2) Vertical differentiation (4) Integration style (1) Degree of integration (2) Emergent formalization Standardization (1)	High functional (8) Geographical differentiation (2) Product differentiation (2) Vertical differentiation (6) Integration style (2) Degree of integration (2) Prescribed = emergent formalization Standardization (1)
Situational Context	Product sold (3) Fiscal pressure 100 employees	Product sold (3) Fiscal pressure leads to cutbacks 100 employees
Interests	Dissatisfaction with deployment of resources	Dissatisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Concentrated power structure
Capability	Manufacturing and financial experience and expertise were added Transactional leadership	No significant change in experience or expertise Transactional leadership

Table 6.8 Organization design of Ultratech at T₃

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	8	8
Number of geographical locations	2	2
Number of product lines	2	2
Vertical differentiation		
Number of levels in the hierarchy	6	6
Integration		
Style of integration	1	2
Degree of integration	2	2
Formalization	3	3
Standardization	1	1

Did this Organization Undergo a Transformation?

Ultratech was founded with a commitment to research and develop a business in a knowledge based industry. Over time, interpretive schemes became eroded and a competitive commitment was introduced. The acquisition of a manufacturing facility brought a core of members into the organization with a commitment to obtaining and fulfilling manufacturing contracts. Nevertheless, the president's vision of researching and developing new technology as the way of the future for the company and the province continued to dominate the thinking of the managerial elite. In the final time period, a new president whose goals were to turn the organization into a viable commercial entity was appointed. Even under the existing desperate financial constraints, his efforts to cut back on resources allocated to research and development resulted in a high level of dissatisfaction throughout the organization. The predominant commitment to research and development was threatened by the competitive commitment to obtaining manufacturing contracts which had the potential to provide a badly needed and immediate cash flow.

The president clearly dominated the organization up until the final time period when a new president and chairman of the board were appointed. This meant that the power was concentrated as the president attempted to maintain tight control over all aspects of the organization. While this was possible when the organization was small, after the acquisition of the manufacturing plant, the president's belief in lack of structure made control more difficult. Emergent structures and systems began to arise as managers perceived a need for integration and direction. Formalization, in the form of documentation of meetings and plans also began to emerge. However, lines of authority remained vague although it was widely acknowledged that the president's word was final in all matters.

Table 6.9 Founding and Final Measures for Ultratech

	T₀	T₁
Interpretive Schemes	Focus on research and development (1)	Competing interpretive schemes: contracts/research and development (3)
Organization Design	No differentiation except for vertical (2) Integration style personal (1) Degree of integration (4) No formalization No standardization	Differentiation: Functional (8) Geographical (2) Product (2) Vertical (6) Integration style (2) Degree of integration (2) Formalization (3) standardization (1)
Situational Context	Product in conceptual state (1) No fiscal pressure 3 employees	Product sold (3) Fiscal pressure 100 employees
Interests	High satisfaction with deployment of resources	Dissatisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Concentrated power structure
Capability	Experience and expertise concentrated in technology, research and development Transactional leadership (1)	Experience and expertise in technology, research and development, manufacturing, and finance Transactional leadership (1)

The high degree of differentiation which developed rapidly, can be seen as a heightening of the president's desire to maintain control as all managers reported directly to him. It also represented the flat structure, or lack of structure, which he advocated. Thus the changes which came about in structure, i.e. the increase in diversification, were a result of an increase in size and represented a heightening of initial values rather than a change in beliefs about structure.

At the time the company acquired the manufacturing facility, it appeared that the organization was about to undergo a transformation in the form of a commitment to manufacturing and marketing their product. However, when further sales failed to materialize, the original managerial elite retained their commitment to research while a competitive commitment to manufacturing contracts was espoused by the plant managers and staff. The rest of the organization looked upon these manufacturing contracts as a means of support rather than a desirable direction for the company.

In the final time period of this study, the competitive commitment was reinforced by the new president, although many managers retained their commitment to the initial interpretive schemes. This placed the organization in a schizoid state and led to its track being classified as an unresolved excursion.

Analysis of an Unresolved Excursion

This organization proved to be the most difficult to study. The president, who retained tight control over the organization throughout most of its existence, also tightly controlled much of the data collection process. Organization members who were interviewed were vague about what had happened and why, and tended to use the broad sweeping generalizations characteristic of the president. Often they

expressed frustration over a lack of clear direction and allocation of authority and responsibility. This, in itself, reveals much about the organization.

A colleague of the president, who was involved in the organization at one time, stated:

"[the president] is wanting to do the vision work. He doesn't have the time and he doesn't have the inclination to want to do the detail work... and that's probably where many of the problems have surfaced for Ultratech.. In that it was growing topsy turvy... My appreciation was that there was not any real management in the sense that [the president] wasn't there as an operating president on a day by day basis where you have all the decisions occurring in a timely order, because he's still functioning as chairman of the board with the vision and directions and all the rest of it... and yet not a structure in place that would handle in an orderly fashion.. so there's a blending and a weaving if you will of how things happen and I think that led to many of the difficulties for Ultratech."

It also explains many of the difficulties encountered by the researcher.

The history of this organization shows that precipitating conditions occurred which resulted in a movement away from the existing archetype, yet change to an alternative archetype was never completed.

At least two precipitating events occurred which were expected to result in change. The first occurred in 1983 when the company entered a joint venture agreement which required them to produce equipment for commercial use in a joint venture, and in 1984 when they received a purchase order for a large system from a Canadian manufacturer. Shortly thereafter the company acquired a lease on a manufacturing facility suitable for producing their product. The second occurred in 1987 when the government, in return for financial support, obtained the right to appoint four of the company's seven directors, thus effectively gaining control over the company.

In 1985, an employee of the firm suggested that because of the venture agreement, the sale and the acquisition of the manufacturing facility, the company was about to undergo a major transition. He projected that the coming year would see the company manufacture and sell ten systems valued at over one million dollars apiece. It was clear that the organization and the media who published their news releases believed a transformation was imminent and that the organization, having developed a system, would now commence manufacturing and selling that system. While the focus was not expected to shift entirely away from research, it was expected that a significant emphasis would now be placed on commercial aspects of the organization.

This change did not materialize. Why? Power was concentrated in the hands of the president whose interests lay in acquiring patents and rights to technology. Thus although a change in situational context suggested change, the commitment of the president who had the power to control the direction of change did not change. While the manager of the manufacturing facility and his staff held a competitive commitment, they lacked the power to influence the direction of the organization.

Enabling conditions in the form of experience and expertise in an alternative archetype as well as transformational leadership were lacking. Outside of the manufacturing facility, no one at a managerial level had worked in a business oriented organization; and as suggested previously the president, while reputed to be a man of vision, did not have a vision of the alternative archetype required in this situation. As a result, in spite of the existence of precipitating conditions, the organization did not undergo the expected transformation.

When the government assumed control of the organization in 1987, it was once again suggested that there would be a

change in the organization. The shift in power from the president to a government appointed Chief Financial Officer who later became president was expected to precipitate a change in the organization from its previous emphasis on new product development and promotion to a profit based orientation.

While the new president had experience in an alternative archetype, that archetype was a professional accounting firm rather than a manufacturing firm. His only experience in this company's areas of expertise was acting as a consultant to the government on the viability of this organization. As a leader, he lacked transformational capability. Although he prescribed increased formalization and standardization of systems and procedures and instituted tighter financial controls, there was no significant change in interpretive schemes and dissatisfaction with allocation of resources increased. As a result the organization became even less coherent than it had previously been.

At the conclusion of the study, the organization exhibited a lack of coherence which typifies a schizoid organization. The organization was still schizoid when it declared bankruptcy shortly after the final interview. This lends support to Hinings and Greenwood argument that if the public sector organizations they studied which "remained in an unresolved design archetype over a long term had been private sector and profit-making organizations .. they would have either gone bankrupt or been taken over because of the effect of being embryonic or schizoid on performance." (Hinings and Greenwood, 1988, p.205)

CHAPTER 7
AN INERTIA TRACK - HITECH

Significant Events

Hitech's roots can be traced back to a research company started four years earlier by its founder, a university professor. He described the founding as follows:

"I was given an opportunity that was rather unique, I believe, by a large American company..... These people had some trust in my abilities as a [researcher] and asked me if I would accept a long term research project, paid me in advance, to do some work for them as I saw fit.. as long as it was in the [area of my expertise]..."

"Then I asked them if we could do this in the private sector and they said 'Of course!' They'd even prefer that because of confidentiality and control over it.. and so I set up a [research company]... with my brother ..., who is a local businessman.. that's in '62... but this company had to be dedicated entirely to [the large corporation's] projects, exclusively."

Thus, before founding Hitech, he founded a research company to do contract research for this large corporation which paid for the work on a cost plus basis.

Then:

"By 1966 we had a building with free space in it for expansion and we couldn't do it with [the research company] because it was dedicated to [the large corporation]."

Even though:

"they actually increased their projects by then, and it was filling most of the building but we still had a lot of it free.."

The founder saw an opportunity to do this type of work for other companies, which of course he could not do in the research company because of the arrangements with the sole client. He founded Hitech in 1967, "on my own", to do this work. He gave some shares to his brothers. Eventually, the

work for the large corporation was taken over by Hitech which totally owned the research company and "around '72 it [the research company] became totally inoperative."

In 1973, the founder sold 70% of Hitech to a government owned corporation which purchased it as part of a program aimed at making Canada a big name in the industry. The founder sold Hitech when his job at the university and his involvement in the company became too much to handle. Forced to make a choice, he decided to continue his academic career. Although he did not sell the remainder of his share to the government until several years later, 1973 was selected as significant since at that time the government owned corporation assumed control of the company.

In 1981, the government sold Hitech to a local entrepreneur. In 1985, the third owner merged Hitech into another company which he owned. 1981 was chosen to represent the significant event as it reflects the time at which the third owner obtained control of the company. The merger with his other company, while it increased the size of Hitech, was not expected to precipitate change as ownership and management remained the same.

The merged companies were purchased by a large foreign owned company in 1988.

It was generally agreed by those interviewed that significant events in this company revolved around changes in ownership. From a research perspective, the difference in ownership was expected to result in differences in the organization's interpretive schemes, systems and structures. Therefore, for the purpose of this study, the time periods are bounded by changes in ownership and management of the company. There have been four owners since the organization was founded in 1967.

T_0 is the founding of the organization in 1967. While its predecessor, was in existence since 1963, it was

limited to carrying out research projects for one company. Although Hitech ultimately took over these projects, it was founded as a separate legal entity. This study involves Hitech, only.

The first time period covers the years between the founding in 1967 and 1973 when the company was purchased by the government owned corporation. T_1 represents the date the government first purchased an interest in the organization.

The second period covers the years when Hitech was owned and operated by the government corporation. T_2 is 1981, the date which a local entrepreneur purchased Hitech from the government.

From 1981 to 1988, when the entrepreneur owned and managed Hitech, is the third period. T_3 is the date a large foreign corporation purchased Hitech.

From the time Hitech became a subsidiary to the present is the fourth and last period for the purpose of this study. The impact of corporate ownership is reflected in the state of the organization at T_4 .

T_0 - The Founding

This section describes the organization at its founding in 1967.

Interpretive Schemes

In the words of the founder:

"My goal was to try to explore the possibility of starting some.... specialty manufacture.. manufacturing special products and certain custom products [locally], for sale nearby."

And also:

"My intention was to try to get some jobs for some highly trained [Ph.D.'s] around here... you don't get jobs for them selling [the product].."

"When I founded Hitech, I had Ph.D.'s who were hired to do research for [the large corporation] in [the research company]. When we

went to Hitech, it was set up because we could now find R and D projects for other customers.. but mainly to do some special manufacturing."

However, one of the early employees had a different view. He stated the goal was:

"To stay alive, to stay alive.. and the main revenue was contract research through all this period.. Hitech did contract research for other customers and we developed two major customers.."

Interpretive schemes at the founding were concerned with manufacturing as well as research and development. In fact, much of the research was geared towards developing a process for manufacturing existing products. The rating for this period (3) reflects the dual nature of the interpretive schemes: research to develop processes for manufacturing and the manufacturing process itself, both of which were given equal weight.

Organization Design

The founder had definite ideas about organization structure:

"The structure was minimal in the sense that we tried to keep our overhead as low as possible.. because that made us competitive. We didn't have anybody watching anybody else work...."

This is consistent with the philosophy underlying the founding archetype.

In spite of the president/founder's stated views on keeping structure to a minimum, functional and vertical differentiation were present from the start.

Horizontal differentiation

Although everyone's work was functionally similar, they were all engaged in research, the organization was characterized by horizontal differentiation based on product from the start.

