Evolution of Technology Strategy For Surviving High-Technology Companies

by

Anupam Sahai

Master of Technology, Computer Science and Engineering

Indian Institute of Technology, INDIA, 1989

SUBMITTED TO THE SYSTEM DESIGN AND MANAGEMENT PROGRAM
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN MANAGEMENT AND ENGINEERING
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
FEBRUARY 2000

© Anupam Sahai. All rights reserved.
The author hereby grants to MIT permission to reproduce
and to distribute publicly paper and electronic
copies of this thesis document in whole or in part.

Signature of Author: ___________________________  System Design and Management Program
                                                      January 10, 2000

Certified by: ___________________________  Scott Stern
                                                      Assistant Professor, Sloan School of Management
                                                      Thesis Supervisor

Accepted by: ___________________________  Thomas Kochan
                                                      Professor, Sloan School of Management
                                                      LFM/SDM Co-Director

Accepted by: ___________________________  Paul Lagace
                                                      Professor of Aeronautics and Engineering Systems
                                                      LFM/SDM Co-Director

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
JAN 20 2000
ENG
LIBRARIES
Evolution of Technology Strategy For Surviving High-Technology Companies

by

Anupam Sahai

SUBMITTED TO THE SYSTEM DESIGN AND MANAGEMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN MANAGEMENT AND ENGINEERING

ABSTRACT

This research study analyzes the evolution of the technology strategy for high-tech startup firms. As such, this thesis addresses several questions relating to the determinants of survival for new firms in high-technology sectors: What are the key factors associated with survival and success in high-technology environments? Are there systematic features associated with the technology strategies of successful firms?

The research is organized around a systematic framework for analyzing the development and evolution of technology strategy in high-technology start-up firms. Using this framework, the thesis analyzes various aspects of the start-up experience, including organizational design, the formulation of a customer value proposition, the perception of the competitive environment, and the development of a strategy to differentiate the firm from current and potential competition. We analyze how these characteristics relate to each other in order to identify the role played by the firm’s founder in shaping a successful technology strategy in high-technology competitive environments.

The thesis begins with a review of the existing literature in the fields of technology strategy, business strategy, and entrepreneurship, with special attention to each of these as applied to the development and evolution of technology strategy in high-technology environments. The methodology and data collection associated with the thesis are then reviewed; the key data come from a detailed questionnaire used to interview the founders of nine startup companies. After reviewing the results from the data collection process through statistical analyses, the thesis attempts to draw some preliminary conclusions. First, the data suggest several strategic
recommendations for high technology firms with respect to organizational structure, the
development of a customer value proposition, and competitive strategy. As well,
recommendations are developed about the qualities required for a high-tech entrepreneur to
succeed in the high-tech market place. The thesis concludes with suggestions for future directions
to extend this study.

Thesis Advisor: Scott Stern
Title: Assistant Professor, Sloan School of Management
I am indebted to my thesis advisor for his continued encouragement and guidance. I thank him profusely for introducing me to the world of technology strategy and for his occasional gentle tapping on my shoulders, whenever I was heading in the other direction. Matt Utterback from the Entrepreneurship center was helpful in providing access to the database of companies maintained by the MIT Entrepreneurship Center.

I am also grateful to my dear wife, Chanchal, for patiently dealing with my absence from home. She has always supported me, even while I was busy juggling work and studies and has stood behind me like a rock. Thanks to my little daughter Aahana, who could not understand why papa could not spend more time playing with her. I hope that she would understand it some day! Thanks a ton to her, for unknowingly, bringing so much joy to my life.

I would like to thank my dear brother, Akhil, and his wife, Nina, for giving me overwhelming support and encouragement. The same holds true for my other members of the family who were also very encouraging. Finally, but not the least, I would like to thank my wonderful parents for lighting that fire inside me, which drives me to seek constant renewal and to seek perfection.
Section 1: INTRODUCTION

“High-technology entrepreneurship” is perhaps one of the most talked-about but least well understood areas of engineering and management. So much having been written about this type of competitive environment, “high technology” has become an overloaded phrase and the nature of the challenges facing managers in this environment become easily caricatured or misunderstood. As well, though Entrepreneurship and Strategy are popular fields of study with strong academic and practitioner interest, most empirical studies tend to focus on mature firms. Consequently, though there is a “boom” in Internet startup activity and many firms in the high-technology sector have been afforded dramatic market capitalization by investors, little systematic strategic guidance is available for high-technology entrepreneurs.

This thesis is motivated by the need to develop guidelines for evaluating strategy in the context of high-technology entrepreneurship. What is different about the current competitive environment, or technical and managerial challenges associated with “high technology”? Did such challenges exist 50 years ago? Or, did the development and commercialization of personal computers and networking technology in the 1970’s and 1980’s create a unique environment requiring new assumptions and novel strategy rules and approaches? Finally, are the challenges facing new entrepreneurial firms similar to those encountered by more established organizations in the high-technology environment? How should strategy differ between these two types of organizations?

Our analysis jointly addresses questions about three distinct areas: entrepreneurship, technology strategy choice, and the specific features of the high-technology environment. Prior research in management has evaluated each of these areas individually. However, few theoretical frameworks or empirical studies tie them together at the same time. For example, in recent years, there has been a great deal of new research on the unique features and strategies for the digital high-technology world [35]. As well, there has been an upsurge in research on the process of entrepreneurship and the boom in venture capital investment [3], [34]. Though these recent publications address the distinctive features of high technology and the challenges of entrepreneurship
respectively, neither focuses on specific issues of entrepreneurship in the context of the high-technology environment. This thesis attempts to shed some light in this respect, and in doing so helps contribute to our understanding of this exciting but extremely uncertain environment.

We begin our analysis in section 2 where we review the definitions and prior literature associated with these three main areas as previously mentioned. Based on this review, the remainder of the thesis focuses on an empirical analysis of a sample of high-technology entrepreneurs. In section 3, we outline the development and implementation of a survey and case studies, which examines the strategy process in 11 high-tech firms. We analyze various aspects of the start-up experience, including organizational design, the formulation of a customer value proposition, the perception of the competitive environment, and the development of a strategy to differentiate the firm from current and potential competition. Section 4 presents our findings by analyzing how these characteristics relate to each other in order to identify the role played by the firm’s founder in shaping a successful technology strategy in high-technology competitive environments.

Using the data collected from these 11 firms and through detailed statistical analyses thereof, section 5 suggests several strategic recommendations for high technology firms with respect to organizational structure, the development of a customer value proposition, and competitive strategy.

Some of the results obtained were revealing as well as surprising. We find that the founders of high-tech companies have a strong technical background that helps them to understand the technological landscape better than it helps others. This understanding is a source of competitive advantage for the firm, given the technology and market related uncertainty associated with high technology. Their background also allows them to learn from the marketplace, through creative synthesis of the feedback from their lead customers and their key strategic partners. Further, the financial risk borne by the founders is minimal due to the easy access of internal and external funding to the high-tech industry.

During the initial stages, a startup firm needs to formulate ambitious goals. Ambitious goals help it to secure internal and external resources and to instill confidence
in various stakeholders to repose their confidence and faith with the firm. This is essential for the long-term survival of the firm.

We find that product differentiation is the most effective strategy used by the startup firms to differentiate itself. Very few competitors enter the marketplace through imitation of the incumbent firm’s strategies. In some cases, first mover’s advantages were large and the requirement of specialized resources protected the first entrant from the subsequent ones.

For an overview of the relevant strategic variables and recommendations, please take a quick look at section 5.7.

As well, recommendations are developed about the qualities required for an entrepreneur to succeed in the high-tech market place. Several of these are unique in terms of characteristics to the environment as outlined in section 2 below. Finally, Section 6 concludes with recommendations for future directions and extensions.
Section 2: BACKGROUND AND RESEARCH REVIEW

The principal goal of this thesis is to evaluate and recommend a technology strategy framework for high-tech startup firms, and to provide recommendations for the role of founders in such startup organizations. In order to do this, we need to bridge three areas of prior research, namely Entrepreneurship, Technology strategy and High technology, which have been developed, in the past, mostly independent of each other.

Reviewing the research in these areas, we begin by studying distinctive features of startup firms, and how they differ from mature firms, in sub-section 2.1. Sub-section 2.2 describes the characteristics of high technology, and herein, we adopt a definition for “high-tech” that we will use through the remainder of the thesis. The existing theories of business strategy models for enterprises and how they apply to new startup firms are described in sub-section 2.3. Sub-section 2.4 describes the various tasks for the entrepreneur of the new enterprise in order to make the firm successful. Finally, sub-section 2.5 concludes this section by summarizing the first two sections, and provides a lead into the latter half of the thesis that develops the strategic framework for successful high-tech startup firms.

2.1 Start-Up Challenges

The transition of a fledgling business into a large, well-established corporation requires a fundamental transformation rather than a simple scaling up because of some basic differences in their attributes. Following the resource based view of the firm [14], [32], [23], a firm is defined as comprising of a distinctive bundle of assets which encompass the firm’s properties (e.g., its plants or patents), reputations (e.g., for fair dealing and reliability), relationships with customers and providers of inputs, and competencies or capabilities.
Startup firms differ from more established firms in three fundamental ways. Firstly, mature firms have more diverse assets than startup firms do. Secondly, resource coordination mechanisms are much better developed in a mature firm. Finally, the firm’s capacity for growth has an influence on its survival. We elaborate on these aspects below [3]:

1. **Diverse assets**: Large well-established firms comprise a more heterogeneous bundle of assets. A broad base of assets fosters longevity because of complementarities, or synergies and insurance effects. However, they create offsetting problems that require long-lived firms to have effective coordination mechanisms.

   **Complementarity**: The distinctive assets that give a firm its identity (such as unique products, know-how and relationships) have limited value on their own. Their optimal use requires other distinctive assets to complement their function. Failure to develop effective complements encourages stockholders and other resource providers to withdraw the asset from the firm.

   **Insurance**: A broad base of assets also provides insurance against the loss of value of any one asset because of imitation by rival’s shifts in demand and so on. Multiple product lines, technologies and organizational capabilities, afford a far greater protection than simply having a lot of cash on hand, or having access to financial markets. Henderson’s study of the photolithography industry [16], and Christiansen’s study of the disk drive industry [6], show that winners often do not repeat in successive rounds of technological races. One explanation is that a winning round leads to myopia or incompetence—the winner does not recognize the threat from the future generations of technology or does not manage the development process efficiently.

Diverse assets provide what Dixit and Pindyck [7], call a valuable “option to wait”, until uncertainties about market size and product attributes have been reduced to a point where the corporate decision making process can endorse a substantial commitment to resources. They do not of course, ensure success, but they give late entrants more of a chance to catch up.
2. **Coordination mechanisms:** The benefits of heterogeneity have offsetting costs. Complementarities also entail potential conflicts. As we will see below, the problems that arise due to heterogeneity defy simple “structural” remedies such as common ownership of complementary assets or the adoption of multi-divisional organizational structures. A firm’s capacity to coordinate diverse assets is deeply embedded in its routines, processes, formal and tacit reporting relationships, incentive and control systems, norms, values and other resource providers. This capacity for coordination represents a critical meta-asset of long lived companies. Firms cannot purchase effective mechanisms to coordinate assets off the shelf (e.g., as they might a payroll management system) or copy them from rivals, and poor coordination mechanisms cause the unraveling of the distinctive assets that comprise a firm.