"There were five Ph.D.'s who were in charge of two or 3 technicians.. each on separate projects. Some of them were more or less split between research and production."

Thus, there were five differentiated product areas present at the founding.

Vertical differentiation

There was also vertical differentiation. The technicians worked for the Ph.D.'s who reported to the founder. In the words of the founder:

"Once a week I went over and I wanted to know what happened during the week.. I talked to the Ph.D.'s.. . I never talked to the others because the others were the Ph.D.'s responsibility.."

On this basis, during the Founding Period, there were three levels in the hierarchy: the president-founder, project leaders, and technicians.

Integration

The functional areas were not dependent on one another at the founding. Whatever integration existed between products was handled solely by the founder at this time. Integration, whether within or between product groups, was carried out through face to face communication. The rating at this stage was therefore a (1) for style.

As the projects were self-supporting, little integration was required between them except for the use of common facilities which were assigned by the president. The degree of integration was low (2).

Formalization and Standardization

The only formalization was emergent and arose as a result of customers' requirements for progress reports if and when they were needed.

As the founder said:

"If every month we'd have to report to the customer, the Ph.D's would write up that, which I would edit...."

Prescribed formalization received a rating of (0). Emergent formalization was (1).

Standardization was also non-existent in an organizational sense, although the demands of research and production meant that the work of individual technologists was repetitive to a certain extent. Standardization was rated (1).

The only distinction between prescribed and emergent structures and systems was the higher emergent formalization and standardization which resulted from the nature of the tasks and was confined to that area.

Situational Context

Fiscal Pressure

A contract with a large corporation in 1963 provided the financial backing to form the research company which preceded Hitech. This organization was dedicated solely to doing research for the large corporation. There was an excess of resources in the form of space in the existing plant in 1967.

In the words of the founder:

"And so by 1966 we had a building with free space in it for expansion.. couldn't do it with [the research company] because it was dedicated to [the large corporation]. They actually increased their projects at a point by then and it was filling most of the building but we still had a lot of it free....."

The organization was financially viable from its founding as research was carried out on a 'cost plus' basis. Thus fiscal pressure played an important role in determining the research done. No equity was issued to obtain funds. From the start, financial viability was made possible through research contracts. This meant that the market for research determined the specific research projects undertaken by the company.

State of product development

The founder had been doing contract research for one company only. At the founding, he expanded the number of

customers for which the company did contract research and also contracted to manufacture products for other organizations. Since the research and the goods which were being manufactured were both viable products, the rating (4) reflected the fact that multiple units were being produced and sold.

Organization size

"Oh, ten probably.. no there'd be more than that... there's be about 6 Ph.D.'s and 6 technicians and one office person.. 13 or something like that."

Ownership

The company was owned and operated by one person, the founder. He described the founding as follows:

"I founded Hitech on my own. I gave some shares to some of my brothers."

Interests

The interests of the founder lay primarily in research. The Ph.D.'s were committed to their projects and therefore had interests similar to the founder. The other shareholders, were the founder's brothers. They were minority shareholders and since the shares they held were a gift, they were happy to let him manage the company as he saw fit. At this time everyone in the organization was satisfied with the allocation of resources.

Dependencies of Power

Power was concentrated. The founder controlled all areas of activity in the organization. In his own words:

"I had to find the research projects, establish them, hire the people and provide direction..."

"So the organization consisted of the president and a few [Ph.D.'s].. it was pretty well still an autocracy.. During that period it was essentially an autocracy.."

Even though he only appeared at the company once a week, the president controlled what was happening within each project as well as the general direction of the company. This is how he put it:

"Once a week I went over... and I wanted to know what happened during the week.. I talked to the Ph.D's ... I never talked to the others because the others were the Ph.D's responsibility.. and of course I knew what was going on.. In a few minutes I sized up the situation.. It was a small company.. so we'd sit down and say "O.K., this is working" and what we'd do if it's not working.. "Have you got any better ideas?" If every month we'd have to report to the customer, the Ph.D's would write up that, which I would edit...."

Capability

Knowledge and Expertise

The founder was a university professor. He was and is internationally renowned in his field. His experience and expertise were technological and academic.

The other key people in the organization, according to the founder, "were the group leaders of all the various research projects.." These were Ph.D.'s with no previous experience in industry. Thus knowledge and expertise in the organization was highly technical. There was no expertise in managing a business or in an alternative archetype.

Leadership

From the start, the founder negotiated research contracts and guided the resulting projects. Although he dreamed of owning a large company, his experience was limited to academia and he wanted to control all the research projects himself. His visions of the future were vague. He was unable to plan and manage growth while at the same time pursuing his academic career. This concern with day to day operations is the basis for rating leadership transactional, {1}.

Summary

The organization differed in several ways from the founding archetype.

First, the research involved developing processes for producing products that were already known. Secondly, the research, itself, was a product since the organization was paid on a cost plus basis for doing it. Thus, even though the organization was involved in research and development activities, organizational goals included marketing of research services and production utilizing the processes developed. Fiscal pressure played a significant role in determining the products since the market determined the selection of research projects.

Because of these differences, the organization was not initially in the founding archetype as we defined it. The consistency of interpretive schemes, structures and systems based on obtaining and fulfilling contracts led us to conclude that the organization was operating in a service oriented archetype.

The strong commitment to interpretive schemes, the high level of satisfaction with allocation of resources, the concentration of knowledge and expertise in areas which supported the status quo, and the tight control of the founder together with an unwillingness on his part to relinquish control led us to expect little change in the organization.

Table 7.1 Organization measures for Hitech at T_0

	Founding Archetype	T_0
Interpretive Schemes	Focus on research and development (1)	Focus on researching production methods and manufacturing (3)
Organization Design	Little differentiation Integration style personal (1) Degree of integration (4) No formalization No standardization	Differentiation in products (5) and hierarchy (2) Integration style (1) Degree of integration (2) Emergent formalization Little standardization
Situational Context	Product in conceptual state (1) No fiscal pressure Less than 25 employees	Research itself is a profitable product (4) Fiscal pressure (market) determined products 13 employees
Interests	High satisfaction with deployment of resources	High satisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Concentrated power structure
Capability	Experience and expertise concentrated in technology, research and development Transactional leadership	Experience and expertise concentrated in technology, research and development Transactional leadership (1)

Table 7.2 Organization Design of Hitech at T_0

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	1	1
Number of geographical locations	1	1
Number of product lines	5	5
Vertical differentiation		
Number of levels in the hierarchy	3	3
Integration		
Style of integration	1	1
Degree of integration	2	2
Formalization	0	1
Standardization	0	1

T₁ - Hitech Under the Founder

This section describes the organization after its founding up to 1973 when the founder sold 70% to the government. The variables reflect the state of the organization immediately before the sale.

As was expected, there was little change in the organization during this time period. The founder retained tight control over the company. Most of the changes that did occur involved a heightening of the original interpretive schemes, structures and systems.

Interpretive Schemes

The founder sold with the understanding that:

"What we were supposed to do was we were going to be the research arm of the [government] investment in the....industry... in collaboration with [another company]. Hitech was supposed to do research..... because [the other company] was going to be the production arm of the investment.. We were going to do perhaps some..... manufacturing that was of interest to the enterprise.. the total enterprise.. but mainly to be a centre for research..."

At this point in time, therefore, the interpretive schemes were as they were at the founding, i.e. the focus was on selling the company's research capability, developing manufacturing processes and some custom manufacturing. The rating on interpretive schemes remained (3).

Organization Design

Horizontal Differentiation

Under the founder, additional elements of horizontal differentiation were added: a sales person, a general manager who handled day to day problems, an office manager who performed accounting functions, a Ph.D. who worked primarily on production, and the Ph.D. researchers.

The founder said:

"In '73, [one Ph.D.] was doing sales and [the general manager] looked after the fort for me because I could only be there a few hours a

week... except for research.. you know personnel problems and things that came up from day to day..."

"[there was an office manager who] kept the books and day to day journals, and payroll and what nots..".

He also singled out one of the Ph.D.s who "was doing production but also was doing quite a lot of research":

"There was some manufacturing.. but the manufacturing when I was there was very small.. we were developing it... as we got the money we would buy some [equipment] I hired [a Ph.D.] from England to start to try and get us into manufacturing."

However, according to the sales-oriented Ph.D. who left to found his own company, as well as another who was with the organization at that time:

"Sometime around about '70 - seventy-oneish we started another line which was resale of [a product] ... buying and reselling.. small quantities.. laboratory scale quantities.. and in '71 [the future owner] and [the founder] had a ding-dong battle and [the future owner] left to start his own business.."

In 1973 there were four distinct functional areas in the company. These included accounting, production, research and office management. Although, as illustrated previously, there was a sales function for a period of time, this function did not exist after the Ph.D. responsible for sales left. Thus at T_1 , the measure for functional differentiation was (4).

There was no change in product differentiation as there were still five distinct product lines in the form of research projects, each under the control of a Ph.D. as at the founding.

Vertical Differentiation

A Ph.D., who was hired as business manager in 1973, described the structure as follows:

"There would be maybe five project [Ph.D.'s before my time] reporting to [the founder]... underneath there would be technicians working in the pilot plant and technicians working on each project.. The projects were usually small.. two or three people and I think maybe 75% of the people contracted to [the large corporation]... There [were also other contracts]. They had a little diversification.. and that was the way it worked.."

The founder described the organization at this time as follows:

"The key people in the organization at that time were the group leaders of the various research projects.. and in a sense it was a very horizontal organization... It was a small company... The groups were small.. two or three people but they were productive.. There were five Ph.D.'s who were in charge of two or three technicians each on separate projects. Some of them were more or less split between research and production."

Thus the vertical structure remained the same during this period. Although a general manager was hired, the president and two Ph.D.'s who were present at that time agreed that he had no real authority. One described the general manager as a "gopher" for the founder and commented that:

"[the general manager] did what [the president] said and if he didn't there was one hell of a row."

The founder was clear that the duties of what he called the "general manager" were restricted to taking care of routine office procedures.

Thus, there were still three levels in the hierarchy at this time: the founder, the Ph.D.'s and the technicians.

Integration

The founder retained his position as integrator and maintained tight control over all aspects of the organization. He did not believe in writing things down and communicated directly, i.e. face to face, with all his researchers. Thus, the style of integration remained (1).

The projects still required little integration and no additional means of integration were added. The rating on degree of integration remained (2).

Formalization

Within the organization there was no formalization or standardization of organization systems or procedures although formalization and standardization existed to a certain degree in the labs because of the nature of the work. There were however no systems for hiring and firing employees or for compensation. These decisions were always made by the founder. In the words of the founder:

"The salaries.. all the people were hired right out of graduate school... so there wasn't any difference in salary.. but I had bonuses and I decided pretty much myself.. I'd say 'Well, we made a lot of money on this contract and this guy works well and hard and he deserves more money than the other guy who didn't work so hard and well....'"

Planning was done 'seat of the pants' and budgeting was done in a similar fashion. The founder described the process as follows:

"As we got the money, we would buy some [equipment]..."

Work continued to be done on a contract basis and charged for on a cost plus basis. Thus the organization was profitable even though there were no formal budgeting and planning systems.

Planning for individual research projects was done during the founder's weekly meetings with project heads. In the words of the founder:

"Once a week I went over..... It was a small company.. so we'd sit down and say 'O.K., this is working' and what we'd do if it's not working.... 'Have you got any better ideas?'"

Formalization was still rated (0) on a prescribed basis and (1) on an emergent basis which represented the reports made to customers.

Standardization, where it did exist, was emergent. It arose as a result of the technical requirements of the work in the case of job functions. Standardization in overall organization systems and procedures was still lacking as most decisions were made by the founder. The prescribed standardization rating is (0). With the exception of higher emergent formalization and standardization, as discussed previously, there was still no distinction between prescribed and emergent structures and systems.

Situational Context

Ownership

There was no change in ownership as the founder owned the company throughout this period.

State of product development

The company was still involved in contract research and some custom manufacturing. However, the departure of the sales-oriented Ph.D., who championed importing and reselling related products, put the company in the same position it was in at the beginning of this period with respect to product. The founder and president was negotiating research contracts. Thus the research itself was a profitable product as were the specialty products which were manufactured. Therefore, the state of product development was rated (4).

Fiscal pressure

Fiscal pressure also remained the same. The research, done on a cost plus basis, was profitable. The contracts determined the nature of the research activities and the market determined which products were manufactured.

Size

"The company was getting pretty big... some thirty-five people, I think.. that would be about '72 or '3 now... and I can no longer handle it."

The organization employed thirty-five people at this time, a change from thirteen at the Founding.