**Joint ownership:** Some “transaction cost” theorists relate the mitigation of conflicts between complementary activities to their joint ownership. The relative efficiency of vertical integration depends “on concrete specific personal relations that develop within or between firms.” Granovetter [13] writes that: “even with complex transactions a high level of order can be found in the market” -- that is, across firm boundaries – and a correspondingly high level of disorder within the firm. Amar Bhide [3] claims that “both order and disorder, honesty and malfeasance, have more to do with the structures of such relations than they do with the organizational form.”

**Organizational Structure:** The adoption of multi-divisional organizational structures, Williamson [38] and other theorists suggest, also represents a powerful solution to the problem of coordinating diversified assets. Chandler highlights the development of the decentralized, multidivisional organizational form (later called the M-form) as a critical innovation of the 20th century.

Therefore, to summarize, long-lived firms resemble species that have evolved many specialized functions rather than unicellular organisms. They have many assets to sustain their profitability. Assets cannot stand-alone, their value is derived from their association with complementary assets. A broad base of assets also contributes to firm longevity by providing insurance against the loss of value of individual components. However the same also creates coordination problems that defy simple solutions – conflicts between
complementary functions for instance do not go away because of their joint ownership. Rather, the net benefits of heterogeneity depend on the quality of deeply embedded coordination mechanisms. Long-lived firms exhibit a high-level of coordinated heterogeneity. Their coordination mechanisms allow them to derive more benefits than costs from complex business systems.

3. Longevity and Growth:

A firm’s capacity for growth has an important influence on its survival. This sub-section explores the subtle relationship between longevity and growth. A firm cannot easily stop growing after it has reached some fixed critical mass. Just as bicyclists have to keep moving to maintain their balance, so competitive forces and stakeholder forces often require firms to keep growing to survive.

Pressures to grow: Firms keep growing in the Penrose-Rubin [22], [33], model, to use the progressive increase in their unused managerial capacity. The lumpiness of assets creates similar incentives to grow. In a firm with heterogeneous assets, as Penrose points out, lumpiness or indivisibilities will cause the under utilization of some assets. External labor markets can also create incentives to grow. Growth is a matter of survival “depending on attracting high caliber people”, who wanted to “align their careers only with a company that offered many opportunities” for personal growth and progress.”

Competitive forces have a similar effect. A firm can’t remain small if its rivals increase market share by exploiting economies of scale or if customers believe that size is a pre-condition for long run survival.

Growth can help reduce conflicts within the firm as has been found through human psychology studies. Growth also creates a sense of pride in the accomplishment of the organization and encourages individuals to internalize the interests of the overall group.

Capacity for Growth: The size of the market for its products or services it carries often determines a firm’s growth potential. The long-term growth potential depends on the productive capacity of the firm’s assets and its coordination capabilities. A firm’s coordination mechanisms affect its growth potential, because, growth inevitably increases
the diversity of assets and activities. Limits on the firm’s coordination capabilities, in combination with the pressures to keep growing, can lead to its eventual demise even in the absence of significant competitive threats.

Most fledgling businesses do not satisfy the requirements for long term survival and growth. They lack a broad base of valuable assets. Rather, they resemble the undifferentiated firm found in the models of perfect competition that use similar inputs and technologies to produce similar products as their rivals.

### 2.2 High Technology Environment

In this sub-section, we will adopt a definition for the phrase “high-technology” which we will use through the remainder of this thesis. In sub-section section 2.2.1, we define the key drivers for the high-technology environment. These drivers are unique to the high-technology environment, hence understanding them is important in order to formulate targeted and successful strategies that work for this environment.

These are some of the definitions of high technology from standard sources:

- The US bureau of labor statistics labels any industry having twice the number of technical employees and double the R&D outlays of the US average as high-tech.
- Regis McKenna asserts that high-tech industries are characterized by complex products, large number of entrepreneurial competitors, customer confusion and rapid change.
- William Shanklin and John Ryans apply the high-tech label to “any company that participates in a business with high-tech characteristics: the business requires a strong scientific/technical basis; new technology can obsolete old technology rapidly; and as new technologies come on stream, their applications create of revolutionize demand.

We will adopt the definition for “high-technology” from Moriarty and Kosnik [19]. High Technology involves uncertainty about both the market and the technology. We adopt this definition for two reasons. Firstly, the framework is able to help us clearly discern the unique characteristics associated with high technology, and puts it in
perspective with respect to the other technology and market determinants for low
technology and high fashion. Secondly, this definition aids our goal of defining a
successful strategy for the high-tech environment as it deals with the important
determinants of both the market and technological uncertainty. It is in contrast to the
conventional wisdom of associating “high-tech” with innovative technology only, and
hence does justice to the defining characteristics of high-tech.

The first dimension is market uncertainty, i.e. ambiguity about the type and extent of
customer needs that can be satisfied by the technology. The second dimension is
technological uncertainty. Market uncertainty is not knowing what the customers want
from the new technology. Technological uncertainty is not knowing whether the
technology, or the company providing it, can deliver on its promise to meet the customer
needs, once they have been articulated. Figure 2.1 below shows the role that
technological uncertainty and marketing uncertainty play in high technology. This is a
slightly modified version of the figure in [19] and characterizes high technology instead
of high-technology marketing.

The first quadrant is low-tech, the application of technology for well-established
needs. Examples include a variety of mature products ranging from milk and coffee to
grinding wheels and steel strapping. The second is a better mousetrap technology, in
which new technology is introduced to solve an age-old problem. An example of this is a
new drug administered in familiar tablet form, which cures cancer or helps the buyer to
loose weight. The needs to be satisfied in this case are clear. The third situation is high-
fashion technology in which the technology changes relatively slowly, but consumer
tastes are difficult to predict. Products in this category include designer jeans, running
shoes and motion pictures.
Figure 2.1: A taxonomy of technology and market uncertainty

Why are the needs more likely to be uncertain in a high-tech environment? This is due to five primary reasons:

1. Confronted with a new technology, customers may not understand what needs the technology could satisfy. A common example is the first-time purchase of a microcomputer. Choice is forced on many managers, between desktops and laptops, PC’s and Macintoshes, without fully understanding how each would perform various management tasks.

2. Customer needs once known may be subject to rapid and unpredictable changes as the environment evolves. Computer software to support income tax preparation is an example.
3. Whether the market will eventually establish technical standards, with which the products must be compatible, if the buyer hopes to use them with other products, people or organizations. The debate over VHS and Beta-max formats in the early years of VCR's is an example of this type of market uncertainty.

4. Predicting how fast a high-tech innovation will spread is difficult. An example is the difficulty market researchers have had predicting the future unit sales of innovations ranging from VCR's to office automation systems.

5. All the above reasons make it very hard to establish the size of the potential market. For example, the classic case often discussed is that of IBM. In 1959, it turned down an offer from a startup company called Haloid corporation to invest in a new total xerographic technology because a consulting study predicted the total market for the Xerox 914 was a mere 5,000 units. A decade later, Haloid (which became Xerox Corporation) had sold 200,000 of the 914's and was a billion-dollar company.

Reasons one and two listed above help understand the high-tech customer needs and puts it in perspective of the rapid changes taking place in the environment. Reason three forms the corner stone of a successful strategy in the high-tech environment. Finally, reasons four and five help determine the size of the target market served by the product/service and provides estimates about how fast the technology would be adopted by the marketplace.

Similarly, to the various factors causing market uncertainty, five factors cause technological uncertainty:

1. Lack of information about a product's final performance – whether it will do what the seller promises? For example, when the computer time-sharing systems were being adopted in the 1970's, both buyers and sellers of computers often encountered this uncertainty when trying to establish the response time (how fast the computer responded to a user at a terminal) of different machines under different usage conditions.
2. The company supplying the technology may not have an established a track record for delivery. Several situations may elicit uncertainty over delivery. The tendency of computer hardware and software manufacturers to miss promised delivery dates for new products is the rule, rather than the exception. Such practices have lead to a new phrase, “vaporware,” which refers to products promised to the market place that may never be completed or delivered.

3. There is uncertainty over whether the supplier of a high-tech product will be able to provide prompt, effective service. However, uncertainty about the service in high-tech setting raised the limited data about how the new technology will behave in the field.

4. The technology may have unanticipated side effects. In the 1980’s, the increased use of microcomputers and computer networks was accompanied by an increase in unauthorized access to business and government computer systems. The press reported numerous threats to businesses, including embezzlement and computer fraud.

5. Finally, technological uncertainty may arise because of questions about technological obsolescence – whether and when the market will turn to another technology to replace the current generation of products. The risk of obsolescence may occur long after a technology has found a stable market. We will revisit this issue related to disruptive technologies later during this section.

Among the various reasons listed above, number one, two and three are challenges that a startup firm intending to bring a new technology to the market, has to face and overcome, to succeed in the market place. The strategy formulation process should take into account reasons four and five. New firms have to constantly justify their technologies to the marketplace, convince customers and partners to repose their faith in them.

2.2.1 Drivers of the high tech environment

Listed below are some of the laws and technologies governing and shaping the high technology industry. It is important to understand them, in order to grasp the underlying
technologies, the expected pace of change in this environment and the underlying
economics behind the phenomenon. This in-turn would help us to predict the pace of
change, and to formulate successful strategies to succeed in this environment.

Rapid changes in the Semiconductor industry, the Networking industry, the
Telecom industry, the Information Technology and the Software industry characterize the
high-tech environment.

Moore’s law

Moore’s law states that the packing density of transistors on a single integrated circuit
(IC) will double every 18 months. This law has major ramifications. Firstly this means
that digital computing power would get faster and cheaper at an exponential rate.
Secondly, using the law of exponential numbers, it is easy to see, that given the decrease
in the cost of computing technology, eventually the cost of digital computing would be
free. There are some doubts about whether this law would hold in the longer term.
However, based on current predictions, this should at least be valid until the year 2012.

This law leads us to the second law shaping the high technology.

Technology paradox

Businesses can thrive at the very moment when their prices are falling the fastest [4].
“The only thing that matters is that the exponential growth of your companies is faster
than the exponential decline of your prices.” The rules for success in high technology
require more than ingenuity, speed and agility. They call for redefining value in an
economy where the cost of raw technology is plummeting towards zero, as mentioned
earlier. Eventually, this plunge will obliterate the worth of almost any specific piece of
hardware or software. Then, the value will be in establishing a long-term relationship
with a customer, even if it means giving the first generation of a product away!

Internet

The Internet is a web of networks, connecting a large number of computer networks
around the world. This allows businesses, educational institutions and government
computer networks around the world to connect and work together using a standard networking protocol called TCP/IP (transmission control protocol/Internet Protocol).

Various protocols governing the structure of the Internet are decided by an engineering task force, called the IETF (Internet engineering task force) that is responsible for setting the Internet standards. The entire suite of Internet related protocols is based on open standards, which allows anybody to contribute towards future Internet standards, and to use them to build Internet compatible products and services. Because of the open standards, and the compelling applications available on the Internet, such as email, World Wide Web (WWW), the adoption rate of the Internet as a technology has been phenomenal. In fact, it has affected every aspect of our life in a very profound way.

The Internet has had a deep impact on the businesses as well. Virtual Businesses have sprung in every part of the world, and they offer products and services globally. Small firms have become multinational players, inspite of being located in a corner of the world. All this has been made possible due to the all invasive reach of the Internet, easy accessibility to the consumer, and due to its ability to connect the community of users around the world. The world has become a big user community and a global village.

Businesses are scrambling to recognize the impact of the Internet on their business revenues. For example, a traditional brick and mortar firm, Barnes and Nobles Inc was the biggest bookseller, before Amazon.com, the Internet based bookseller started out by selling books over the Internet. Barnes and Nobles Inc., was slightly late in realizing the full potential of the Internet. The net result was that Amazon.com is now the world’s largest bookstore and has a market capitalization that grossly exceeds that of Barnes and Nobles Inc.