Interests

Hitech experienced several shifts in satisfaction with interests during this time period. A Ph.D. who championed the manufacture and sale of specialty products entered into a conflict with the founder whose interests lay in research. As a result the Ph.D. left the organization effectively removing this dissatisfaction before the period was over. Another Ph.D. who assumed responsibility for manufacturing was concerned with the limits of the resources allocated to manufacturing.

The main dissatisfaction arose when the president and founder perceived that managing the organization was placing increasing demands on his time. He came to the conclusion that he would have to choose between his academic pursuits and managing the organization. This growing dissatisfaction led to his decision to sell the organization. The president's lack of satisfaction with the use of his time (he preferred research to administration and was the sole member of the managerial elite), led to the rating of dissatisfaction with interests for this period.

Dependencies of Power

The president maintained tight control over all aspects of the organization. The appointment of a manager did not change the power relationships in the organization. The situation was described as follows :

"Still essentially an autocracy though because [the manager] did what [the founder] said and if he didn't there was one hell of a row.."

Thus, power was still concentrated.

Capability

Although a Ph.D. with expertise in sales was hired and given responsibility for sales during this period, due to a conflict of interest with the president he left the company before the end of the period.

A Ph.D. with manufacturing experience was also hired and remained with the organization, taking responsibility for the production facilities as well as doing research. Thus manufacturing experience was added to organizational capability in this period.

The general manager was a paternalistic appointment. The brother of the founder, he added no expertise to the organization. In the words of the founder:

"I had a brother that I hired that had retired from the airforce and he was more or less a general manager.. and an office manager.. secretary.. a handyman.."

Although the company acquired manufacturing expertise, at the end of this period, there was still no expertise in managing a business.

Summary

Hitech differed considerably from the norms suggested for the founding archetype at this stage, as it did at T_0 ; however, there was little change in the major variables. Nevertheless, the changes that did occur were potentially important.

While interpretive schemes did not change, an increase in size led to an increase in functional differentiation and organizational capability was expanded to include manufacturing experience.

The change in size led to the president's dissatisfaction with the time required to manage the organization since this took him away from his research activities. He recognized the need for managerial skills and the fact that no one in the organization at the time had

these skills. He was also unwilling to relinquish control while he was associated with the organization. He therefore decided to sell the organization to a government corporation which he believed would continue to pursue his interpretive schemes and develop Hitech into a research oriented organization.

The addition of manufacturing expertise to the organization's capability and the increase in manufacturing were seen as supporting the increase in research activities, since the latter were directed towards manufacturing the product after the process was developed.

Although there was a strong commitment to interpretive schemes by organizational members, the promise of the government to allow the organization to concentrate solely on research and development activities presented them with a proposed situation that they deemed even more favourable than the present. While the leadership factor for the next period remains unknown (the current president is a transactional leader), the expectation is that overall organization conditions favour a move towards the founding archetype.

Table 7.3 Organization Measures for Hitech at T₁

	<u>T₀</u>	<u>T₁</u>
Interpretive Schemes	Focus on researching production methods and manufacturing specialty chemicals (3) Commitment to the status quo	Focus on researching production methods and manufacturing specialty chemicals (3) Commitment to the status quo
Organization Design	Differentiation exists in products (5) and hierarchy (2 levels) No functional differentiation (1) Emergent formalization No standardization Integration style (1) Degree of integration (2)	Differentiation in products (5) and hierarchy (2) were unchanged Increase in functional differentiation (4) No change in formalization, standardization No change in integration
Situational Context	Ownership - the founder Product was manufactured (4) Fiscal pressure determined products 13 employees	Ownership - the founder Product was manufactured (4) Fiscal pressure determined products 35 employees
Interests	High satisfaction with deployment of resources	Dissatisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Concentrated power structure

	T_0	T_1
Capability	Experience and expertise concentrated in technology, research and development	Experience and expertise concentrated in technology, research and development Some manufacturing experience
	Transactional leader	Transactional leader

Table 7.4 Organization Design of Hitech at T_1

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	4	4
Number of geographical locations	1	1
Number of product lines	5	5
Vertical differentiation		
Number of levels in the hierarchy	3	3
Integration		
Style of integration	1	1
Degree of integration	2	2
Formalization	0	1
Standardization	0	1

T₂ - Hitech Under Government Ownership

This section covers the development of the organization from the time the government corporation took over up to the time the company was sold to an entrepreneur who was a previous employee. The variables in the final table reflect the state of the company immediately prior to the third owner assuming control.

Interpretive Schemes

The government purchased Hitech because they wanted to make Canada a big name in the industry. In order to do this, they planned to develop a Canadian company which would research, develop and sell these products.

This was also the belief of the founder when he sold the company:

"We were going to build in Canada a multi-national company.... This was an opportunity to further the Canadian economy in a very unique and effective way..."

When he sold, it was with the understanding that:

"we were going to be the research arm of the [government] investment in the industry... in collaboration with [a large company that had also been acquired by the [government] as part of the same project]."

According to the founder, Hitech:

"was supposed to do research in the framework of R and D investments by [the government] in [the other company's] behalf because [the other company] was going to be the production arm of the investment.. We were going to do, perhaps some ...manufacturing that was of interest to the enterprise.. the total enterprise.. but mainly to be a centre for .. research..."

These beliefs were consistent with the founder's initial goals for the organization and if carried out would have placed interpretive schemes at (2). The commitment was also widespread as it was not only the view of the founder (as suggested above), but was echoed by the Ph.D.'s who had

been with the company since its founding. It was also the view of the Ph.D. who was hired to act as general manager by the new owner. In his words:

"What they wanted us to do.. the research people that were doing research for [the large corporation] would now do research for the [government] and they wanted to develop products that they could manufacture in Canada and that they could sell around the world."

While the founder saw Hitech becoming the research arm of the 'great Canadian company', the general manager was adamant that the new owner wanted to develop a specialty manufacturing business:

"The goals were to develop a specialty (manufacturing) business using the pilot plant as a starting point.. and they agreed to put money into the pilot plant so that it could be a plant rather than a pilot plant.. That was one of the goals.. the other goal was to invent, discover some.. and they continued looking at [certain products]. The goal was to discover commercial products that they could make in Canada and sell..."

The goals at the end of this period were the same as they were at the end of the previous period. The goals originally espoused by the government which suggested the company would become "the research arm of the great Canadian company" were never implemented. In the words of the general manager:

"they wanted the company to expand its specialty business and to expand its contract research business..."

"For the first five years the objectives were to establish a specialty [product] business and to establish [another type of] business and they dropped that.... the [other type of] business and they put it to contract research because at that time it appeared to be the most promising direction to go. They didn't put any money into contract research.. to expand the labs or buy the equipment but they put money into the plant because it was going quite well."

This description of what happened indicates that the government did not support the interpretive schemes which the founder understood to be part of his sales agreement with them. The general manager stated:

"We were to earn our revenue.. by charging our.. we still had contract research customers.. we still continued to charge them.. The [second owner] agreed to set their research up as essentially a contract. We would assign people to do their research and charge the [second owner] for their time and their overhead and the profit associated with those and the production facilities were to make money and generate a profit selling [their products]."

The beliefs about interpretive schemes for this period were mixed. There was some indication that the company would become a research oriented organization. By T_2 , however, the company was operating under the same interpretive schemes as it was at the end of the previous period, i.e. the focus was on developing manufacturing processes, marketing research capability and carrying out some specialty manufacturing. The rating for interpretive schemes remained as it was, (3).

Organization Structure

Horizontal Differentiation

A professional, who was with the company since the founding period, described the structure for this period as follows:

"People are beginning to have titles.. One person is now really taking control of the contract research.. I'm taking control of the manufacturing and it's recognized now by the powers that be.. By now [the general manager] had the financial side of it and [a new man] had the el presidente's job.. now they were the only two who ever talked to [the government] .. they were the people who reported to [the government].. Essentially [the president] was the one who reported... [the general manager] was treated as a gopher by [the government] where it suited them"

"And they hired a research director to run the research for [the government]; they hired me to look after the office and get the plant off the ground.. in other words start manufacturing, find customers and get products made.."

"But by now I would be dropping research and picking up manufacturing.. I think by this time [another professional] was pretty well research boss except he wouldn't be over [one of the Ph.D.s] because [that particular Ph.D.] had got time spent in prison over him... he was a long term offender.. [the research boss] would have risen to the top of the research group but he wouldn't be over [the other Ph.D.] because [he] had been here so long that [he] had his own independence.. but the junior ones would be."

Functional differentiation increased from (1) to (5): research, manufacturing, finance, sales and general administration.

Vertical Differentiation

The new owner (i.e. the government) immediately added another level to the hierarchy. The company management now reported to a board of directors established by the new owner. After a year, when the founder resigned they appointed a president to take his place.

According to the general manager and consistent with the founding values, it was believed that the president's "main responsibility was to expand contract research.." The appointment of a Manager of Contract Research added another layer to the hierarchy since previously those in charge of research projects reported directly to the president.

It was not clear, even to the general manager himself, whether his position added a level to the hierarchy or whether he was at the same level as the other [Ph.D.s]. When asked if he and the production manager were on the same level, his response was:

"It wasn't clear.. I think [the production manager] was in truth partly reporting to the president.. maybe on administration matters.. [the

president] would decide his salary.. but as far as running the plant was concerned, he was reporting to me in the sense that there was consultation between he and I in that we're going to make this product and we've got to make it this week and this is the schedule for the plant..."

The lack of formalization in the form of job descriptions and an organization chart contributed to this confusion.

The measure on vertical differentiation increased to (5): the board , president, general manager, research project managers, and technicians; or the board, president, general manager, plant manager, and technicians.

Integration was still primarily achieved through face to face communication (1), as the following comment by a senior employee suggests:

".....no budgetary system so when you needed funds you had to go to [the president]. If it was a technical decision that needed funds then it would have to be done with [the president]. If it was a technical decision on how to carry out [a job] then that was mine... I explained to [the president] afterwards why it went wrong of course."

The degree of integration (2) also did not change.
Formalization and Standardization

The new titles reflected an increase in formalization. As the confusion over structure and lines of authority suggests, formalization and standardization increased only marginally and were allocated a rating of (2).

Situational Context

Ownership

In 1973, the government purchased 70% of Hitech from the founder. In 1975, the founder sold his remaining 30% to the government so that they became the sole owner of the organization.

State of Product Development

The product remained the same, i.e. contract research and specialty manufacturing.

"We still did contract research... so we took some terrible contracts.. We took some government contracts to stay alive.. they kept us alive I suppose but they were nothing but a pain..."

Fiscal Pressure

The founder felt that fiscal pressure was hindering his plans for the organization. He stated:

"The company wasn't growing. It was stagnant. It was doing pretty much what it had done before except that its profits were now being used to do research within the framework of a situation that had no use for the research."

The managerial elite believed that the second owner intended to fund them as a branch of the organization which would be devoted to research. However by '78:

"they cut us off from the research funds that they had been giving us and essentially stuck us right in a hole and told us to dig ourselves out.. and we spent the next two years.. '78 to '80 digging ourselves out and we were reasonably successful. We had just about got to making a small profit in 1980."

It was initially believed that fiscal pressure would be removed after the sale, since the company would be dedicated to research. When the expected funding failed to materialize, the company continued to be self supporting through research contracts and production contracts and to fund its own research through profits.

Size

As suggested previously, the company was stagnant. There was no change in size during this time period.

Interests

Dissatisfaction with interests was high as the second owner failed to live up to its promises. The founder was

definitely disappointed in the way resources were being used. He stated:

"The company wasn't growing. It was stagnant. It was doing pretty much what it had done before except that its profits were now being used to do research within the framework of a situation that had no use for the research."

Dependencies of Power

According to the founder even when he was president:

"I was president in name only and my recommendations weren't listened to... The lines of authority there remained with the president of [another company which was purchased by the government as well], this holding company which held by then five or six companies in the general area"

"They (government representatives) would come out..... once a month. There was a board of directors which was controlled by [the other company purchased by the second owner] the president would come out, the treasurer would come out. They were setting direction..."

The third owner supported this view:

"The [government] was administering Hitech from [eastern Canada], with a board of directors...."

Although control remained at the top, power was less concentrated. The parent company set the direction for the organization. Managers, however, made decisions related to their specific functions so power was less coherent.

Capability

Knowledge and Expertise

The general manager described the new president as follows:

"He had been at [an eastern university]. [The university] has a very active industrial research component to their research. He was an engineer and his job was to sell research.... He sold research for the chemistry department and the engineering department and the physics department

at [the university]. He was their industrial research liaison person.."