Almost overnight, a large number of Internet based companies such as Amazon.com, Yahoo.com, Ebay.com have sprung up which offer unique products and services to interested buyers. “Business to Consumer” and “Business to Business” commerce is flourishing over the Internet. Forester research estimates that “Business to Consumer” based electronic commerce will be worth 50 billion dollars in 1999. In
addition, by 2003, it is predicted that “Business to Business” e-commerce will be worth 1.5 trillion dollars, and will be the biggest revenue driver for the Internet.

However, because of its huge popularity and its rapid global adoption, the Internet now has its own share of problems. The Internet has not been designed to handle such a heavy traffic load. It is congested due to excessive traffic flow. The volume of non-data traffic, such as voice and video traffic is also increasing everyday. Besides, there is another problem. The Internet Protocols do not provide any Quality of Service (QoS) guarantees. Lack of QoS guarantees from the Internet rules out any assurances that the data sent from one end of the Internet will reach the destination within a specified duration. This has caused several outages, unexpected delays causing huge amounts of losses for businesses and consumers who rely on the Internet to do business.

The IETF is working to establish the next generation of Internet Protocol, IPv6 which will have quality of service guarantees with respect guaranteeing transmission latencies, providing delay bounds and reducing jitter effects.

Metcalfe’s law

It is also referred to as the value of communities. In a network with N nodes, there are \( \frac{1}{2}N(N-1) \) possible interconnections. If each interconnection has the same value, the value of the network is proportional to \( N(N-1) \), or approximately \( N^2 \) for large \( N \). Put differently, the value of a network is a convex function of the number of users connecting through the network. Each user adds more than a proportionate value to the network, because by being on the network all the other users can interact with him/her. This truism is called Metcalfe’s law (named after Robert Metcalfe, the inventor of Ethernet).

Metcalfe’s law, stated alternatively as that the value of a network is a convex function of the number of users connected to it, implies a “critical mass” phenomenon: With a small number of users, usage will be choked off, whereas for a sufficiently large number of users, network use will take off. A great example of this law is the widespread use of the Internet. Once the number of users on the Internet reached critical mass thanks to the introduction of the browser and the World Wide Web, its use became widespread.
And with more users browsing the Internet, individuals and companies add content, create virtual communities and implement electronic storefronts and trading hubs that increase the value of the network for each connected user. This attracts more users, further increasing the value of the network for each user. Metcalfe’s law is a concrete representation of this virtuous cycle.

The law of Input Substitution and Digital Convergence

With the cost of handling bits falling so fast, and the power to calculate with bits rising so quickly, it makes sense to substitute bits for atoms [15], whenever possible. This is called the law of input substitution. When an input to production gets cheaper, input substitution dictates that we substitute that cheaper input for other inputs that have stayed the same or becomes more expensive. Another way of expressing this is in terms of relative prices. It is most economical to use more of the inputs whose relative prices have fallen.

Another force driving the use of bits is convergence. As more devices become digital, the separation between products is breaking down. Televisions become more like computers, and computers become more like TV’s. Telephones acquire computing power, and one can use the laptop computer to place a call. Since all such forms of data generated are digital, they can now be transported, by being multiplexed, over a single transmission medium. In fact, the Internet is becoming the de-facto transmission medium to carry the digital bits for converged traffic. Hence, the computer industry, the communications and the telecommunications industry are moving towards using the Internet to transmit data for different purposes. The voice/video over Internet Protocols effort from the telecommunications industry, media streaming and other data transmission efforts over the Internet from the computer industry, and the use of Internet as a packet switched communications networks, are definite steps in that direction.

However, as mentioned earlier, the Internet lacks quality of service guarantees and hence cannot support transmission of interactive real-time traffic, such as audio and video. A true “digital” convergence will not really take place until such problems are sorted out. The good news is that the IETF is working to solve some of these problems
and within a few years, there will be a number of solutions available to address such problems.

Because of this convergence, products that can handle bits in a consistent and powerful way increasingly surround consumers and firms. Once some portion of the world has become digitized – has become represented in zeroes and ones – it can be sent, stored and reproduced with very similar machinery. Industries that once used separate approaches now have many technological similarities. The same digital CD is used to send products like record albums and computer disks, instead of the unique packaging required earlier. Telephone and computer links now travel over the same digital-fiber optic cable.

**Living on Internet time: Time to market issues**

Engineering efficiency in product design is nice, but with computing, communication resources so cheap, and speed to market being so essential, quick and dirty is often the best route. In fact, being first to market can make all the difference between success and failure, or being wildly or moderately successful. For example, the success stories of Yahoo and Excite have some important lessons for the High-tech Internet age. Excite had a better technology as compared to Yahoo. The founder’s of both the companies are Stanford alumni. However, Yahoo understood one of the most important rules in any market: “Be there first.” While neck and neck in developing the basic Internet search technology, Yahoo went live in April 1994. Excite did not show up until October 1995. That 18-month lead established Yahoo as the pre-eminent search engine brand, Excite has tried to play catch-up since then. It never has. The result is that Jerry Yang and David Filo, the founders of Yahoo, are the poster boys for high-tech success and are worth billions of dollars due to appreciation of Yahoo stock. Whereas, the four excite founders are worth 155 million, combined [9]. Neither of them even makes it to the top 100. Yahoo also proved another high-tech adage. The best technology does not always win. Excite’s search software won praise for being very precise. Yahoo’s directory technology was at first much less effective. Nevertheless, Yahoo’s marketplace lead made up for its software failings.
Hence, to succeed in the high-tech marketplace, times to market issues are of primary concern.

**Technology life cycles and crossing the chasm**

The following books by Geoffrey Moore [17], [18] are part of the folklore in the high-technology industry. We will not go into too much detail, describing the analysis of the book, but would only summarize its findings.

Technological products have a fascinating lifecycle as they progress from birth through maturity. The same product that was attractive and desired in its youth can be irrelevant and ignored at maturity [8].

In the early days of the technology, some people will buy, because of the functions it offers. These are called early adopters, people who will buy because they are in love with technology and will buy any new item, or whose needs for the newly developed functions are so great that they are willing to put up with any other problems. New technology, functionality that is what these early adopters purchase. Specific features and technological claims promote and sell products. The result is technology driven feature-laden products, as shown on the left-hand side of the Figure 2.2 below. Once technologies mature, we take their basic performance for granted. We assume it works just fine for our purposes. Therefore, we look for other properties: price, value, prestige, appearance, and convenience. We purchase by brand name as much as by actual product.

A vast chasm separates the requirements of the people on the early side of the product life from those on the late side. The first, early adopters want technological superiority, and they will suffer any cost, whether initial purchase price or cost of maintenance and usage for benefits. On the other hand, the conservative late adopters want reliability and simplicity: Their creed is “turn on, use it and forget it.”

The problem faced by a high-tech company is that the strategy for dealing with customers in the early stages is contradictory to the strategy required in the mature phase. At first, the selling point is the technology and the list of features. Technology attributes
need to be minimized at maturity as a future selling point. The buyers now focus on solutions and convenience, on their experience with the product. They want to talk to experts in their problem areas, not experts in technology.

Given the above information, it is very important to recognize the presence of the chasm in the technology diffusion process. Further, it is necessary to understand the location point on the diffusion curve, where the current technology offering from the company resides. Depending on which side of the chasm the technology adoption is, products and services offered by the company needs to be re-designed if necessary, to suit the demand of the consumers.

Crossing the Chasm

Figure 2.2: Crossing the Chasm

Economics of information goods

Information goods, defined as goods distributed in digital form, have always been characterized by a distinctive cost structure. Producing the first copy is often very
expensive, but producing subsequent copies is very cheap [36]. A book publisher for example may spend hundreds and thousands of dollars to acquire, edit and design a manuscript. Nevertheless, once the first copy of the book is printed, the cost of printing another one, is usually only a few dollars. The fixed costs of producing information are large in other words, but the variable costs of reproducing it are small. The sharp skew towards fixed costs is not the only thing distinctive about the cost structure of information goods. The fixed costs and the variable costs themselves have unusual characteristics. Sunk costs, i.e., costs that are not recoverable, if production halts, tend to dominate fixed costs. If you invest in a new office building or factory and later decide you do not need it, you can recover parts of your fixed costs by selling the facility. However, if the book is a flop, all the production costs are lost.

The variable costs of producing information also have a unique feature: producing a large number of copies does not affect the unit cost of creating each additional copy of an information product. Information producers, in other words, have little capacity constraints, which is quite a different situation from that faced by most manufacturers.

Pricing of goods in a competitive environment is better understood through an understanding of their economics. Further strategies such as versioning of goods, discussed in section 2 later, are essential components of a technology strategy for the high-tech firm.

2.3 Technology Strategy

This sub-section reviews the existing strategic frameworks, and suggests modifications in order to apply them to high-tech startup firms. The rest of the sub-section is organized as follows. Sub-section 2.3.1 reviews the existing business strategy models and the strategy formulation process. We look at the core competence view of a firm as championed by Prahlad and Hamel. A brief review of the work by Henderson and Clark is done to drive in the point that the strategy formulation process needs to explicitly consider the organization variables that can affect the survival of high-tech firms. The effect of new and disruptive technologies on incumbent firms, as per the framework proposed by
Christiansen and Bower is also discussed. It is important to discern disruptive technologies and take remedial actions to survive in the high-tech marketplace. Otherwise, examples abound about well-established companies getting blind-sighted by incumbent technologies and hence leading to failure, due to stealth attack from new emerging technologies. The next sub-section 2.3.2 discusses a set of effective strategies for the high-tech economy. In subsection 2.3.3, we criticize some aspects of the existing strategy frameworks. As mentioned earlier, most of the existing strategy literature deals with mature firms only and hence their relevance to the strategy formulation process as applied to startup firms is questionable. Hence, we discuss some modifications to the existing strategy framework, as suggested by Amar Bhide [3], so that we can talk about technology strategy for new startup firms in a coherent and consistent way.

2.3.1 Business Strategy Models

Kenneth Andrews published a comprehensive synthesis, the book “concept of corporate strategy”, [1], in 1971. A firm’s strategy was “the pattern of purposes and policies defining the company and its business,” which the chief executive or president had to formulate and then implement. Formulating strategy (“deciding what to do”) required the consideration of factors such as goals and values of the decision-makers, the company’s resources and competencies, and the external or market opportunities and threats. An optimal strategy involved a good “match” between goals, resources, and opportunities. The implementation (“achieving results”) of strategy comprised “primarily administrative” activities, such as, establishing or modifying the organizational structures, incentive and control systems and the recruitment of personnel.

Michael porter [27], who started out as an IO economist, revolutionized the field of strategy. He recognized that variable IO research, which had shown to affect the profitability of an industry, could be used by strategists to identify the attractiveness of a business. As Ghemawat puts it [12], “IO economists focussed on issues of public policy rather than business policy: they concerned themselves with the minimization rather than the maximization of excess profits”. Porter instead tried to “turn IO on its head by focussing on the business policy objective of profit maximization rather than the public policy objective of minimizing excessive profits.” Porter’s “five forces” framework also
incorporated practical rules of thumb that did not come out of the IO research. The incorporation of experimental rules into a framework with prima-facie plausibility and consistency had a profound influence on the process strategy formulation. Porter’s framework made the ad-hoc process of matching a company’s goals, opportunities and assets, much more systematic and standardized. He also gave business strategists a common vocabulary that helped establish strategy formulation as a specialized business function.

Core competence of the corporation

In their paper, [30], Prahlad and Hamel argue that the success of a corporation hinges on its core competencies and how they identify, define, enhance and leverage them.

In the short run, a company’s competitiveness emerges from the price performance attributes of current products. However, the survivors of the first wave of global competition, Western and Japanese alike, are converging on similar formidable standards for product cost and quality. This reduces hurdles for continued competition, but progressively declines as a source of differential advantage. In the long run, competitiveness derives from an ability to build, at lower cost and more speedily than competitors, using the core competencies that spawn unanticipated products. Management’s ability to consolidate corporate wide technologies and production skills into competencies that empower individual businesses to adapt quickly to changing opportunities are the real sources of advantage. Core competencies constitute the collective learning in the organization, especially the ability the ability to coordinate diverse production skills and integrate multiple streams of technologies.

Once the top management has identified overarching core competencies, it must ask businesses to identify the projects and people closely connected with them. This sends an important signal to middle management - corporate management can reallocate core competencies, since they are corporate resources. For example, elements of Canon’s core competence in optics are spread across businesses as diverse as cameras, copiers, and semiconductor lithographic equipment. The core competency model should per-se be incorporated through an alteration of the reward system of the organization. Reward
systems that focus only on product-line results and career paths that seldom cross Strategic Business Units (SBU’s) boundaries, engender patterns on behavior among unit managers that are destructively competitive. They recommend that competence carriers should be regularly brought together from across the corporation to trade notes and ideas. Largely, their loyalty should be to the integrity of the core competence area they represent, and not just to the particular area of business. Lastly, they recommend that top management must add value by enunciating the strategic architecture that guides the competence acquisition process.

**Organizational Variables and Strategy**

In [16], Henderson and Clark examine the importance of the various organizational variables responsible for the failure of established firms. Traditional categorization of innovation, as either incremental or radical, is incomplete and potentially misleading. It does not account for the disastrous effects on industry incumbents of seemingly minor improvements in technological products. They categorize product innovations by looking at the product architecture more closely. Innovations in product architecture sometimes change the architecture of the product without changing its components. Such innovations destroy the usefulness of the architectural knowledge of established firms. Further, since architectural knowledge tends to become embedded in the structure and information-processing procedures of established organizations, this destruction is difficult for firms to recognize and hard to correct. Architectural innovations therefore, present established organizations with subtle challenges that may have significant competitive implications. Data drawn from the semi-conductor photolithographic alignment equipment industry where architectural innovations are very common, proved this.

This analysis assumes that the knowledge and information processing structure of the organization mirrors the internal structure of the product that they are designed with.

The effect of architectural innovations depends in a direct way on the nature of organizational learning. Given the evolutionary character of development, and the prevalence of dominant designs, there appears to be a tendency for active learning among
the engineers, to focus on improvements in performance within a stable product architecture. Learning about changes in architecture, about new interactions between familiar components may not occur naturally. It requires explicit management and attention.

The understanding of an architectural innovation has the potential to offer firms the opportunity to gain significant advantage over well entrenched, dominant firms. We might expect less entrenched competitor firms to actively search for opportunities to introduce changes in product architecture in an industry.

Disruptive Technologies and Strategy

In [6], Christensen and Bower examine established firms, and the reason why firms that are regarded as astutely managed at one point, subsequently lose their leading positions in industry when faced with technological changes from a new entrant. They represent a model grounded in a study of the world disk drive industry. This model charts the process through which the demands of a firm’s customers shape the allocation of resources in technological innovation. It is a model that links theories of resource dependence and resource allocation. Their analysis shows that established firms lead the industry in developing technologies of every sort, even radical ones, whenever the technologies addressed existing customer needs. The same firms failed to develop simpler technologies, the use whereof was confined initially to emerging markets, because impetus coalesced behind and resources were allocated to, programs targeting powerful customers. Projects targeted at technologies for which no customers yet exist languish for lack of impetus and resources. Because the rate of technical progress can exceed the performance demanded in a market, technologies which initially can only be used in emerging markets can later invade mainstream ones, carrying entrant firms to victory over established firms.

2.3.2 Strategies for the High-technology economy

Strategies aligned to deal with the high-tech marketplace have been described below. Several of these have been culled from [35] based on their applicability to the high-tech
environment. During the latter part of this sub-section, we describe the bowling alley effect, a well-known strategy used by high-tech firms to design products and services for niche market segments. This enables the “new” technology to cross the chasm, thus paving the way for mass adoption. This has been derived from [17] and [18].

The technology entrepreneur should fully understand and internalize these strategies. The applicability of these strategies would vary depending on its appropriateness to the context as described below.

**Leveraging Network effects:** The economics of networks constitutes the information age and not the economics of factories. Positive feedback is hence, central to the network economy.

It is the dynamic process by which the strong get stronger, but it also makes the weak, weaker. Adoption dynamics in the presence of positive feedback tend to follow a predictable pattern. The typical pattern involves an S-shaped diffusion curve as discussed earlier. A slow start followed by explosive growth, then saturation.

Consumers' value information technologies that are widely used, just as they value communications networks with a broad reach. The resulting demand side economies of scale, or network externalities, are major causes of positive feedback in the information economy. Consumer expectations are vital to obtaining the critical mass necessary to fuel growth. During the early stages of the product introduction, expectations management is critical.

Firms introducing new products and technologies face a fundamental trade-off between performance and compatibility. The evolution strategy for products involves a high degree of backward compatibility but limited performance improvement. The revolution strategy involves little or no compatibility with existing products but compelling performance. Firms introducing new products and technologies also face a fundamental trade-off between openness and control. More popularity is gained by open technologies, but the rewards from such success are far greater for an innovator who can retain control over the use and design of his/her technology.
Understanding the mechanics of network effects is important, since it could be an essential determinant of a successful technology strategy for the high-tech startup firm. Designing a product architecture that leverages the network effect, and generates a positive feedback, can make all the difference between a successful firm and an unsuccessful one.

**Standards setting and complementary goods:** To compete effectively in network markets firms’ need allies, and choosing and attracting them becomes a critical aspect of strategy in the network economy. Competition thus becomes a mixture of politics and economics. The firm must assemble allies to promote a standard and then compete against these same companies once the standard is established.

To find natural allies, the firm must determine how a proposed standard will affect competition. Standards alter competition in several predictable ways. They can expand network externalities, reduce uncertainty, and reduce consumer lock-in. Standards, also shift competition from a winner-take-all battle to a more conventional struggle for market share, from the present into the future, from features to prices, and from systems to components.

Standards tend to benefit consumers and suppliers of complements at the expense of incumbents and sellers of substitutes. All groups benefiting from a standard should be searched for allies.

More standards than ever before are developed today through formal standards setting. It is a slow process, but it can give a new technology enormous credibility. It is important to find natural allies and negotiate to gain their support for the firm’s technology. Allies can include customers, complementors, suppliers and competitors. Be prepared to offer special deals to early supporters. With positive feedback, a few visible early supporters can be enough to tip expectations in the company’s favor, making it easier to attract more allies over time.

**Locking in customers:** Consumer lock-in to specific technologies, and even to specific brands, is an ever-present feature of the information economy. Both buyers and sellers
have much to gain from evaluating the consequences of their actions over the entire lock-in cycle. Shortsightedness can be extremely costly when switching costs are involved. Sellers of technology can employ the following strategies:

The firm should be prepared to invest to build an installed base through promotions and by offering up-front discounts. It cannot succeed in competitive lock-in markets without making these investments. Influential buyers and buyers with high switching cost should be cultivated, since these are the most profitable consumers.

Customers are attracted by product design and pricing which convinces them to invest in the firm’s technology. This would raise their own switching costs. Firms should employ a loyalty program to make the product attractive to the customers at their next brand selection point. This requires keeping track records of customer’s cumulative purchases.

**Versioning:** The extremely low marginal costs of information production rule out many traditional pricing strategies. The only viable strategy is to set prices according to the value customers place on the information. But which customer should the firm target? The value of a piece of information can vary dramatically from one person to the other. In a perfect world, an information producer would sell his/her product to each buyer at a different price, reflecting the value that the different buyers place on it. In reality, such personalized pricing is rarely possible. However, there is a practical way to set different prices for the same information without incurring high costs or offending customers. Offering the information in different versions designed to appeal to various types of customers does this. Through this strategy, called “versioning”, customers in effect segment themselves [36]. The version they choose reveals the value they place on the information and the price they are willing to pay for it.

The basic idea is to adjust the characteristics of the information products to emphasize differences in what customers value. Different versions can be offered that have varying appeal to different groups, adjusting the price if necessary to sort customers.
The products can be versioned along a variety of dimensions. Delay, user interfaces, image resolution, speed of operation, format, capability, features, comprehensiveness, annoyance and support are some examples. The product line naturally, needs to be matched to target market segments. For example, offer versions designed and priced to appeal to both professional and amateur users.

**Strategies for Technology Diffusion:** As discussed earlier in section 2 above, there exists a chasm during the process of diffusion (adoption) for high-tech products, which needs to be carefully studied. According to Geoffrey Moore, [18], “the only safe way to cross the chasm is in fact to put all eggs in one basket”, by designing the products after identifying a single beachhead of pragmatist customers in a mainstream market segment and to accelerate the formation of 100 percent of their whole product. This should be contrasted with the general effective strategy for creating products and services, building a product that suits a wide-variety of customers that is typically deployed in a non-high-tech market segment. However, this general-purpose strategy will not be valid for the high-technology environment and products. The goal in this case is to win a niche foothold in the main stream as quickly as possible i.e. cross the chasm.
The bowling alley effect shown in Figure 2.3 above, is a period of niche based adoption in advance of the general marketplace, driven by compelling customer needs and the willingness of vendors to craft niche-specific whole products. The bowling alley represents that part of the technology adoption life cycle in which a new product gains acceptance from niches within the mainstream market, but has yet to achieve general widespread adoption. The goal of bowling alley marketing strategy is to keep moving towards the tornado (mass adoption), to progress from niche to niche, developing momentum. Each niche is like a bowling pin, something that can be knocked over in itself but can also help push over one or more additional pins. As in bowling, so in marketing, the more pins, the more points. The reasons for focussing on niches are two folds.

First for many customers, there is still plenty of life left in the old paradigm the firm is trying to displace. They might see the attractions of the new paradigm you are offering, but they have no compelling reason to move. Since infrastructure changes of
any kind always entail hidden consequences, this part of the market instinctively holds back.

Second, although the technology might have crossed the chasm and proven that for at least one niche the firm has a whole product that can displace the old paradigm, it remains to be proven that the new technology offering is in fact, generalizable. That is, a prime reason for focusing on a new niche when crossing the chasm is to simplify the construction of the whole product.

2.3.3 Criticisms and Modifications

Quinn [31] has criticized the “top down” approach to strategy because companies rarely use “grand design” strategic plans in practice. Strategies, Quinn found, were typically formulated at a subsystem level, in response to precipitating events over which top managers did not have much control. Given these organizational realities, Quinn recommended that managers adopt a process of “logical incrementalism.” In contrast to the traditional top-down anticipatory approach to strategy formulation, Quinn suggested that “the prudent and rational executive make final commitments as late as possible consistent with the information available”.

**Modifications**: Amar Bhide makes two modifications to the currently existing strategy literature [3] for startup firms.

Firstly, The goals of a firm’s top decision-makers, which are often glossed over in the strategy literature, should be explicitly taken into consideration. We cannot evaluate the effectiveness of a strategy without reference to the goals it is supposed to achieve. Similarly, if we expect a causal link between consciously formulated strategies and outcomes, we should also expect a prior link between goals and strategy.