The new president's background didn't change the organization's capability, since the founder/president had expertise in this area.

The general manager readily admitted his lack of business expertise:

"My background was strictly [research].. I worked for [a large corporation] in their research department and I didn't have any accounting...."

"I have a Ph.D.... So I knew all the [technology] but I didn't know the financial, the business end of things so I had to pick that up with the MBA program..."

"I enrolled in the MBA program at the [university] in the evenings and learned accounting and cost accounting so that I could oversee the keeping of the financial records and so that I could basically set prices for the things we were going to make in the plant."

While new titles and responsibilities were added to the organization chart, these positions were held by people with backgrounds in research. Thus, there was little, if any change in knowledge and expertise in the managerial elite. There was no expertise in managing a business or in an alternative archetype.

Leadership

Although the company was now part of the 'great Canadian company', the new president saw his role as similar to the one he had previously held, i.e. that of selling research contracts. Since this was the role carried out by the founder before him, leadership did not change and was transactional during this period.

Summary

At the beginning of this period, the managerial elite believed that the organization was going to become the research arm of the "great Canadian company". They therefore were expecting the organization to change its

goals by limiting them to research and development activities. This means that change was expected in the direction of the founding archetype. In fact, this change never occurred. The second owner failed to provide the funds necessary to support research activities. The reasons for this were outside of the scope of this study but the result was that fiscal pressure was placed on Hitech to remain self-supporting. It continued to operate as it had from its founding, doing contract research and specialty manufacturing in order to support other research activities.

The organization, which still did not conform to the founding archetype of the study, was on an inertia track. Interpretive schemes did not change. Changes in structure and systems were consistent with the initial interpretive schemes and ensured that the organization was able to maintain its existing values in spite of growth.

Dissatisfaction with interests was high as the company earned revenue to support research activities which were not appreciated. In fact, it appeared to those involved, that there was no intention on the part of the parent company to utilize the results. There was no change in organizational capability and power remained concentrated although it was less coherent.

The managerial elite were consulted about prospective purchasers. It is not surprising that the company they favoured was a local organization which was known to them and appeared to operate under interpretive schemes which were compatible with the existing interpretive schemes. The organization was expected to continue on its inertia track for the next period.

Table 7.5 Organizational measures for Hitech at T₂

	T ₁	T ₂
Interpretive Schemes	Focus on research and manufacturing (3) Commitment to the status quo	Focus on research and manufacturing (3) Commitment to the status quo
Organization Design	Product differentiation (5) and hierarchy (2) No functional differentiation (1) Emergent formalization No standardization Integration style (1) Degree of integration (2)	Product differentiation (5) Hierarchy increased (5) Increase in functional differentiation (5) Increase in formalization and standardization (2) No change in integration
Situational Context	Ownership - the founder Viable product (4) Fiscal pressure determined products 35 employees	Ownership - the government Viable product (4) Fiscal pressure determined products 35 employees
Interests	Dissatisfaction with deployment of resources	Dissatisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Concentrated but less coherent power structure
Capability	Experience and expertise concentrated in technology, research and development Some manufacturing experience Transactional leader (1)	Experience and expertise concentrated in technology, research and development Some manufacturing experience Transactional leader (1)

Table 7.6 Organization design of Hitech at T_2

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	5	5
Number of geographical locations	1	1
Number of product lines	5	5
Vertical differentiation		
Number of levels in the hierarchy	5	5
Integration		
Style of integration	1	1
Degree of integration	2	2
Formalization	2	2
Standardization	2	2

T₃ - Hitech Under an Entrepreneur

Interpretive Schemes

In March, 1984, a new production manager was hired for the plant. According to him:

"The goals of the organization, at least from my point of view, were to better organize the production side of the business, to increase production, to increase efficiency; and the first steps I took when I came here was to move the organization, at least on the production side, from an 8 hour day operation to a 16 hour day operation; and we did that slowly, in stages."

According to the previous plant manager:

"..[another company owned by the entrepreneur] consisted of two operations.. one was a resale business under a manager.. and the other was the manufacturing business making one particular product.. the manufacturing was transferred to Hitech.. so that settled that.. now all the manufacturing was Hitech, all the resale was [the other company].....Hitech .. which was manufacturing and contract research"

In 1985, according to the owner, Hitech merged into the other company so that there was only one organization. In a 1987 news report, Hitech was described as follows:

"...Hitech is a custom research/manufacturing firm that most often produces first-time, experimental....products..."

"The complex [developmental research] accounts for about 80 percent of the company's services, which are sought after by some of the world's largest.... companies."

"The other 20 percent of the company's time is occupied with a broad range of activities [in various related fields]."

Interpretive schemes continued to focus on both research and manufacturing with a slight increase in the emphasis on production efficiency and marketing. A rating of (4), an increase from the previous period, was given on this basis.

Organization Design

Horizontal Differentiation

Product differentiation increased to (6) as the production of the new owner's product was added to the products manufactured by Hitech. Since the products which were purchased for resale did not require a separate manufacturing process, they were not included in product differentiation.

There was also an increase in functional differentiation. According to the previous plant manager:

"Within, say a year, after the takeover by [the entrepreneur's company], [the entrepreneur] promoted [a researcher] to head the lab.. and he rehired [another researcher] to run the production.."

"There would be one more significant change around about the same time... one of the [Ph.D.s].. we made him quality control manager. He has to be on the same level as [the production manager] and [head of the lab]. He has to report independently of them.. He must not report to production because that would.. compromise his objectivity.. So he's reporting up to [the president].. I'm at the side.. We're now about 82.."

"Let's say '83.. but it might have been '84.. we promoted two people from the lower echelons.. one from the plant.. and he became commercial officer which was essentially sales and marketing which is supposed to be different from sales.. although that's a little theoretical.. so now [the owner] has someone to help him with that. We promoted from the lab, [an individual], to be purchasing officer.."

"Then a year or so ago..... we hired a controller."

"Then the managers... laboratory manager, production manager, quality control and then me (engineering design)..... and then the commercial officer (sales) and the purchasing officer."

EF: So now you have a purchasing officer and a sales manager.. where do those people fit in the organization?

"Status?? El Presidente.. then the managers.. laboratory manager, production manager, quality control and then me. There are four of us essentially on the same level.. And then these two.. the commercial officer and the purchasing officer.. they're at a lower level but they're still reporting to [the president]. Then a year or so ago, the last major change took place... we hired a controller... and he's come in at the same level as the managers and reporting to [the president]."

The new production manager described his position as follows:

"The operation was expanding quite rapidly. The fellow who was in charge of the plant was required to split his responsibilities because he was covering both plant maintenance and engineering and production. So he moved over to become the building and maintenance manager and I took over the production side of the plant."

Functions included lab, production, quality control, design engineering, commercial officer (sales and marketing), purchasing officer, financial controller, training officer. On this basis horizontal differentiation received a rating of (8).

Vertical Differentiation

Vertical differentiation also increased. Not only were maintenance and production functions split and placed under the control of a production manager, but after a period of time, the engineering manager also reported to the production manager.

"Basically because the function.. the responsibility was now too large for one person to handle. What ultimately ended up happening, and this wasn't made clear for about two years, I became responsible for all the production, and engineering and maintenance with the fellow who was looking after the engineering side working for me.."

"...that more evolved than a firm directive.. So in 1984 we had [one person] in production plus maintenance ... and then in 1984-1985 - vis a vis myself here we had maintenance here under [one person] and here we had production under [myself]."

"1985..let's say onwards to the present, what we have is [myself] production, well really plant manager, with responsibility for production and then [another person] with responsibility for maintenance.. and then in addition to that I have [someone] who's responsible for production and then that came in 1988."

An additional level of middle-management emerged as functional areas became too large for one person to manage. However, the company was now privately owned and the board of directors was eliminated. Thus there was no change in the number of levels in the hierarchy (5), although the functions were different. The effect of this difference was particularly apparent in the impact it had on power dependencies.

Integration

Integration was still achieved primarily through face to face communication during this period. The president, in describing the organization through which he purchased Hitech, made the point that the organization literally had no structure up until 1984. Although he noted that the organization had reached a size where not everyone reported to him, he said there were no formal lines of communication developed. If anyone wished, they could always communicate directly with him. When asked what changes he made to Hitech after acquiring it from the second owner, he replied that he developed a more open administration in order to obtain quicker response and flexibility. The rating on integration style remained (1) reflecting the policy of openness.

The new owner's policy of openness facilitated integration which is reflected in the increased rating of (3) for degree of integration.

Formalization and Standardization

"We promoted one of our operators in 1987 to fulltime safety and training officer so this now gives us more resources to do the training, to get the procedures put into place."

EF: Why did you appoint a training officer at that time?

"[Earlier], we had an explosion; and [shortly after], we had a gas leak, a poisonous gas. These incidents, and a few incidents that occurred, did not really cause any.. didn't cause any injury.. nothing major in those terms; but they indicated to us that if we wanted to prevent injury, and death perhaps, in the future, we had to take precautions. So I think it was in September or October of '87, we moved this fellow over. He was one of our more experienced operators. We moved him over from that responsibility to the responsibility of safety and training..."

The emergence of a system for training personnel and the appointment of a training officer are evidence of increasing standardization during this period.

One of the senior managers indicated that planning activities had started to occur regularly even before the fourth owner purchased the company:

"So we were starting to plan ahead, more on sort of a 3 month - 6 month sort of basis..."

"We didn't have formalized job categories, at least not written.. No we didn't have formalized job capacities written down. About a year ago.. a year and a half ago (that would be January - June 1988) we started that."

(Note that this period ended in 1987, which means that there were no formal job descriptions at that time.)

Formalization and standardization had always existed in the labs to a certain extent; but as the following statement indicates, it increased significantly at this time:

"Yes we have written procedures for all of our processes.. but we have had them for many

years. That's the processes, procedures relating to the [lab] are formalized, written down, typed. The operators when they go into the plant have a typed operating instruction. And what they have to do is follow the instructions and fill in the requests for information. That's been there for at least ten years but it's become more formal gradually. There was a time.. when I came back here in 1984, this was done for about 70 or 80% of the work and over two years.. from '84 to '86 I raised that number to 100% so that as of late '86 nothing goes on in the plant without a firm, formal written procedure.. typed. Typed, approved and signed by two managerial people."

Formalization and standardization increased in the production and research operations in response to the pressures of size and meeting safety requirements. However, outside these areas, the new owner's efforts were directed at developing a more open administration in order to obtain quicker response and greater flexibility. Thus prescribed formalization and standardization did not change (2) while emergent formalization and standardization were increased to reflect the formalization and standardization developing in the plant and in the research lab (3). In other areas, there was no difference between prescribed and emergent structures and systems.

Situational Context

Ownership

In 1981, an entrepreneur bought both Hitech and its inactive research company from the second owner and then formally disbanded the latter. In 1985, Hitech merged into the new owner's company so that from that time on there was one organization. Since prior to the merger, the two companies were being run by the same owner with the same goals, changes were a result of the change in ownership/management rather than as a result of the merging of two different organizations. Changes that can be

attributed to increases in size, however, may be attributed to the merger.

State of Product Development

"Eighty-one was the best production year we'd ever had.. This is when I come back to [the second president's] shade trees. One of the shade trees he had planted bloomed or whatever shade trees do.. dropped gummy material over us which stuck to us like money.. We got a million dollar contract out of that.. and that made the merger work.. The next year one of the other products blossomed and those two products have been growing since then and they are the mainstay now.. They're manufactures..... and this is the first real transformation between.. where manufacturing became more important than any of the other subgroups..."

The rating for state of product development remained at (4), a viable product.

Fiscal Pressure

As suggested previously, the company did well financially this period. Income from manufacturing, in particular, had increased. Additional funds would be required for facilities and equipment if the company was to continue to grow. As in previous periods, products were determined by the market.

Size

By 1987, the company had increased in size from 35 employees, at the end of the previous period, to 55 employees.

Interests

The growth and increased income over this period were reflected in increased satisfaction with allocation of resources as funds were available for managers to improve operations as they saw the need.

Dependencies of Power

A senior employee described the power structure at this time as follows:

"Now you must realize that there's far more conversation between managers than with any other group.. Most of the decisions are made at the managerial level.. But when did that come about? Certainly not when they were first appointed.. Even now they have a limited autonomy..They're under [the president].. He essentially OK's their decisions.. although they're getting to make more and more decisions on their own..."

Power was becoming less coherent as it began moving down to the managerial level and managers started to make decisions on their own. Thus, power was highly centralized but less coherent than at the previous stage.