Secondly, we need to modify the strategy model to suit the firms that have not yet developed their portfolio of assets and coordination mechanisms. The orientation of strategy theorists towards established companies leads them to assume a more or less stable pre-existing base of business activity. For instance, in choosing between strategic
alternatives, Andrews suggests that “the company’s strengths and weaknesses should be appraised together with the resources on hand and available,” in order to match “opportunity and corporate capability at an acceptable level of risk”. Such assumptions, we will see lead to a more analytical or deductive process of strategy formulation than is practical for the CEO of a fledgling business, who starts with a more or less clean slate.

The assumption of an established business also affects the variables that decision-makers can manipulate. For instance, organizational policies and norms help determine the effectiveness of a firm’s coordination mechanism, and by extension, its longevity and growth. Once they are in place however, changing policies entails great disruption, and because CEO’s of established companies can not easily change organizational policies and norms, they are often glossed over in the strategy literature. In the management literature, the reformulation of organizational policy typically falls under the specialized rubric of “change” or “crisis management.” In a fledgling business, which has yet to establish its coordination mechanisms, organizational choices represent important variables in the formulation of a strategy.

It is important to make the above modifications to the existing strategy framework(s) and apply them to startup firms, as these objectives will now be explicitly listed as critical tasks for the entrepreneur, as discussed in Section 2.4 below. The entrepreneur has to explicitly handle the tasks of goal setting for the company and creating a diversified portfolio of assets for the new firm. These tasks are critical pieces of the strategy required to succeed in the high-tech environment.

2.4 Critical Tasks for the Entrepreneur

Critical tasks that entrepreneur’s face in turning fledgling businesses into long-lived corporations is goal setting, strategy formulation, and implementation, chapter 11, [3].

Based on the strategy formulation frameworks discussed earlier, transforming a fledgling enterprise into a large and long-lived corporation requires entrepreneurs to adopt a strategic rather than an opportunistic approach.

Entrepreneurs must perform these three tasks:
1. Articulation of extremely ambitious goals and “purpose” for the enterprise.

2. Formulation of a “strategy” – a set of general rules or boundary conditions – for realizing their goals.

3. Effective implementation of the strategy – i.e. translating the general rules into specific actions and decisions.

We will examine each of the above objectives in some detail in sub-sections 2.4.1 through 2.4.3 below.

2.4.1 Goals

Entrepreneurs who build long-lived firms establish extremely ambitious goals for their companies, in that they envision a sharply different and difficult-to-realize future state, in terms of revenues, competitive rank, geographic scope, and so on.

Importance of Goals

Ambitious goals help entrepreneurs build large, long-lived firms in several ways.

Impetus: Fledgling businesses do not automatically undertake the initiatives and investments needed to build a system of coordinated assets. According to the satisficing principle, audacious goals stimulate the search for these initiatives and investments.

Justification: Entrepreneurs cannot easily justify the initiatives required to build a large corporation just based on financial projections. Although the uncertainty of firm-building initiatives is usually lower than the uncertainty of startup opportunities, the irreversible investment and the personal financial exposure of the entrepreneur is substantially greater.

Securing resources: Ambitious goals help a business secure commitments from resource providers. The publicity generated by the promise of a grand adventure, and the psychic benefits it can afford, can help persuade employees and customers to take a chance on a fledgling business.
2.4.2 Strategy

Building a durable corporation requires long term goals as well as rules to channel investments and initiatives towards the achievement of these goals. These rules—which [3], Amar Bhide calls a strategy—have several dimensions. A strategy defines in broad terms, where and how the firms will seek to add value, distribution channels, technologies, R&D efforts and so on. A strategy includes organizational rules pertaining to matters such as the firm’s hierarchical structure, the personalities and qualifications of staff, the broad line of products, and charging higher prices than competitors, while offering prompter deliveries and higher quality services.

Importance of Strategy

Many entrepreneurs start their businesses in an improvised way and rely on imitation or small modification of existing ideas to serve niche markets. Their subsequent search for a more differentiated and larger business also tends to be ad-hoc rather than systematic. The entrepreneur finds a new combination that is closely related to the initial business or only very tangentially so. Factors such as luck, the intensity of dissatisfaction with the current situation and the willingness to take a chance on an unconventional perspective rather than a strategy play a determining role. In Karl Popper’s [26] terms, finding a source of differentiation tends to be an inductive rather than a deductive process.

Strategies complement the role that an entrepreneur’s goals play in building complementary assets. They promote coherence across multiple initiatives, help develop intangible assets such as expertise and reputation, and help solve coordination problems by fostering cooperation and teamwork.

Coherence of Initiatives: Firms develop new assets through an ongoing process of search and experimentation with new initiatives. As opposed to random selection, a strategy defines the boundary conditions or envelope within which new initiatives are likely to result in complementarities or synergies. For instance, the Wal-Mart system is the result of many years of continuous change. Sam Walton was an avid innovator and imitator who quickly tried out many new ideas. However, his experiments all fit a long-
term strategy of low cost mass market discount distribution, and this cumulatively provided Wal-Mart with significant competitive advantages.

**General Discussion:** As the above discussion suggests, effective strategies have an optimal level of precision. Broad strategies provide the latitude to adapt to unexpected setbacks and opportunities and guide the search for complementary assets. At the same time, defining goals and rules too broadly limits their utility in coordinating the firm’s efforts. The difficulty of communicating an imprecise strategy also limits its utility. The degree to which the firm’s key constituents, such as employees, customers and investors understand long-term rules, determines the value of these rules.

**Distinctive features and contrasts**

The strategies that bring order and focus to a fledgling company’s efforts are not themselves the result of a systematic research and careful analysis of alternatives. Rather, strategies emerge from the entrepreneurs’ goals and past experiences and adaptation to unforeseen circumstances rather than through a structured approach to maximizing returns.

**Goals and Prior experiences:** The entrepreneur’s overall goals can lead to rules about specific policies. Wal-Mart’s strategy of serving out-of-the-way markets can be traced back to chance events that lead the founder, Sam Walton, into discount retailing in rural Arkansas. He moved to Bentonville, which was closer to his wife’s family and allowed Walton to fully satisfy a passion acquired from his father-in-law, for quail hunting.

**Adaptation:** Entrepreneurs do not formulate their strategies all at once – they adapt and expand the scope of their policies in response to unforeseen problems and opportunities. HP and Wal-Mart’s strategy evolved over a long period. In Wal-Mart’s case, it grew out of necessity.

Although policies result from adaptation, this does not mean that effective strategies are in a state of constant flux. Rules need some stability to guide a firm’s activities. At the same time, effective strategies for building a long-lived firm are not static either. Goals and prior experiences shape the initial policies. External
developments, such as a union organization drive, or the availability of cheap computing power, cause entrepreneurs like Sam Walton to reformulate their strategies.

**Analysis and Research:** Although entrepreneurs formulate their strategies in a purposeful and goal-oriented way, little formal analysis or research informs their choices. They pick long term rules without much study of whether an alternative set would lead to superior results. For example, McKinsey’s decision of choosing to work only with “the approval and liaison of its client’s chief executive officer” was a matter of faith.

Entrepreneurs make satisficing rather than “maximizing” strategic choices. The risks of seemingly arbitrary choices are, somewhat, mitigated by the gradual evolution of a firms strategy. As they understand more about their business, they develop a sense of intuition. In addition, although the breadth of possible options makes it impossible to identify the best possible choice, entrepreneurs can analyze the merits of their intuitive learning. As firms evolve, they pursue opportunities that require more initial investment and involve less uncertainty. Accordingly, entrepreneurs have both the option and the incentive to make a serious effort to investigate the risks and the returns of their strategy defining initiatives.

**Corporate strategies:** Strategy formulation in a mature business involves the consideration of a limited number of options because of a large pre-existing stock of assets and embedded coordination mechanisms. Strategy formulation in these companies according to school theorist Andrews [1], involves “matching” the firms assets with its market opportunities. Similarly, IO economist Richard Caves [5], represents “strategic choice” in a large firm as a “constrained optimization problem”. The best strategy maximizes some objective function, subject to the constraints set by the firm’s assets and market environment. In this process of matching, (or constrained optimization), decision-makers face limited choices. Prior commitments and assets similarly limit the number of options that mature companies have in their choice of technologies, manufacturing capacity, product features, pricing, joint ventures partners, policies, distribution channels and other such strategic variables.
History not only limits the feasible range of values, or a state that a strategic variable can take, it also limits the number of variables that decision-makers can consider manipulating. Entrepreneurs pay considerable attention to policies regarding compensation, promotion, recruiting, firm governance and to establishing the basic norms or values of their organizations. The choices they make in the formative period of their organizations have a profound impact on their firm’s coordinative capacities and longevity. Hence, strategy models that take the perspective of the CEOs of large companies, offer an organizational dimension.

Fewer options permit a more detailed evaluation of strategic alternatives. In fledgling companies, where entrepreneurs have to decide what assets they want to develop rather than match opportunities to existing assets, the overwhelming number of possibilities lead to intuitive, satisficing judgements. The constrained optimization of strategy formulation in large corporations facilitates research and analysis to pick the best option.

Summary: Entrepreneurs start their business in an ad-hoc way, without any systematic effort to find the best possibility. They serve small markets and often rely on their personal efforts and market disequilbria to turn a profit. Through a determined, but usually not systematic search, some entrepreneurs find larger opportunities that provide a platform for building a coordinated system of assets that can sustain a long-lived firm. The development of the system is neither random nor fully planned, rather, it evolves through experiments conducted within the framework of the firm’s strategy. Although the long-term rules, which comprise the strategy, provide a consistent systematic structure of the firm’s initiatives and investments, the formulation of the strategy itself is arbitrary and evolutionary. Entrepreneurs make a-priori choices about the type of firm they would like to build, and rules they would adopt to do so. The entrepreneur conducts many experiments within the guidelines of long-term rules and experiments to refine and expand the rules.

Over time, the firm accumulates a distinctive bundle of assets that are best deployed against a limited number of market opportunities. These accumulated assets, rather than entrepreneur choices, set the boundary for subsequent initiatives and make the
formulation of strategy more deductive and analytic than is possible in the transitional phase.

2.4.3 Implementation

Implementation refers to the concrete decisions and actions taken, in contrast to the choice of general rules or principles involved in strategy formulation. For example, Microsoft’s policy of recruiting and training programmers straight out of college (rather than hiring experienced personnel) represents a strategy formulation choice. Similarly, adopting the principle of having a decentralized organization represents a formulation choice.

Importance of implementation

The quality of implementation matters at least as much as, and sometimes more than, the formulation of rules and policies. While goals and rules help direct and coordinate effort, building a durable firm also requires an exceptional capacity to execute or implement strategy. Implementation is especially important when competitors monitor each other’s strategies. Success is largely determined by differences in the quality of implementation if rivals choose to adapt the same broad approach.

Distinctive features and contrasts

Although the success of a strategy depends on its effective implementation, regardless of a firm’s age or size, we can find differences between mature and fledgling firms in the role played by the top decision makers and in the nature of the implementation tasks.

Implementation in strategy models: Many models underplay the role of the implementation of strategies. They suggest that choices along a few policy dimensions are the main determinants of long-run profitability. Implicitly or explicitly, they assume a firm can readily acquire the capacity to implement effectively the right policy choices.

The focus of the Porter and similar models on strategy formulation reflects their interests in the top managers of large, established firms who delegate many
implementation decisions to subordinates. Moreover, a mature firm’s effectiveness in implementing strategies often derives from difficult to change routines and procedures established earlier. Like established organizational policies, therefore, the firm’s capacity to implement represents more of a constraint than a decision variable. In fledgling firms however, specific implementation choices made by the top decision-makers have a considerable impact on long-run profitability.

Tasks: Strategy implementation in a transitional firm involves some distinctive tasks:

1. Upgrading resources: Upgrading of employees, complementary assets, customers (e.g. SUN sold to universities rather than to OEM’s). Changing of sources of capital from bootstrapped finance to professional venture capital, credit from larger banks etc.

2. Building the organizational infrastructure: Most startup organizations have no organization to begin with. Entrepreneurs who want to build long lived firms face the task of formulating and implementing policies to build the firm’s organizational infrastructure from scratch.

2.5 Summary and Conclusions

The strategic approach to building a mature firm stands in contrast to the opportunistic or improvised approach adopted by the founders of promising new ventures. It also has some noteworthy differences, we saw, with the strategic tasks of the top executives of the mature firms. The existing assets and norms limit the variables that the top managers of mature firms can manipulate. As for instance, they cannot easily change the firm’s basic purpose or its organizational climate. The need to match new initiatives with existing assets similarly limits technology and product market choices. In addition, with fewer choices (and greater resources), they can derive strategies in a more deductive and analytical way. In a fledgling venture, by contrast, entrepreneurs can choose the long-term goal of their firm, the norms it will seek to develop, the customers it will target, and the assets it will invest in. They need to make these choices in an intuitive and adaptive
fashion. In a young firm, policies reflect the entrepreneurs’ belief and adaptive responses to unexpected events rather than a formal process to deduce a strategy [3].

The unique characteristics of the high-tech environment also require dealing with the technological and market related uncertainty. The entrepreneur in this environment needs to be able to deal with such uncertainty and rapidly learn from the marketplace. The articulation of the firm’s goals, the strategy of the firm, and its implementation needs to evolve with time, through a process of learning from the marketplace, as technological and market-related changes unfold.

As the above background research shows, the characteristics of a high-technology environment coupled with the unique demands of a startup firm require that the strategies to succeed in the marketplace be unique.

Our research quest in this thesis stems from the basic question that we asked in section 1: What are the various factors that cause some high-tech startup firms to succeed? What are qualities and traits of successful high-tech entrepreneur’s? What are the technology choices that entrepreneurs and their firms need to make to succeed in the high-tech environment?

We seek answers to these questions in the latter half of this thesis through a process of data collection and analysis. The founders of nine high-tech startup firms were interviewed to conduct our investigation. We analyze various aspects of the start-up experience, including organizational design, the formulation of a customer value proposition, the perception of the competitive environment, and the development of a strategy to differentiate the firm from current and potential competition. The latter sections present our findings by analyzing how these characteristics relate to each other in order to identify the role played by the firm’s founder in shaping a successful technology strategy in high-technology competitive environments.
Section 3 DATA COLLECTION PROCESS

Our data collection process involved interviewing the founders of nine startup companies in the high-technology sector from three geographical regions (Boston metro region, Silicon Valley, and the Seattle, WA, region). As discussed in section 2, this research is focused on the information-intensive "high-technology" sector and so all of the firms are drawn from the software products and services sector or the networking and telecommunications sector.

Our data on eleven firms in these sectors are drawn from two distinct sources: a detailed author-developed questionnaire and reviews of case studies and publicly available materials. We have gathered questionnaire data from nine of the eleven firms included in the sample; while for two remaining firms (Inktomi and Hotmail), we are limited to publicly available information. A copy of the questionnaire is enclosed in Appendix A.

In the remainder of this section, we first provide details about the questionnaire in Section 3.1. Section 3.2 then describes the selection procedure used to choose the firms included in the sample and overviews some basic summary variables about the startup companies that make up the final sample. Finally, Section 3.3 describes the protocol used during interviews with founders of firms within the sample. This then allows us to proceed to section 4, where we summarize the principal results from our data collection process.

3.1 The questionnaire

The first section of the questionnaire gathers details about the founder's background and his/her vision, and how that might have influenced the evolution of strategy for the firm. The second section examines the firm from the customer point-of-view and the value proposition that it offers to them. It also looks at how the firm's target customer segments might have changed with time and the events in the firm's history that spurred such changes. The third section examines the firm and its competitive environment. There are questions about the state of competition at the time of the firm's founding as well as how the state of competition evolved during the firm's lifetime. The fourth section focuses on the internal structure and
hierarchy of the organization, as well as the decision making process, strategic alliances and acquisition behavior. The last section elicits information about the strategy formulation process within the organization and how this process has evolved with time.

### 3.2 Startup companies

This sub-section is organized as follows. Sub-section 3.2.1 details the selection procedure used by us to select the companies in our data sample. We provide some details about the various companies, and their technologies, while maintaining anonymity, in sub-section 3.2.2.

#### 3.2.1 Selection Procedure

After examining the profile of leading high-technology entrepreneurs within the United States, twenty potential companies were selected using both several publicly available sources such as Fortune’s list of “hot startup” companies, Red-herring’s list of “top Internet startup” companies as well as from a proprietary MIT entrepreneurship center database. The companies were chosen so that they were observed in different phases of their evolution. A second criteria was that, conditional on their age and phase of evolution, chosen companies were recognized as relative “successful” high technology organizations. For this study, a company was defined to be “successful” if it had gone public through an initial public offering (IPO), or if it had been acquired by a larger company, or if the firm had been in existence for at least 3 years with 2 million dollars in annual revenues.

#### 3.2.2 Final List of companies

Here is a brief description of the various companies used in our research study. Please note that the identity of the companies has been disguised to maintain confidentiality and anonymity.

**Company A:** Leading player in the e-commerce supply chain management space and e-commerce infrastructure space. Venture capital funded by leading VC firms. This company is an acknowledged leader in this space.

Company C: A pioneer in the broadband communications space. The company provides innovative solutions for delivering quality content over broadband data pipe, ADSL and cable modems.

Company D: A niche player in the software services segment. The company has been immensely successfully in holding on its own inspite of competition from larger, more established firms in the software industry.

Company E: A pioneer in the e-commerce space. Provides software based products and solutions to solve e-commerce based transaction support.

Company F: Leading software based products, services and solutions provider in the e-commerce space. Provides products and solutions for user management, e-commerce infrastructure to support secure e-commerce among a host of other e-commerce solutions.

Company G: A pioneer in the multimedia software products and services sector. Has been acquired on favorable terms by a large software product and services company based in the United States.

Company H (Hotmail): A pioneer Internet company. Envisioned and shaped leading Internet business model and was subsequently acquired by a major software product and services company in the US.

Company I: An important software services firm in the healthcare industry. Provides communications systems for the medical provider segment of the healthcare industry.

Company J : A pioneering software company. Provides software services and products for the wireless computing space. An acknowledged technology leader, it has created innovative and creative solutions for real end user problems.
**Company K**: A leading e-healthcare software company providing software products and solutions for the healthcare provider industry. A host of leading VC firms funds the company.

Of the 11 companies surveyed above, two of them provide software products and solutions for the healthcare industry, two of them are leaders in segments of the wireless and broadband communications space, one company provides a unique software product, which has resisted and constantly surpassed the performance of database products offered by the bigger players in the industry. The remaining six companies are leaders in different segments of the e-commerce industry. Of these six companies surveyed, another larger company has acquired two of them, while the other four are still active independent organizations.

Five of these eleven companies were founded and located on the West Coast and six of them were founded on the East Coast.

The chosen companies are in different stages of their growth. Four of the companies were founded between three and five years ago, have between twenty and fifty employees and have average revenues of approximately $ 2 million.

Three companies have a net market worth between 100 million dollars and 10 billion dollars. Among these companies, the number of employees ranges from 100 to 600.

The table below shows key details about the companies. It is important to note that some of the figures mentioned below are approximate, and may have been changed to maintain confidentiality of the information.

**Figure 3.1: List of surveyed companies and their demographics.**

<table>
<thead>
<tr>
<th>Name of company</th>
<th>Public/private</th>
<th>Market worth (approx.)</th>
<th>No. of employees</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>private</td>
<td>100 million</td>
<td>500</td>
<td>East coast</td>
</tr>
<tr>
<td>B</td>
<td>public</td>
<td>10 billion</td>
<td>500</td>
<td>West Coast</td>
</tr>
</tbody>
</table>
3.3 Interviewing process

Request for interviews were mailed out to about 20 startup company founders of whom nine founders were available and interviewed either over the phone or face-to-face. Typically, the interviews lasted for 1½ hours. In some cases, more than one founder from the same company was interviewed to get different perspectives of the strategy for the company.

The interviewees had the discretion to refuse to respond to any of the questions asked. As well, most interviewees requested that company information be kept confidential. Hence, in our analysis below we do not present any company-specific information. Instead, we draw inferences based on the aggregate strategic behavior across all of the firms in the sample.
Section 4: EVOLUTION OF TECHNOLOGY STRATEGY – SURVEY FINDINGS

This section outlines the various findings from data analysis of the 11 high technology firms under study. Sub-section 4.1 discusses the impact of the founder on the origin and evolution of the technology strategy for the firm. Sub-section 4.2 details the customer value proposition(s) offered by these startup companies and its evolution. Sub-section 4.3 details the competitive environment at the time of the origin of the firm and how that may have evolved over a period. Sub-section 4.4 looks at the various organizational variables influencing the firm’s technology strategy. Finally, sub-section 4.5 analyses the overall decision-making and the strategy formulation process of the firm and its evolution.

As alluded to earlier, we will not discuss specifics about a particular firm during our analysis. Instead, we will talk about all the 11 companies as a high-technology group of companies to maintain the confidentiality of each one of them. All statements mentioned under quotes in this section imply that they are verbatim statements made by one of the founder(s) of the company under study.

We use statistical correlation of data to draw inferences during our analysis in this section. Various pie charts correlating data gleaned from these interviews are included at the end of this section. As appropriate, we will refer to the interviewee data as percentage responses or use absolute numbers, during the course of our analysis.

4.1 Founder’s Influence

The initial goals set by the founder of the firm are extremely ambitious and in some cases audacious. Four out of eight companies interviewed had set extremely ambitious goals (a value of 5 on our scale, see Figure 4.1 for details) which could have a major impact on the high-tech industry. These major impacts are in the form of disruptive technologies possibly changing the shape of the industry in a profound way. The other four have aggressive goals (a value of 4 on our scale), which were quite ambitious as well, but their potential impact was limited to a narrow market segment or sector relative to the broad scope of their respective industries (see Figure 4.1). As the firm matures, reformulated
goals and visions of the companies continue to be extremely ambitious and audacious (Figure 4.2). In some instances, the ambitions of the company seem to increase relative to narrower goals at founding.

The initial growth criteria for the company were extremely ambitious for 4 cases (see Figure 4.4) and modestly ambitious for 1 case. The reformulated growth criteria were more ambitious than the early startup growth criteria for the companies (see Figure 4.3). In all the cases, the exit criteria was pre-planned (Figure 4.5).

The origin of the “idea” for the firm is typically associated with the entrepreneur’s background and/or specialized expertise in a particular high-technology area. In addition, owners are typically very technology savvy (“techies”). As well, founders are either aware of the challenging technological problems in this area or have studied the problem and use their background knowledge and expertise in starting the new firm.

Perhaps surprisingly, most of the founders did not report undertaking a lot of financial risk when starting their companies (six out of seven cases, Figure 4.6). Funding for the company was drawn from external sources. Most of the companies were funded initially either by angel investors or through friends and families. As the firm progressed, venture capital firms provided additional funding. Perhaps because of the strong technology focus and unique value proposition associated with this set of companies, the firms did not report having trouble raising additional funding for their firms.