Capability

Knowledge and Expertise

The new owner/president who took over at the beginning of this period had previously founded his own company which he had developed into successful commercial venture so that he was now in a position to purchase Hitech. He saw Hitech as an opportunity to increase his own business and saw the need for increased formalization and standardization as the company grew in size. Thus, the third owner added entrepreneurial and business skills to the organization.

Leadership

The president/owner had a definite vision of the future of Hitech as a commercial venture. However, his interpretive schemes were similar to the founder's and reflected a heightening of the existing paradigm rather than a change in direction. The leadership was therefore, still classified as transactional.

Summary

Under the guidance of an entrepreneurial owner/president, with values similar to the founder but with business acumen, the organization continued to develop within the founding paradigm.

Face to face communication was seen as the key to problem solving and integrating operations. While the

administration prided itself on its openness, as the organization grew, the need for a more complex structure and formalization was felt. Accordingly, towards the end of this period, there was an increase in complexity, formalization and standardization.

The managerial elite were once again satisfied with the allocation of resources. Interpretive schemes were not expected to change. However, if the organization continued to grow, formalization and standardization were expected to increase.

Table 7.7 Organizational Measures for Hitech at T₃

	T ₂	T ₃
Interpretive Schemes	Focus on research and manufacturing (3) Commitment to the status quo	Focus on research, manufacturing and marketing ('resale') (4) Commitment to the status quo
Organization Design	Differentiation exists in products (5) and hierarchy (5) Functional differentiation (5) Emergent formalization (2), standardization (2) Integration style (1) Integration rating (2)	Product differentiation (6) Vertical differentiation (5) Increase in functional differentiation (8) Emergent formalization (3), standardization (3) Integration style (1) Integration rating (3)
Situational Context	Ownership - the government Viable product (4) Fiscal pressure determined products 35 employees	Ownership - entrepreneur Viable product (4) Fiscal pressure determined products 55 employees
Interests	Dissatisfaction with deployment of resources	Satisfaction with deployment of resources
Dependencies of Power	Power structure less coherent	Power structure less coherent
Capability	Experience and expertise concentrated in technology, research and development Some manufacturing experience Transactional leader (1)	Entrepreneurial president adds business expertise Transactional leader (1)

Table 7.8 Organization Design of Hitech at T_3

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	8	8
Number of geographical locations	1	1
Number of product lines	6	6
Vertical differentiation		
Number of levels in the hierarchy	5	5
Integration		
Style of integration	1	1
Degree of integration	3	3
Formalization	2	3
Standardization	2	3

T₄ - Hi Tech Under Corporate Ownership

This section covers the time period following the purchase of Hitech by a large international company, the fourth owner, up until the present. The variables reflect the status of the organization at the end of the study.

Interpretive Schemes

"The goals are still to increase production. They've placed a stronger emphasis on sales, there's no doubt about it. They've placed a stronger emphasis on the formalization of procedures and projections, budgets and projections. But as far as the goals are concerned, no. They are very much in favour of us continuing with our product lines. They are in favour of us building a new plant, which we intended to do within the next three years... but that was already in the cards."

"So as far as the goals are concerned, I don't think they've changed... and this is typical of [the fourth owner]. When they acquire a company, they look for a successful company which isn't as obvious as it first appears. Many companies go out to find companies which are not successful because they feel that by bringing their money, their procedures, perhaps even their products, they can make a company more successful.. With Hitech and with many of the other acquisitions of [the fourth owner], this was not the thrust. The thrust was to buy a successful company. Leave the management in place. Have the company essentially run the way it was. There are others that do that of course, but that's very clearly [the fourth owner's] approach. Because the company is successful and therefore its goals must be achievable.. at least they have proven that their goals were achievable in the past. Then the course is don't change it.. other than make clear sure that the company has a clear idea of where they're going..."

There was no evidence of a change in interpretive schemes. Rather, as the excerpts from two different interviews above illustrate, there was a strong consensus that interpretive schemes had not changed.

Organization Structure

Horizontal differentiation remained unchanged. One level of vertical differentiation was added. A managing director from the parent company came periodically, to oversee operations. According to one of the managers, whose opinion was echoed by all of those interviewed:

"The thrust was to buy a successful company. Leave the management in place. Have the company essentially run the way it was."

Formalization and Standardization

Formalization clearly increased. In the words of the previous owner who was still president:

"I wish we didn't have to write reports and send reports."

Managers all emphasized the increase in formalization:

"So the organization is moving much more from 'seat of the pants' to planning ahead and formally planning ahead and attempting to meet that plan and measuring one's performance against that plan. This is where we're going, this is what we're going to do."

"It became clear the bigger the organization was becoming.. It was becoming unwieldy to attempt to just fly it by the seat of our pants. In other words, if someone wanted to spend \$50,000, he just talked to a few people in the corridor and lo and behold, he just went and spent \$50,000. This is all very well if there is only one person doing that, but when you have four or five people doing that you can end up in a cash crunch if you're not careful.. when all four or five of them decide they want to spend \$100,000 at the same time. So the whole budgeting procedure had to become formalized because of the size of the organization. It is now becoming not possible to run it efficiently without a plan."

"So we were starting to plan ahead, more on sort of a three month - six month sort of basis; but now that [the fourth owner] has taken over we're looking at planning ahead for five years. So say that we had a rough plan for five years, we had a firm plan for a year, and a very firm plan for the next three months. As I mentioned, our

performance is measured against the plan and this applies in all areas - safety, production, commercial, financial... the whole thing... capital expenditure, staffing.. all the facets, if you like, of running a business, all have to be taken into account in planning."

Formalization and standardization increased under the fourth owner. Managers saw this as a continuation of activities which had been initiated by the third owner who was still president. The increase in formalization and standardization was considered a heightening of previous operations, rather than a change. For example, one of the managers stated:

"Before the [recent] purchase we were well aware that we were going to have to increase our level of written procedures. We learned that by experience. We learned that from a number of incidents we had in terms of accidents and so forth. To reduce these incidents we had to train people better. We had to write more comprehensive, more encompassing operating procedures for people to follow.."

"The whole thing came together from all sides. There is some input from [the fourth owner] on this. There is some input from the likes of occupational health and safety demands, environmental demands, workmen's compensation.. Regulation does such directly but greatly that's the way we wanted to go anyway. Also we are a member of [an industry association] for two years now.. so let's say since '87.. '86 - '87. So all these external organizations, our interface with them, makes it clear to us that this is the direction.. everything we read in the newspapers, everything that we read that comes across our desk relating to operating procedures indicates that's the direction we have to go. So we're really making the decision based on the information coming to us. Nobody is actually telling us pre - [the fourth owner]."

Researcher:

"Wasn't that information coming to you 5 years ago?

"It was. It was coming to us but in a less concentrated way.. less intense. You're well aware of the pressure there is on the environment because of spills and so on.. All these things indirectly affect us. They tell us that things are even going to get tighter. Whenever you read what is going on in the United States, what is going on in the U.K... Everything which is happening there, eventually is going to come here which means we have to tighten everything, procedures and so on. So this information has always been coming to us, but it has become more and more intense and so of course the more intense it becomes the more we react to it and now since we've joined the [parent company], then we're getting some firm directives.."

"Since [the fourth owner] came in we perhaps have accelerated this procedure because now we're beginning to get clear directives from them on what to do. For instance in safety, we have to develop a three year safety program which has to be presented to the Managing director who's responsible.. who's a [parent company] employee.. who one of his responsibilities is Hitech."

"At the moment we have formalized job categories. That was actually done at the start of the fall... That was started a year ago...."

The organization received a formalization rating of (4) reflecting the high level of formalization at this time. There was no difference between prescribed and emergent structures at this time.

Situational Context

Ownership

The company is now a wholly owned subsidiary of a large foreign company. While Hitech management expected to retain control of the goals and activities of the organization, they also expected an increase in formalization and standardization would result from their dependence on a large organization.

State of Product Development

The company continued to do contract research and specialty manufacturing as it had since its founding.

Therefore, the rating for product development remained unchanged at (4), indicating that it had a viable product.

Fiscal Pressure

Financial needs are now met by the large parent company providing that they can be justified by the management of Hitech. The association with the new owner made it easier to acquire funds for expansion and improving facilities as the company did not have to go to outside sources. As one manager suggested, the president no longer had to put his home on the line, vis a vis a mortgage, in order to finance expansion. Although the company now had freer access to funds for expanding facilities, products and research were still determined by the market for them. Thus, there was little change in fiscal pressure.

Interests

Management continued to be satisfied with the allocation of resources as funds were still available for managers to improve operations where they saw fit, with the difference that they now had to justify expenses to the parent company as well as the president.

Dependencies of Power

One manager described the relationship with the new owner as follows:

"Since [the fourth owner] came in.... we're beginning to get clear directives from them on what to do. For instance in safety we have to develop a three year safety program which has to be presented to the Managing Director who's a [parent company] employee, who one of his responsibilities is Hitech. He comes.... once every couple of months and we have a quarterly business report.. that must be once every three months. In that business review, things like staffing, safety, commercial aspects, financial aspects are all discussed. This is where we have some slight changes now in staffing. We are not now free necessarily to make all our own decisions regarding staffing. Staffing, levels, projected staffing levels are now discussed at a quarterly business meeting. Now it's not yet clear to us how

much control he's going to exercise. Or whether he just wants to be informed of the next two or three months requirements.. at the moment that's where it lies. We feel we just have to inform him rather than actually get approval....."

"But if we hadn't informed him, then of course he wouldn't be very happy. We have to let him know."

Another manager stated:

"We're relatively autonomous.. Certainly any major expenditures like a quarter of a million dollars has got to go to [the new owner].. since it's no longer made here.. but the decision that we ought to make that expenditure is still ours.. and the decision how we should spend it is still ours.. the authorization to do it is theirs.. but the driving force that requires it is ours.. We need new equipment in order to do a certain job.. or we want to make a new type of product.. those are our decisions.."

"All the managers would be involved in a major decision.. I can't see a major decision that would not affect all groups.. You see at the moment we're looking at a major production expansion on a new site.. a huge expansion by our standards.. trivial by the outside world's standards.. but that's nether here nor there.. Now theoretically in the simplest possible view, that's purely a production unit.. "

While the parent company added another level to the hierarchy, and instituted a system which necessitated that all major decisions be presented for approval, essentially power dependencies were not significantly changed. Power was previously concentrated, with the management level taking responsibility for certain decisions and individual managers taking responsibility for others. This process, except for requiring approval from the managing director (representing the parent company) as well as the president, remained unchanged. The rating on power dependency remained the same.

Capability

Knowledge and Expertise

Within the company itself, there were no major changes in the managerial elite, thus knowledge and expertise remained as they were in the previous period. The extent to which the parent company exerted their influence on management is the degree to which the knowledge and expertise of managing a large commercial organization were passed on to Hitech. This has been confined to increasing formalization and standardization, which everyone interviewed agreed had begun prior to the takeover. Since for the most part, the parent company does not take an active role in running its subsidiaries, there has been no change in expertise.

Leadership

Basically the leadership has not changed since the new owner took over. The efforts of the managing director from the parent company have been directed towards increasing reporting procedures. Therefore, the leadership remained transactional.

Summary

As was expected, interpretive schemes have not changed since the new owner purchased Hitech. Changes that did occur were limited to structure and systems.

One such change was the addition of a level of management above the president. In reality, this meant that a managing director came from the parent company to oversee operations periodically. This was not seen as a significant change by the managerial elite, as they were accustomed to justifying financial decisions on a market basis; and believed that decisions which were justifiable to the president would also be approved by the new parent company.

The most significant change noted was the increase in formalization and standardization. However, this was also

not looked upon by the managerial elite as a change imposed at the whim of the parent company. Rather it was seen as fulfilling a need that arose as a result of organizational growth and institutional pressures. While the increase in formalization and standardization was not looked upon entirely favourably (many viewed it as an inconvenience), it was generally recognized as the continuation of a much needed process which began prior to the change in ownership.

Table 7.9 Organization Measures for Hitech at T_4

	T_3	T_4
Interpretive Schemes	Focus on research, manufacturing and marketing ('resale') (4) Commitment to the status quo	Focus on research, manufacturing and marketing ('resale') (4) Commitment to the status quo
Organization Design	Product differentiation (6) Vertical differentiation (5) Functional differentiation (8) Emergent formalization (3) standardization (3) Integration style (1) Integration rating (3)	Product differentiation (6) Vertical differentiation (6) Increase in functional differentiation (8) No change in formalization, standardization Integration style (1) Integration rating (3)
Situational Context	Ownership - entrepreneur Viable product (4) Fiscal pressure determined products 55 employees	Ownership - large corporation Viable product (4) Fiscal pressure determined products 55 employees
Interests	Satisfaction with deployment of resources	Satisfaction with deployment of resources
Dependencies of Power	Power structure less coherent	Power structure did not change
Capability	Experience and expertise in research, development, manufacturing and business Transactional leader (1)	Addition of corporate experience at advisory level Transactional leader (1)

Table 7.10 Organization Design of Hitech at T_4

	Prescribed	Emergent
Horizontal differentiation		
Number of functions	8	8
Number of geographical locations	1	1
Number of product lines	6	6
Vertical differentiation		
Number of levels in the hierarchy	6	6
Integration		
Style of integration	1	1
Degree of integration	3	3
Formalization		
	4	4
Standardization		
	4	4

Did this Organization Change ?

At T_0 , Hitech was not in the founding archetype. Although the company was primarily involved in research and development, unlike the founding archetype Hitech treated research as a product which provided a cash flow for the organization. The research was oriented towards developing processes for manufacturing a known product which the company would then produce for the client. Thus, fiscal pressure played a role in the determination of company activities from the start. At T_4 , Hitech retained this market orientation continuing research and development activities and custom manufacturing as well as maintaining the 'resale' activities which were added at T_3 . On this basis, there has been no significant change in interpretive schemes in this organization since its founding.

In terms of structures and systems, differentiation increased. Functional differentiation increased from (1) when research was the only activity, to (8); and vertical differentiation increased from (2) to (6). While this appears to be a significant change, when size is taken into account, the perspective changes. When the organization consisted of 13 people, the president performed sales, administrative and research functions. The Ph.D.s were responsible for manufacturing as well as research. Functional differentiation emerged when it could be justified by an increase in work which resulted in the need for additional staff. Similarly with vertical differentiation, an increase in the number of levels in the hierarchy can be attributed directly to increasing size rather than a change in interpretive schemes.

Table 7.11 Comparison of Founding and Final Measures for Hitech

	T₀ - The Founding	T₁
Interpretive Schemes	Focus on research and manufacturing (3) Commitment to the status quo	Focus on research, manufacturing and marketing (4) Commitment to the status quo
Organization Design	Product differentiation (5) Vertical differentiation (2) Functional differentiation (1) Formalization (1) Standardization (1) Integration style (1) Degree of integration (2)	Product differentiation (6) Vertical differentiation (6) Functional differentiation (8) Formalization (3) Standardization (3) Integration style (1) Degree of integration (3)
Situational Context	Ownership - the founder Viable product (4) Fiscal pressure determined products 13 employees	Subsidiary of a large corporation Viable product (4) Fiscal pressure determined products 55 employees
Interests	High satisfaction with deployment of resources	Satisfaction with deployment of resources
Dependencies of Power	Concentrated power structure	Power structure less coherent
Capability	Experience and expertise concentrated in technology, research and development Transactional leader	Corporate management as well as experience and expertise in technology, research and development Transactional leader

Formalization and standardization also increased. However, the needs for formalization and standardization were apparent from the start as reports were written for clients, and standardized operations and documentation were developed for research activities. The increase in standardization and formalization is still looked upon as a necessary evil rather than as a desirable way of doing business.

Based on the foregoing, Hitech followed an inertia track. This does not imply that no change occurred. Rather, the changes that did occur were not revolutionary. The interpretive schemes remained the same. The changes in structure and systems that did occur, involved a heightening of the archetype which enabled the organization to reproduce its values as it increased in size.

Analysis of an Inertia Track

Hitech underwent three changes of ownership. Each change in ownership brought with it the expectation of change. Ultimately, the changes that occurred did not result in a reorientation. Rather, they involved a heightening of existing interpretive schemes and their supporting structures and systems as well as changes that occurred as a result of growth and aging.

The first change in ownership, from private to government ownership, was expected to transform the organization into the research and development (founding) archetype; however, this change did not materialize. The second, the purchase of the organization by a local entrepreneur involved in resale of a similar product, was expected to introduce a commercial orientation. Since a market orientation existed previously, no major change occurred. Finally, the sale to a large foreign company was expected to result in an increase in bureaucracy. The increase in formalization and standardization which

resulted, was attributed by organization members to growth and institutional requirements.

Thus, as suggested previously, interpretive schemes remained unchanged.

The founder, a university professor, had a strong commitment to research. Since the company was founded to handle research projects for other companies, an element of fiscal pressure was always present. The founder maintained tight control over the organization. Eventually, it increased in size to the extent that he felt the time he had available for his own personal research was being severely curtailed. At that time, he was approached by the government who wanted to acquire the organization as part of a project to develop the industry in Canada. The company would be, according to the government, "the research arm of the great Canadian..... company" which they were in the process of establishing.

The founder entered into an agreement to sell partly because of the time constraints suggested previously and also because he believed that the new ownership would enable the company to become dedicated to research. If these aims were realized, interpretive schemes, together with supporting structures and systems, would change and the organization would conform to the founding archetype.

The change of ownership from private to government was expected to precipitate this change by removing fiscal pressure from the organization. The company would be able to develop its own research interests rather than relying on contract research for financial support.

The pattern of value commitments strongly supported research and development activities. The Ph.D. who proposed entering the resale business was no longer with the organization because of a disagreement with the founder over market orientation. While satisfaction with the allocation

of resources was high, there was little doubt that the researchers would be even more pleased if they were allowed to pursue their own research interests rather than being restricted by contract work.

Conditions which would enable the change to a research and development archetype were also present. Power was concentrated. The managerial elite had technological expertise and experience in research and development organizations, i.e. they had academic backgrounds.

Although the exact nature of the new leadership was unknown, i.e. whether it would be transactional (as in the past) or transformational, since so many factors favoured a transition, it was expected that the organization would change in the direction of the founding archetype.

This change did not occur. The new president, appointed by the government had experience and expertise selling research for a university. Experience in developing research ideas and obtaining either private funding or government grants to support research activity (which was present in the third organization studied) was lacking. Without knowledge of the archetype and how to support it, his leadership was transactional. When the expected financial support was not forthcoming, the president marketed the research capability of the organization. The interpretive schemes ingrained by the founder continued to exist and contract research became the mainstay of the organization although there was also some manufacturing. The funds from these activities were used to support the company's research interests.

Changes in structures and systems which could be attributed to growth were consistent with the interpretive schemes and ensured that the organization was able to maintain existing values.

Dissatisfaction with interests was high as it appeared to those involved that the results of the company's research was not going to be utilized.

When the government decided to forego the idea of developing a model company, it decided to sell its 'research and development' arm. Employees were asked their opinion on prospective purchasers. They favoured a local company which had been started by the Ph.D. who had left Hitech early on to establish his own business. Their rationale was that they preferred to go with someone they knew rather than a large organization of which they had no knowledge.

The new owner/president was a transactional leader. In addition, although he had built his business on resale, his values, as a Ph.D., were consistent with the interpretive schemes of the founder. Thus the organization did not undergo a change in interpretive schemes during this period. Some change occurred in structures and systems. These included an increase in complexity, horizontal and vertical, as well as increased formalization and standardization. Most of these changes were emergent led in response to the requirements of the work which had to be done or environmental pressures.

Finally, the company was sold to a large international company. It was believed the sale would provide the organization with financial support which would allow it to maintain its interpretive schemes and at the same time increase in size. This, in fact was the case. The most recent changes were an increase in complexity, formalization and standardization. It was agreed by all of those interviewed that these changes were not brought about by the bureaucratic influence of the new owner, but had commenced in the prior period. It was suggested that perhaps the new ownership had caused some of the changes to occur more rapidly, but there was a strong belief that these

changes were the inevitable result of a change in industry standards as well as the increased size of the organization.

CHAPTER 8

The three organizations studied present an in-depth look at three of the four different tracks suggested by Hinings and Greenwood: A Reorientation, an Unresolved Excursion and an Inertia Track.

All of the organizations studied experienced a change in situational context, specifically fiscal pressure, that was expected to lead to change. Each organization responded differently with the result that each followed a different track. Only one underwent a reorientation. An examination of the similarities and differences embodied in and encountered by these organizations led to the conclusion that Hinings and Greenwood's framework is useful as a theoretical and empirical tool since it provides an explanation of why these organizations followed different tracks. In so doing, it contributed an insight into the change process.

Similarities

The Founding Archetype

All three organizations were involved in research and development activities when they were founded. Supertech and Ultratech conformed to the Founding Archetype. Hitech, although involved in research and development, was operating in a different archetype. Since Hitech was being paid to carry out research, its interpretive schemes were different. There was a greater market awareness and the research, itself, was looked upon as a product. Since there was a consistency among interpretive schemes, systems and structures, the organization appeared to be operating within an archetype which we classified as a service archetype. Although Hitech was not in the founding archetype at the outset, there was a belief early on that it would change into the founding archetype, i.e. become a research oriented organization. Although this belief did not last for long,

the perception by the public and industry specialists in the province of the similarity between this and the other organizations studied led to its inclusion.

Precipitating Conditions

The founding archetype was characterized by an environment which placed no fiscal pressure on the organization's performance, i.e. there was an understanding of the long term nature of research and funding was provided for the researchers to pursue the research interests of the firm. Supertech and Ultratech met this criteria. In Hitech, organization members believed that when fiscal pressures were removed (i.e. when the government purchased the organization), they would be able to operate in the founding archetype.

Ultimately, all three organizations experienced fiscal pressure. In Supertech and Ultratech, investors were no longer willing to provide funds unless the organization was willing to give up some control. In Hitech, the expected financial support for the firm's research did not materialize. Thus fiscal pressure was a factor in all three cases.

In all cases, the development of a viable product was expected to precipitate a shift from a research and development orientation to a market orientation.

Finally, each of the three organizations employed less than ten people in the founding period and by the end of the study had over one hundred employees. This exponential growth was expected to lead to increased differentiation, formalization and standardization, and decreased centralization.

Tracks

While precipitating conditions were the same in all cases, the manner in which the organizations responded and ultimately the track that each followed was different.

Supertech followed a Reorientation track. Interpretive schemes, structures and systems all changed as Supertech underwent a major transformation from the founding archetype to a commercial archetype.

Ultratech remained in an unresolved excursion throughout the study. While organization theory presents strong arguments for configuration and archetypes, recent research suggests that lack of fit can be a long-term situation for some organizations. (Miller and Friesen, 1984; Miller, 1990; Hinings and Greenwood, 1988) Given the emphasis in theory on the relationship between fit and performance (Donaldson, 1987), studying an organization on this track not only provides a basis for comparison with a reorientation, it is potentially important in shedding light on why these organizations fail to resolve their inconsistencies.

Hitech, which was not operating in the founding archetype at its inception, followed an inertia track. It had a market orientation and operated in what we called a 'service' archetype. Early in its second period, Hitech was taken over by the government. The expectation was that this arrangement would make unrestricted funds available to Hitech for research and development activities and would allow the organization to move to the founding archetype. When the funding failed to materialize, the organization retained its initial interpretive schemes and continued to be self-supporting.

The fact that an organization follows an inertia track does not mean that no change occurs. In an inertia track, momentum can lead to a heightening of existing values. In fact, there may be many changes in structures and systems. This was the case for Hitech. The track it followed was classified as an inertia track because the changes which took place in structures and systems involved a heightening of its initial interpretive schemes.

The Dynamics of Change

Why did these organizations follow different tracks? Since all three organizations early in their existence conformed to, or were closely aligned with the founding archetype; and since all three underwent the same precipitating conditions, i.e. a shortage of funds and a viable product, what were the dynamics that caused them to respond differently?

Directors

A precipitating condition, in itself, is not sufficient to induce change. When a precipitating condition is encountered, i.e. when there is a change in context which presents a problem to the organization, the solution will be activated by those in power based on their interests and their level of commitment to interpretive schemes. (Hinings and Greenwood, 1988)

In all three organizations there was a strong commitment to the status quo during the founding period. In order for an organization to embark on a reorientation track, there had to be a change in commitment. In Supertech, the organization that followed a Reorientation Track, a change in the commitment to interpretive schemes was introduced early on when the venture capitalists gained a position of influence by acquiring a seat on the board of directors. Their intervention, while initially subtle, was directed towards changing interpretive schemes. The venture capitalists were instrumental in acquiring a new chairman of the board with experience in the industry who was committed to developing a profit oriented organization. Since it is the prerogative of those in power to allocate resources and define tasks, the direction of the organization was determined by their interests. The new chairman used the power he was given to change interpretive schemes of organizational members and introduce a layer of management

who were committed to the interpretive schemes he championed. By exercising their power as board members, the venture capitalists were able to make changes in the managerial elite thereby influencing the direction of change.