Founders seem to have a profound impact on the company’s strategy in the period from founding until professional-management takes over the firm’s operations (8 out of 8 cases, Figure 4.7). Most of the founders had not run a company prior to their experience with the startup in the sample (7 out of 8 cases), but reported that they had gained experience from the marketplace and prior job experience.

There was strong alignment of the company’s long term goals and those of the founder(s) (8 out of 8 cases, Figure 4.8). In most cases, the principal motivation was not “getting rich” and was not singled out as a cause for starting the company. In fact, some were already financially independent when they started their own companies. Instead, most seemed motivated by the opportunity to fulfill a mission or a long-standing dream of making an impact. As well, some of the founders were very technologically focussed (4 out of 8 cases); According to this sub-sample, this focus hurt their company by
slowing their evolution towards maturity and so hurt the company in the long run (see below for Figures 4.7, 4.8 and 4.9).

Once professional management (including a CEO) begins to operate the company’s affairs, the founder’s control over the company’s vision and its operations are lessened (4 out of 11 cases).

### 4.2 Customer Value

According to the founders, the customer value offered by 2 out of 8 respondents was huge (a value of 5 out of 5, Figure 4.10). For example, Inktomi wanted to change the face of super computing using general-purpose processors, thereby dramatically, reducing total cost of ownership with enhanced scalability. Similarly, Hotmail Inc. wanted to change the email communication offerings using a simple web based infrastructure, dramatically reducing communication and maintenance costs. 5 out of the 8 companies offered customer values that were significantly different from the currently offered solutions (scale of 4 out of 5). For example, one of the companies offers a unique telemedicine solution which dramatically reduces medical provider costs, leading to better medical care at a lower cost for the end consumer (see Figure 4.15).

As mentioned earlier, most of the founders have a strong technological background or experience in the firm’s area of eventual business. This experience allows them to uniquely understand the needs of target consumers and to make changes to product offerings by “listening to the customer.” In fact, we found that most of the companies had repositioned their company’s product offerings in response to learning from the marketplace (i.e., after talking to consumers). The Internet -- as a communications infrastructure, as an electronic commerce infrastructure and product development and marketing infrastructure -- has been the single most important technology shift that has affected the companies under study. Indeed, 9 out of 11 companies dramatically changed their company’s strategies to address various business-related issues arising from the rise of the Internet. And as mentioned earlier, these changes took place after listening to the consumer and the kind of needs that they might have had, given the changed technological scenario. In most cases, their
customers/partners specifically told them about their new requirements that changed their initial product offering.

For 7 out of 8 companies understudy, the number of customer segments addressed changed with time (see Figure 4.11). Similarly, for 7 out of the 8 companies, the number of customer segments increased with time (see Figure 4.12) and for none of them the number of customer segments decreased with time (see Figures 4.13, 4.14).

4.3 Competition

Perhaps surprisingly, most of the high technology companies in this study faced relatively little competition at the time of their founding. In some cases, these companies were the first entrants into a particular sector of the high-tech market. In other cases, the firm was able to offer unique advantages over potential competitors because of the innovative nature of their products and technologies. In some cases, these companies blazed a trail and created new market segments (e.g. Inktomi and Hotmail Inc.). 8 out of 11 companies either did not have any competition to begin with or had 1-3 companies present in the same competitive space (see Figure 4.17). As well, once these companies entered and created product offerings, competitors tended to enter, offering similar customer value (6 out of 8 cases, see Figure 4.18).

Among these competitors, few simply mimicked the strategy of our sample companies, (see Figure 4.20). Instead, most new competitors had specific strategies, perhaps reflecting the belief of several of the founders that these other companies were considering offering a similar product at the same time, but were unable to market the product prior to the company under study (Figure 4.20, Figure 4.21). Not many companies had exited the market place with time (see Figure 4.19).

Product differentiation -- through a better technology offering or high customer value -- was the main cited source of competitive advantage (see Figure 4.22). These companies claimed to have unique product offerings with superior technology, which they had delivered at an incredible pace to the marketplace. Use of intellectual property protection through patents and copyrights was the least popular method to gain competitive advantage (see Figure 4.24). As well, for most of the companies, cost
leadership was not very important (see Figure 4.23). On the contrary, some companies are charging a premium due to the effectiveness of their solutions. Almost none of the companies we spoke to used standard bodies to push their technologies as a standard (see Figure 4.25). When standards did exist for technologies in the company’s focus, the companies embraced these standards. In fact, for one of the companies, embracing a standard earlier than the rest of the competition was a major source of competitive advantage (“a lead of one year over the competition”).

Branding was not heavily used as a competitive strategy (see Figure 4.28). Only two companies in our sample controlled the distribution channels or used this as an important source of competitive advantage (see Figure 4.26). Similarly, only two companies used control over key factor inputs like manpower, software sources, as a key sustainable source of competitive advantage (see Figure 4.29). This means that unique technology offering from the company is the main source of competitive advantage for the high-tech companies in our data sample set, and any other strategic means are seldom used.

The necessity of forging important strategic alliances with the important, larger players in the high-tech industry came up as a recurring theme from most of the companies under study (see Figure 4.27). Most of the companies had convinced at least one strategic alliance partner to buy into its technology, product and services. This alliance/customer was used as a reference account and acted as a credible evidence for the newly founded startup company.

4.4 Organization

The founder of the company had a profound impact on the organization of the firm (see Figure 4.31). Most of the startup companies did not have any formal decision making structures in place during the early stages of the firm. The founder(s) and the early group of employees had relatively equal voice in company operations and strategies. While the roles and responsibilities for the employees were clearly defined, these roles were seldom strictly adhered to. Within the organization, there was not much of a hierarchy in place and the working atmosphere was very informal. Most of the employees were offered stock options or participated in some form of profit sharing plans. In some instances, the
founders took a salary cut from their previous salaries, given the lack of sufficient financial funds with the company (see Figure 4.30). However, the regular employees of the company were always paid competitive salaries, and hence faced relatively little financial risk in joining these startup companies. In part, this seems to be due to the tremendous shortage of skilled work force in the high-technology area. Open communication about where the company was headed ("even if it is bad news") was deemed an important management criterion for all the stakeholders of the company, including the employees, in order to make them feel part of the family.

A second round of funding brought more discipline to the company in case the funding came from a venture capital firm. Venture capital firms enforced processes that are more professional and mandated a professional executive-management team to be instituted in the company. Because of that, 5 out of 11 company founder(s) did not become the CEO of the company they had help found. Many of the founders regretted that they had not had a professional management team in place earlier on in the life-cycle of the company; they claimed it would have given them a much bigger lead over the competition (regretted "not having any dissenting voices"). In one case, it was suggested that a professionally managed team should be in place about 9 months before the first product launch. This would help the company to do the necessary groundwork to make the product launch successful.

The companies tried to diversify their business quite early on. This diversification resulted from learning from the market place and customer feedback (see Figure 4.32). Most of these diversification initiatives were consistent with the core competencies and strengths of the companies (see Figure 4.33). A large number of the diversifications were due to re-orientation of the company’s focus because of rapid changes in technology in a very short period of time (e.g., 1 year). These diversifications were sponsored by the key strategic partner(s)/customers as mentioned earlier who was their champion in providing feedback (see Figure 4.34). Most of the decisions to diversify the company were taken during company’s informal strategic planning sessions (see Figure 4.35). However, opportunities for this diversification’s appeared due to rapid change in technologies and were not randomly derived from the market place. Very few companies tried to adapt the organization to meet every opportunity that came by. The company’s strategy was very
customer or strategic partner driven but was aligned with the core competencies of the company in the overall sense.

The financing mechanism changed since the time of the founding of the company (see Figure 4.36). Recall that most of these companies had external sources of funding. They sought additional funding from VC’s during the second and often third round of financing. External funding was easy to come by for these high-technology companies.

### 4.5 Decision making and overall strategy

This section details the decision-making and strategic planning processes adapted by the companies under study.

Very little, advance planning, if any at all, was done to devise a formal business strategy for the company (except for three out of eleven companies). In some cases, the company did not have a business plan in place, as they had secured funding through angel investors or through friends and families. This was surprising since some of the founders were professional managers who had prior experience in running larger corporations. The decision making process was ad-hoc and in most cases was consensus-driven. It involved the founders, the early key employees of the company and any professional executive management\(^1\). In companies that lacked professional management, the founders had the ultimate decision making authority. Amongst them, “the founder with the loudest voice” prevailed in most cases. In the case of a single founder company, where there was not any “dissenting voice”, the founder single-handedly devised and decided on the company strategy. In most cases, the company strategy, once decided upon, was doggedly pursued (see Figure 4.37).

The founders make short-term satisficing decisions while keeping in mind the long-term strategy of the company. These decisions are not by any means optimal, under all circumstances. Short term interests such as, getting the next level of funding, creating the next strategic alliance, shaped the actions and strategy of these companies. In some cases, the companies were totally reactive to opportunities that showed up and the “strategy” was formulated along the way. All the companies concerned changed some
parts of the strategy of the company since the time of founding. As mentioned earlier, these changes were due to customer feedback and rapid technological changes taking place in the high technology industry.

The companies surveyed were very technology focussed (8 out of 11) and had a unique technology offering to begin with. Most of them took some risky strategic bets during the early stages of the company. They had made early bets on emerging technologies, which in some cases, had turned out to yield sustainable competitive advantage in the medium to long term. They could take these bets due to the highly specialized background knowledge of the founders and their understanding of the various technologies concerned. For example, one of the companies jumped on the emerging directory standard (LDAP) - during the early stages of the standard formulation process because of its association with Netscape, its key strategic partner leading to competitive advantages. As a startup company, lack of resources constrains early diversification and a possible hedging of the bets.

Founders for three out of the 11 companies were influenced by their emotions, long-standing dreams and passions, when they decided upon the company’s long-term goals, objectives, and the strategy for the company. In some cases, these emotions clouded their ability to make rational decisions and to effectively compete in the market place. However, they continued to pursue their objectives to the detriment of the company. Two of the companies surveyed wanted to build an Asian global brand in order to express their gratitude to their homeland. In order to achieve this emotionally appealing objective, the founders of these companies went to great lengths to create an organization that was based in the named Asian country. The parent organization was still based in the USA. The result was that over time the competition had leapfrogged them due to a number of reasons, the primary reason being the time delay of managing a diverse organization located across continents and the associated logistics.

The early goals of the founders were not entirely discarded during the evolution of the company. Instead, the objectives were refined and broadened in some cases, to incorporate the learning from the market place and the environment. The number of

1 Any senior management personnel, with prior experience in running large established corporations in a senior executive management position.
customer segments targeted was increased to greatly increase the value offering to address a broader target of consumers.

The negative consequences of the early vision for most of the founder’s surveyed was that they had too much of a technological focus without being grounded in reality of the market place (8 out of 11 cases) and its business aspects. Some of the founders were very inexperienced and “didn’t know how to do budgeting” for example.

The positive aspects of the founder’s vision were that most of them were very technologically focussed and had the willingness to adapt from the market place. They had learned from the market place and adapted themselves very quickly to respond to the changing requirements and customer responses’. They had adapted the company strategy by talking to the lead customers and partners for their products.