In Ultratech, the organization which experienced an Unresolved Excursion, the president retained tight control over the organization. His interpretive scheme, which focused on researching and acquiring patents, dominated the organization. The introduction of a competitive commitment, which accompanied the acquisition of a manufacturing facility, was dampened by the concentration of power which enabled the president to ensure that his interpretive schemes continued to dominate the organization. Finally, when the government acquired control of the board of directors and appointed a new president, the original interpretive schemes became more tenuous. It appeared a new direction was being set. Although the directors were in place, the reorientation was not completed. A reformative commitment was not sufficient to ensure change would take place when it was not accompanied by appropriate enabling conditions.

In Hitech, which followed an inertia track, the interests of organization members were strongly supported by the promised change to a research and development organization. When the expected funding failed to materialize, the strength of the relationship of the organization with its environment and the strength of the commitment to initial interpretive schemes, which were both familiar and successful, assured a continuing commitment to the status quo. Thus, momentum kept Hitech on an inertia track.

Enabling Conditions

While values and interests established a direction for organizational change, they were not sufficient to ensure that change took place. For change to occur, knowledge of and experience in an alternative archetype were needed to carry out the tasks required by that archetype. In addition, transformational leadership, that is a leader who was experienced in implementing organizational change, who had capability in the alternative archetype and the ability to gain the commitment of the organization, was needed to enable the organization to complete its reorientation.

In Supertech, the venture capitalists, by acquiring positions on the board, introduced a commitment to commercialization.

The coherent power structure of the organization enabled the venture capitalists to implement changes by first gaining the commitment of the consensus group. This group, because they valued knowledge, were amenable to suggestions of others whom they perceived to be knowledgeable in areas with which they were not familiar, e.g. building a business.

Thus the venture capitalists were able to influence the interpretive schemes, structures and systems in the organization and ultimately to engineer its reorientation. They accomplished this by first selecting a Chairman of the Board who held their values. The new Chairman not only had knowledge and experience in the industry in which the company was involved, he also had experience managing organizational change and brought with him a vision of the company as a commercial enterprise.

His initial efforts were directed towards developing the president's expertise in managing and operating a business. He was also concerned with changing the commitment of the president and other managers from interpretive

schemes favouring research and development to interpretive schemes which promoted manufacture and sale of their product. The coherent power structure facilitated the transmission of these ideas to the managerial elite. The chairman also instigated the hiring of a consultant to lead the organization through structured planning activities. Finally, he prescribed a more complex structure and hired experienced people who were committed to the new interpretive schemes to fill the newly created managerial positions.

A concentrated power structure together with the capability of management experienced in the alternative archetype, the technological expertise to operate the new archetype and transformational leadership enabled the organization to complete a Reorientation.

The power structure was also coherent in Ultratech which exemplified an Unresolved Excursion. The founder, who retained control, was strongly committed to acquiring and developing technology. He had no experience in a relevant alternative archetype, nor did he have the technological experience to operate an alternative archetype. When he acquired the manufacturing facility, he added manufacturing capability and a competitive commitment since the plant manager and his staff were committed to manufacturing. The president, however, did not believe the product was ready for market. He added the manufacturing facility because he had an opportunity to acquire it cheaply and he wanted to give reluctant investors the impression that the manufacturing stage was imminent (i.e. a manufacturing facility gave the appearance of conforming to an institutional environment which sought a return on investment when the product was manufactured and sold). At the same time, he used his power to ensure that his interpretive schemes, which favoured research and

development as well as the acquisition of new technology, remained dominant. He retained control over hiring, ensuring that those he hired for other areas of the firm were dedicated to research.

In the final stage of Ultratech, the initial interpretive schemes were deeply entrenched. When the government installed a financial officer, resistance to the alternative interpretive scheme he proposed was strong. When he became president, he lacked the capability which comes from working in the archetype he advocated. The centralized power structure, enabled him to prescribe and implement changes in structures and procedures which supported the alternative commitment to obtaining manufacturing contracts. However, he was not a transformational leader and lacked experience with organizational change. He was unable to gain the commitment of organizational members to his interpretive schemes. In the long run, the organization lacked the coherence of an archetype and remained schizoid up to the time it was dissolved.

A centralized power structure and commitment of the president was not sufficient to secure a reorientation. The lack of capability, in the form of experience in the alternative archetype and transformational leadership, contributed to the organization's failure to change and resulted in an unresolved excursion.

In the last case, Hitech followed an inertia track. As suggested previously, this did not mean there was no change. Rather, changes that occurred were limited to structures and systems and resulted in a heightening of the original interpretive schemes. A concentrated power structure and a strong commitment to interpretive schemes ensured that as the organization grew, changes in structures and systems were consistent with interpretive schemes.

When a problem was encountered, it was solved on the basis of interpretive schemes and history. In the second time period when the government failed to come up with funds to support research and development activities, the organization solved the problem using familiar interpretive schemes and remained in its initial archetype. The strong commitment to the founding interpretive schemes, and the strong relationship between task and environment provided the momentum to keep Hitech on an inertia track.

The third owner of Hitech brought entrepreneurial experience to the organization. Because he was committed to the interpretive schemes of the founder as well as having business experience, he was able to implement changes in structures and systems that were supportive of the existing interpretive schemes. In this case, power and commitment worked together to furnish the momentum which allowed the organization to develop on an inertia track.

The experience of Hitech lends support to Hinings and Greenwood's theory that where there is a strong relationship between task and environment and a commitment to the status quo "these features would seem to override any dissatisfaction with interests" (Hinings and Greenwood, 1988, p.198). In Hitech, we found fit and compatibility provided the momentum to keep the organization on an inertia track.

The Role and Sequence of Prescribed and Emergent Systems and Structures

The consensual nature of decision making in Supertech made differentiating between prescribed and emergent systems difficult, particularly during the early stages. While the venture capitalists would have liked to prescribe a change in interpretive schemes, structures and systems, they opted instead to operate in an advisory capacity. Thus, attempts were made to change interpretive schemes through a sharing

of knowledge and experience. Following a suggestion made by the chairman of the board, planning was instituted. A consultant was hired to run planning sessions on a trial basis. The suggestion made by the chairman of the board was likely to be adopted by the managerial group but could have been turned down. Also, when the managerial group made the decision to hire a consultant and to commence planning activities, those who made the decision were also responsible for implementation which took place shortly thereafter. Not only is there a question of whether the chairman of the board or the managerial group prescribed formalized planning, there is also a question of whether prescription preceded planning to an extent that it could be considered that the activities emerged following prescription.

It was also often difficult to determine whether structural changes were prescribed or emergent led. If any member of the group wanted to change any aspect of their work, they would first bring it to the attention of the entire group and the decision was made on a consensual basis. When the founding group discussed the need for a manager of planning, one of the group volunteered to undertake the activity. The consensual nature of the organization which required that all decisions be made by the group made it difficult to distinguish between prescribed and emergent systems since prescription and implementation occurred almost simultaneously.

In Hitech and Ultratech, there was much clearer evidence that changes were emergent led. However, these changes were not changes that led to reorientation, rather they resulted in a heightening of the archetype. As noted previously, although these organizations underwent changes in structures and systems, neither underwent a reorientation.

In Ultratech, increases in formalization and standardization were emergent led. These changes arose when an increase in size led to a need for integration which is as important in a research oriented organization as it is in a manufacturing and sales oriented organization. It was also pointed out by an employee who was responsible for much of the original documentation, that documentation of procedures and results is an important aspect of the research process. After the addition of the manufacturing facility, emergent integrative structures and systems allowed the predominant commitment to research to continue since representation in these committees was weighted in their favour. Thus the increase in formalization and standardization can be seen as heightening the existing archetype rather than pointing the way to a reorientation. In the latter stage of the organization, the appointment of a new president, and the restructuring he prescribed was not sufficient to change the strongly embedded commitment to interpretive schemes.

As pointed out previously, there were also changes in the organization that followed an inertia track. These changes involved increased vertical differentiation and increased horizontal differentiation as well as an increase in formalization and standardization. Nevertheless, these changes, which were emergent led, were consistent with interpretive schemes and resulted in a heightening of the archetype rather than a reorientation.

This led us to the conclusion that the role of prescription is different in small, young organizations than in large mature organizations. Perhaps, because fewer prescriptions are required to generate an impact on a small organization than on its larger counterpart. For example, in a small organization the creation of three positions and hiring three new managers to fill these positions can effectively introduce a whole new level of management and a

new value system for the managerial elite. In small, new organizations, where there is a strong commitment to interpretive schemes, emergent led changes tend to reinforce the original archetype. In these organizations, prescription provides a means not only of signalling change but also of adding the commitment and capability necessary to carry out a reorientation.

Summary

In terms of our approach, the case studies presented situations where incompatibilities were expected to arise. A change in fiscal context was common to all cases. In all cases, there was also an expectation of change among organizational members as well as among people outside the organizations who were familiar with them. In fact, change was looked upon as desirable and necessary for organization development, growth and/or survival. Here we have a situation where change was expected to be the norm, yet only one of the organizations actually underwent a transformation.

Thus, precipitating conditions were not sufficient to cause change. Transformation required precipitating and enabling dynamics. While changes in context produced pressures for change and the greater the pressure the more need for response, responses were based on how the managerial elite interpreted the change in context. Their interpretation was based on not only how they perceived the change but also on how they perceived their interests would be affected by possible responses.

The direction of change was thus affected by the interests of the managerial elite. Where they were committed to the status quo, responses were made utilizing the existing interpretive schemes and as a result change was directed towards heightening of the archetype. Where there was a commitment to an alternative archetype, the responses

was made based on those interpretive schemes. Where there was a competitive commitment, power was expected to be a factor in determining the response. In Ultratech, the organization failed before the situation was resolved.

Although the managerial elite play an important role in determining the direction of change, they do not have complete control. Regardless of the direction they select, power and capability are also necessary to effect change. The managerial elite are thus constrained by the degree to which they are responsible to other stakeholders and may therefore suppress their values in favour of a position which they see as necessary to retain their position in the organization. A powerful board can replace managers, effectively changing the interpretive schemes of the managerial elite.

In Hitech, which underwent a reorientation, power was used, both actively and passively, to ensure movement continued along the desired track. With a concentrated power structure, the dominant elite were able to enforce their value preferences and continue to manage the momentum. The same form of power structure in a situation of competitive commitment, i.e. in Ultratech, enabled the founder to ensure that the concerns of others were not heard. It becomes a way of insulating and thus neutralizing a potential incompatibility.

Our data suggested that capability, i.e. expertise and leadership, was more important than power in determining outcome. When knowledge and experience in an alternative archetype were lacking, as they were in Ultratech, change did not occur. For an organization to change there had to be knowledge present on how to run the new archetype. An organization's capability to operate a design archetype was important across all tracks.

Transformational leadership was also important in effecting change. Leaders had to be able to mobilize commitment to new interpretive schemes in order to ensure that emergent as well as prescribed structures and systems were supportive. In Supertech, change efforts were first directed towards altering interpretive schemes, then systems and procedures, and finally structure.

While our findings agreed in most instances with those of Hinings and Greenwood, we found a significant difference in the timing of change activity and the role of prescription. Hinings and Greenwood found that there was a higher degree of activity at the beginning of the change period for organizations that underwent a reorientation than for organizations on other tracks. It was our experience that none of the organizations exhibited a high incidence of change in the early stages. In Supertech, which followed a reorientation track, changes were gradual in the early stages and increased over time. Thus the highest rate of change occurred in the final stage. This was also true, however, of Ultratech, which followed an inertia track. In this case, where changes were interpreted as heightening the original interpretive schemes, changes were also gradual in the early stages, and momentum increased as time passed and changes continued to heighten the founding interpretive schemes. What was apparent in both the Reorientation Track and the Inertia Track was the gradual build up of momentum which resulted in one case in a reorientation and in the other in a heightening of the initial archetype.

While it was more difficult to differentiate between prescribed and emergent led change in small organizations where prescriptions were set forth by the implementors and acted upon virtually simultaneously, it was apparent that prescription had a greater effect on these organizations than on the larger organizations in Hinings and Greenwood's

study. While it was expected that this type of organization would be emergent led, there was a strong element of prescription in the organization that underwent a reorientation. The new interpretive schemes were prescribed by the chairman of the board who worked at gaining commitment as well as introducing new managers who supported his interpretive schemes. The chairman of the board also prescribed the formalized planning activities, even though they were first instituted on a trial basis. As was suggested previously, we believe that prescription had a greater impact because of the small size.

Reflections on the Data

The High Impact System in the Founding Archetype

One of the keys to understanding the development of these organizations was uncovering the high impact system for the Founding archetype. Both Kanter's (1983; 1984) and Pettigrew's (1985) works on change suggest that certain kinds of systems, which they call high impact systems, are crucial in signalling change. According to Hinings and Greenwood, these high impact systems are aspects of organizational design which have a high impact in terms of the messages encoded within them and in terms of the extent to which they underpin prevailing ideas of purpose and organizational character (Hinings and Greenwood, 1988, p.113). Since the central struggle in reorientations focuses upon these systems (i.e. those that mark the difference between the old and new archetypes), one of the questions which arises out of Hinings and Greenwood's research is: What are the high impact systems in archetypes other than the ones in their study (i.e. the professional bureaucracy and the corporate model)? In their study, two of the high impact systems were the routing of decisions through the system and the criteria used in decision making.

Our research suggests that in the archetype represented by the new and small research and development organizations in this study, the high impact system is the system for managing relationships with the environment. In the early stages of the organizations in this study, the president/founders handled all relationships with the environment, effectively isolating the organizations from their environment. Initially, in Supertech and Ultratech, this activity was confined to raising funds for research in a predetermined area. In commercial organizations, on the other hand, separate systems often exist for handling marketing and sales, market research, human resources, purchasing raw materials, and public relations.

Hinings and Greenwood also questioned whether organizations which achieve a reorientation use these high impact systems as early symbols and levers of transformation, and the extent to which change originates in these high impact elements.

It was clear in Supertech, which underwent a reorientation, that the problem precipitating change arose from a failure in the relationship with its environment. The founders were no longer able to raise funds for their research from friends and relatives. A shift of power resulted when, in an attempt to solve this problem, they acquired a government contract and sold shares to venture capitalists. Thus, the need for change originated in the environment. The appointment to the board of a chairman who was well known in the industry resulted from intervention by the venture capitalists. The appointment, which occurred early in Supertech's existence, was a symbol both to the outside world and members of the organization that they had become part of the business community. When the chairman of the board became president, he appointed a vice president of marketing with a mandate to promote and sell the product.

The appointment of a vice president of marketing at a level above that of the founding members was also a symbol that the focus of Supertech was shifting from research and development to a market orientation. The appointment of other managers at this level, who came from outside the organization, had business experience, and were committed to the interpretive schemes of the new president, was also symbolic. In addition, these appointments acted as a lever by inserting a level of management committed to the interpretive scheme favoured by the new president.

In Ultratech, this type of symbolism was lacking. In response to fiscal pressure, the president criticized the government for failing to adequately support research and development. The lease of the manufacturing facility was intended to signal change, particularly to investors. From this standpoint, it was successful for a time. However, within the organization, manufacturing was not practical without orders to fill. Although employees of the plant held interpretive schemes which facilitated production and manufacturing, the presence of manufacturing capability did not change the interpretive schemes of other organization members. Thus, the addition of capability not directly related to the high impact system, acted as neither a symbol nor lever of change.

In the cases studied, change in the high impact system was used both as a signal and a lever in transforming Hitech; while in Ultratech, a change in capability which was not directly related to managing relationships with the environment did not have the same effect.

The Role of Growth

In this study, we controlled for growth and size by selecting organizations which were the same size at the founding and increased by a similar amount during the study: At their founding, all employed less than ten people and at

the conclusion of the study all had over one hundred employees. These organizations were selected because their high growth rate was expected to precipitate changes which have been empirically linked to increases in size. (See p.8). Thus an increase in formalization, standardization and complexity, both horizontal and vertical, was expected as well as a decrease in centralization (Blau and Schoenherr, 1971; Pugh, Hickson, Hinings and Turner, 1969; Child, 1972).

In all organizations, there was virtually no formalization, standardization or differentiation and there was a high degree of centralization during the founding period. By the end of the study, all organizations showed significant increases in formalization, standardization and complexity and a decrease in centralization. The manner in which these changes occurred varied.

In the case of Supertech, these changes were prescribed and implemented early and continued to increase concurrently with growth and aging. In this case, it was difficult to separate the effects of growth and the prescription and implementation of changing interpretive schemes, since the prescription of new functions and additional layers in the hierarchy increased the size of the organization and facilitated the growth process.

In Ultratech, increases in formalization, standardization and differentiation were emergent led in spite of the president's strong opposition. Interview data suggests a direct link with increased size and changes in structures and systems as organization members described the frustrations which led them to develop procedures for documenting and integrating their activities.

In Hitech, organizational members were quick to attribute increases in formalization and standardization to the nature of the task and the institutional environment as well as increased size.

Thus, although the manner in which the expected changes occurred varied among the different tracks, the results are consistent with contingency theory which suggests an increase in formalization, standardization and complexity and a decrease in centralization is related to an increase in size (Ibid.).

The fact that changes in structure and systems resulting from growth occurred in all organizations, regardless of the track followed, suggests that these changes are not always accompanied by a change in interpretive schemes and can be achieved without the organization undergoing a major transition.

This leads us to question Greiner's (1972) theory of organizational development which suggests that an organization's first crisis is triggered by problems resulting from growth which are solved through a change in leadership. In the organizations studied, fiscal pressure, rather than growth, played a significant role in precipitating change. In both Supertech and Ultratech, changes in leadership were triggered by attempts to solve financial problems. In Supertech, this change occurred relatively early as a result of pressure from the venture capitalists. In Ultratech, the founder/president was able to gain financial support without giving up control for a much longer time period. Ultimately, Ultratech faced a financial crisis which the president was unable to resolve and a new president was appointed.

In contrast, a change caused by a crisis in managing the organization because of growth does not necessarily mean there will be a change in interpretive schemes. In the case of Hitech, the founder/president was overwhelmed by the administrative task as suggested by Greiner's model. The result was not only a change of leadership but a change in ownership as well. In fact, Hitech had three presidents and

four owners in the time period during which it was studied. In spite of this, Hitech remained on an inertia track. No fiscal crisis developed since, from its founding, Hitech had a system for managing relationships with the environment which worked well for it.

This contradicts Greiner's findings since it suggests that the first crisis an organization encounters is due to problems in the system for managing relationships with its environment. It is worth noting that Greiner's work was based on organizations which survived. In this study, the organization that survived, Hitech, did undergo a change of leadership when the president/founder could no longer deal with administrative problems arising from increased size. However, in the organizations that failed, the crises were attributed to changes in the environment which they were unable to manage. Increasing our knowledge about the nature of an organization's first crisis is important not only in understanding how organizations develop but also in helping young organizations overcome the liability of newness.

The Significance of Capability

Hinings and Greenwood (1988) noted the impact of scale on change, suggesting a reorientation was achieved more painlessly and quickly in smaller organizations. By selecting organizations which were small and similar in size at both the beginning and the end of the study, the impact of scale was controlled, as was the impact of growth/size. Under these conditions, capacity became critical. Both Ultratech and Supertech attempted reorientations. The lack of transformational leadership and capability (both technological and managerial) required to operate the new archetype culminated in an unresolved excursion for Ultratech. While Supertech initially lacked these same capabilities, it managed to acquire them early. With these

enabling conditions present, Supertech completed a reorientation.

Neither Supertech not Ultratech possessed enabling factors at their founding. Why did Supertech acquire them while Ultratech did not? One possibility lies in a capability not addressed by Hinings and Greenwood, organizational learning. Thomas and McDaniel (1990) suggest that if CEO's want to alter their interpretation of their environment, they may wish to manage their management team's capacity to gather, process and convey information. Miller (1990) suggests that learning (together with the system for managing relationships with the environment and decision making) is one of the central processes in an organization. In terms of change, the type of learning system embedded in organizational culture is critical in determining whether an organization will recognize the need for change.

Argyris and Schon (1981) distinguish among three levels of learning: Single-loop learning which they suggest leads to a change of action that does not violate a pre-established norm of effectiveness, double loop learning which leads to a change in the norms defining effective behaviour, and deutero learning which occurs when an individual or organization is able to reflect on its ability to learn and influence it. Based on these definitions, organizational change implies that an organization's ability to change is directly related to its ability to learn.

Normann (1985) suggests that organizations with good constitutions prescribe several power centres and that they allow power to be shifted among these. In order to do this, an organization must possess multiple capabilities or functions in order for power to be shifted from one to another.

In Supertech, the founders placed a high value on expertise and learning. They were able to recognize the need

for and accept advice from experts in other areas and act on this advice. Even though they did not initially possess expertise in all areas required, by adding expertise in these functional areas, they were able to affect Supertech's ability to learn and ultimately to change by shifting power to these areas.

Change and Survival

Even though Supertech underwent a reorientation, this did not ensure its survival. Of the three organizations studied, the only one to survive to date is Hitech. Why?

We cannot answer this definitively since many factors could come into play. In Ultratech, failure could be attributed to the fact that the organization was unable to adapt to a change in its environment, i.e. there were no longer unlimited financial resources to support research activity.

But Supertech underwent a reorientation and also failed. Why? The answer is not clear cut. It was generally believed (with the exception, perhaps, of the two founders who had left) that Supertech was going to succeed. A possible explanation is that, taken to extremes, the reorientation resulted in the departure of the visionaries and creators who possessed capabilities which were critical in this fast-paced industry.

While literature on organizational change suggests that revolutionary change is both more efficient and effective (Miller and Friesen, 1984; Starbuck, Greve and Hedberg, 1978; Albert, 1984), theorists suggest that organizational effectiveness is paradoxical in nature (Cameron, 1986). In fact, even the theorists who argue for revolutionary change agree that to be effective, organizations should maintain a balance and avoid extremes (Miller, 1990; Starbuck, Greve and Hedberg, 1978). Miller (1990) argues that the very qualities

which make an organization successful will, when taken to extremes, be responsible for that organization's decline.

Did Supertech fail because of a hostile environment, because of a poor product, or because it lost the creative capability which would have enabled it to keep pace with the environment? The answer is far from obvious. This is an issue which bears further examination, not just for its applicability to the survival of young organizations but how it relates to change in established organizations as well. What is apparent is that capability needs to be thought of, not in a uni-dimensional way but as a multi-faceted concept. Those who manage change, should be aware of the need to retain capability rather than carry the change process to extremes as was the case with Supertech.

This study bears out what we would expect to find from biological life cycle theories, i.e. that organisms which do not have to change to fit the environment are more likely to survive. At the outset of the study, all three organizations were expected to grow and prosper. They all grew as expected. The bankruptcies (deaths) of Ultratech and Supertech were unforeseen but not inexplicable based on organizational change as well as life cycle theory. Hitech, the only organization to survive did not have to change to adapt to its environment as it was self-supporting from its founding.

In Conclusion

What does this work tell us about managing new organizations? Kimberly (1980; 1987), Hanaan and Freeman (1984), Filley and Aldag (1980) stress the importance of the founding period on subsequent development. A key issue is the length of time a founding archetype can be expected to last or have an effect on the organization. Our research supports the finding of Miller (1990) that "Firms perpetuated their initial thrust until something earth-

shaking stopped them." In the current study, the earth-shaking occurrence was a change in the availability of financial resources with which the organization was unable to cope. This led us to conclude that organizations will remain in the founding archetype until power holders recognize the need for change, or until a crisis of sufficient magnitude that it results in change occurs. Then, only if the organizations possesses or obtains the capabilities required to implement change as well as operate in the new archetype can the initial archetype be expected to change.

The literature on change suggests that changing cultures is difficult since there is a large degree of stability in interpretive schemes (Hinings and Greenwood, 1988). A small organization does not have the resources and time to change interpretive schemes that a larger, well established organization has; thus, an attempt to change may end up bankrupting the organization, as it did in the cases of Ultratech and Supertech.

Our research has shown that fiscal pressure is a major problem for these firms. The literature and policies on funding research and development suggest there is a lack of knowledge on funding these organizations. Spotting winners appears to be almost impossible.

Our findings suggest the design of a new organization is critical to its survival. At the founding, particular attention should be paid to the system for managing relationships with the environment and the learning system. Putting pressure on young organizations to develop the appropriate capabilities is one way investors can improve an organization's chances for survival. At the same time, it is important to be aware that organizations may adhere to institutional norms of structure and design without adopting the interpretive schemes to support them.

Hinings and Greenwood's theory of organizational change provided a framework which worked well in explaining change or lack thereof in the organizations studied. The variables were specific enough to be meaningful, yet general enough to cover a broad spectrum of situations and direct the researcher to relevant concepts. By showing that Hinings and Greenwood's theory could be applied equally well to small, new private sector organizations as it did to the large, public organizations in the original study, this research increased the generalizability of the theory. In addition, the framework was useful not only in explaining the changes that took place but also led us to link other theories in formulating answers to questions which further our understanding of why organizations develop as they do.

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