When asked to comment about what could the founders have done differently if they were to start all over again, some recurring issues came up repeatedly. A number of founders (6 out of 11 cases) said that they would have gone for a VC funding stage earlier on in the life-cycle of the firm in order to seek professional management and advice in running the companies. They believed that this would have better positioned their companies to take advantage of the market place. It would have brought in “experienced” dissenting voices into the company, otherwise the founder(s) dominate the company’s strategy and decision making process. As mentioned earlier, they felt that dilution in their company stake was negligible in comparison to the total benefits derived (“it is better to have a smaller part of a larger pie than to have a larger part of a smaller pie”). Several of them (3 out of 11 cases) would have liked to jump onto the Internet bandwagon much earlier than they actually did. Only one founder would have entirely changed his early vision. Starting all over again, he would have picked a different technology and a different target market segment.
FIGURES LEGEND:

The conventions followed are:

- Percentage value shows the total percentages polled by each response category.
- The responses to the various questions are of two types: Boolean Yes/No type answers and a range of values 1 (least likely) to 5 (most likely).

  A Yes response is shown as “Y” and a No response is shown as a “N” on the pie charts enclosed below.

  In case of quantitative measures, a value of 5 denotes the maximum extent that is possible (or most likely, or most positive response). A value of one denotes the minimum extent that is possible (or least likely, or the most negative response). E.g., huge customer value proposition, which changes the value offered to the consumers in a dramatic way by offering a lower cost of total ownership and better services, is assigned a value of 5. A value proposition, which does not affect the customer at all, is assigned a value of 1. As you can see, there is some amount of subjectivity involved during the weight assignment process. A table below each of the figures describes the contextual interpretation of the quantitative value.
FIGURES: The Entrepreneurs goals and vision

### Figure 4.1: Were the initial goals ambitious?

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No impact</td>
<td>Negligible impact</td>
<td>Minor impact</td>
<td>Major impact</td>
<td>Big impact on the high-tech industry, possible disruptive technologies</td>
</tr>
</tbody>
</table>

### Figure 4.2: Reformulated goals ambitious?

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No impact</td>
<td>Negligible impact</td>
<td>Minor impact</td>
<td>Major impact</td>
<td>Big impact on the high-tech industry, could be a disruptive technology</td>
</tr>
</tbody>
</table>
Figure 4.3: Was the later growth criterion ambitious?

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No growth criteria</td>
<td>Very small growth criteria (&lt; 5%)</td>
<td>5-10%</td>
<td>10-20%</td>
<td>Extremely aggressive growth criteria. Greater than 20%</td>
</tr>
</tbody>
</table>

Figure 4.4: Was the initial growth criterion ambitious?

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No growth criteria</td>
<td>Very small growth criteria (&lt; 5%)</td>
<td>5-10%</td>
<td>10-20%</td>
<td>Extremely aggressive growth criteria. Greater than 20%</td>
</tr>
</tbody>
</table>
Figure 4.5: Was the exit criteria pre-planned?

0%

100%

Figure 4.6: Did the owners' take any financial risk?

14%

86%
**Figure 4.7:** Impact of the owner's vision on the organization?

**Figure 4.8:** Good alignment of owner's and firm's goals?
Figure 4.9: Unique vision of the founder impacted the firm?
FIGURES: Customer Value proposition

Figure 4.10: How big was the customer value proposition?

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No value add</td>
<td>Minor value add for the customer</td>
<td>Some value add for the customer</td>
<td>Major value add, not radical</td>
<td>Radical change in value add to the customer</td>
</tr>
</tbody>
</table>

Figure 4.11: Did the customer segments change with time?
Figure 4.12: Did the customer segments increase with time?

- Yes: 13%
- No: 87%

Figure 4.13: Did the customer segments decrease with time?

- Yes: 0%
- No: 100%
Figure 4.14: Were the customer segments entirely repositioned?

0% 100%

Figure 4.15: Did the value proposition change with time?

0% 100%
Figure 4.16: Did the change reflect the vision of the founder?
FIGURES: The Competitive Environment

Figure 4.17: Initial number of competitors

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No competition</td>
<td>1-3 competitors</td>
<td>3-5 competitors</td>
<td>5-7 competitors</td>
<td>Greater than 10 competitors</td>
</tr>
</tbody>
</table>

Figure 4.18: Current number of competitors

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No competition</td>
<td>1-3 competitors</td>
<td>3-5 competitors</td>
<td>5-7 competitors</td>
<td>Greater than 10 competitors</td>
</tr>
</tbody>
</table>
**Figure 4.19: Number of companies that have exited the marketplace?**

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No companies exited</td>
<td>1-3 companies</td>
<td>3-5 companies</td>
<td>5-7 companies</td>
<td>Greater than 10 companies</td>
</tr>
</tbody>
</table>

**Figure 4.20: Number of company's mimicking the incumbent's strategy**

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No companies exited</td>
<td>1-3 companies</td>
<td>3-5 companies</td>
<td>5-7 companies</td>
<td>Greater than 10 companies</td>
</tr>
</tbody>
</table>
Figure 4.21: No. of companies entered the market with their own strategies

- 0% 29%
- 57% 14%

<table>
<thead>
<tr>
<th>Value</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>No companies exited</td>
<td>1-3 companies</td>
<td>3-5 companies</td>
<td>5-7 companies</td>
<td>Greater than 10 companies</td>
</tr>
</tbody>
</table>

Figure 4.22: Use of product differentiation as competitive advantage?

- 0%
- 100%
Figure 4.23: Cost Leadership as a competitive advantage?

- 38% (Y)
- 62% (N)

Figure 4.24: Intellectual property protection as a competitive advantage?

- 33% (Y)
- 67% (N)
Figure 4.25: Standards participation?

- 25% (N)
- 75% (Y)

Figure 4.26: Control over distribution channels?

- 43% (N)
- 57% (Y)
Figure 4.27: Strategic alliances with other companies?

- 38% Y
- 62% N

Figure 4.28: Control over brand image?

- 13% Y
- 87% N
Figure 4.29: Control over key factor inputs?
FIGURES: The organization

Figure 4.30: Organization had distinctive characteristics?

0%

100%

Figure 4.31: Founder's vision impact on the firm?

0%

100%
Figure 4.32: Diversification initiatives?

Figure 4.33: Diversification initiatives consistent?
Figure 4.34: Any strategic alliances?

Figure 4.35: Decisions made through planning?
Figure 4.36: Has the financing mechanism evolved with time?
Figure 4.37: Was the company's strategy actually pursued?
Section 5: ENTREPRENEURIAL STRATEGY EVOLUTION - RECOMMENDATIONS

This section details the various insights we have gained through our interview and data analysis process. We use these insights to come up with general recommendations for high-tech startup companies. Some of these recommendations are valid only for the high-technology industry, unlike the more broad-based research done in [3]. In this section, as appropriate, we will compare our findings with that of Amar Bhide [3], and [34].

Currently, the high-technology sector of the IT industry is facing high growth, with Internet and E-commerce creating unprecedented turmoil and excitement. It is not clear how long this excitement will last. Hence, some of our deductions and recommendations mentioned below may have been tainted by the “positive glow” surrounding high-tech companies, at the present time. However, we believe that the recommendations below are generic, and apply to new high-technology firms. As well, several conclusions are well economic phenomena being applied to the “information economy” [35]. Please note that the results are valid for new high-technology firms and their evolution to the transition phase of the firm. The strategy required to succeed during the transition phase is quite different from that during the early stages of the firm.

The organization for the rest of this section is as follows. Sub-sections 5.1 through 5.6 detail our findings and recommendation of technology strategy for high-technology startup firms. Wherever applicable, we compare our findings with the other research work done in this area, including that of Prof. Amar Bhide [3], and [34]. Finally, we summarize our strategic recommendations and key findings in sub-section 5.7.
5.1 Influence of the founder

This sub-section details the various influences of the founder on the strategy of the high-tech startup firm.

Background

Successful founder(s) have a strong technological background and a deep understanding of the technology (or has a core member in the startup team with a deep understanding of the technology). Since the key to success in the high-tech market place is to be able to deal with technological and market uncertainty, it is important to have a founding team which is able to deal with such ambiguities and thrive in the face of them. This aspect of the founder’s background knowledge does not seem to be a requirement from [3]. Thus, the role of founder’s background in a high technology firm may be a unique characteristic of entrepreneurship in this environment.

Financing

The personal financial risk borne by the founders is minimal, given the ongoing high-technology boom and financing of high-technology ventures. Whether this continues into the future remains to be seen. However, using venture capital funding is not frowned upon, provided the venture capital funding brings along with it a package of strategic alliances and a body of associated relationships [34]. The art of bootstrap financing of companies is still active, but firms are tempted to receive VC funding early in the maturity process. The valuation of the companies does not seem to suffer as a result of the dilution of stock. This is slightly different from the conclusions in [3], where the founders took a great deal of risk to start their high-tech ventures. The difference in conclusions is due to the unique characteristics of the high-technology market place and the fact that these high-tech firms had relatively easy access to external funding. It is not clear, whether this situation is sustainable in the long term.
A word of caution though. Securing of external funding is not easy and does not guarantee success. Further, there are pitfalls to using somebody else’s money. For details, see bootstrap finance by Amar Bhide [34].

** Importance of goals **

Setting ambitious goals for the organization is an important task for the entrepreneur. In contrast, simply setting up financial goals is insufficient. Ambitious goals help the firm to secure resources, secure external and internal funding when required, and attract skilled work force, all of which are crucial for the success of the company. This goal setting also helps in creating strategic alliances and convinces the first set of customers to take a chance on a fledgling business. This finding is similar to the finding in [3] with a slight difference. Amar Bhide mentions that setting up of “audacious” goals is important for firms during the transition phase and not during the early phase of the company. We also find it important during the early phase of the company.

It is very important for the high-technology startup firm to have ambitious goals, which includes offering of exciting technology, appealing to the high technology consumer(s) and partners, and capable of solving real problems. As the value added provided by the company’s offering increases, it becomes much easier for the company to secure resources, create alliances and get the first customer/partner who is willing to bet on their technology. This is different from the inference drawn in Amar Bhide [3], where the entrepreneur starts the company in an improvised way and rely on imitation or small modification of existing ideas to serve niche markets. Perhaps this discrepancy with [3] can be explained by the “Crossing the chasm”, lead-user effect [17] as discussed in section 2 above.

The founder of the firm has a tremendous impact on the evolution of the firm. In most of the cases, the firm’s evolution is entirely aligned by the long-term visions and goals of the founder. That is why it is very important that the founder articulates the goals clearly and sets directions for the firm. This conclusion is similar to [3], wherein the founder’s goals and visions influenced the firm’s evolution process.
Nature of ambitions

High-tech entrepreneurs seem not to be profit-maximizing individuals. At the time of the founding of the company, many of them have intentions to take the company to an IPO or have it be acquired by another company. However, this is only a part of the bigger “dream” that these entrepreneurs are pursuing. Specifically, the main motivation for most of the founders to start a company is the opportunity to fulfill a mission or a long-standing dream. Founders are not necessarily profit maximizing individuals. A profit-maximizing individual will take advantage of any transient opportunities that arise, capitalize on them and move on without making an effort to leave a permanent mark. This was not the case as reported in the interviews. Inspite of numerous setbacks, and perhaps sometimes at the risk of the company’s financial disadvantage, founders seemed to stick with the company. This is quite similar to the findings in [3].

Most of the founders lack sufficient business experience to run a startup company. In case executive professional management joins the company, it makes sense to wait until the business model is validated before hiring the external CEO [37]. If the CEO is hired before the business model is refined, the firm will get the business model that the individual used in their last job. If you wait until you have refined the business model through several iterations, you have a chance at choosing a person who can really execute that model. In fact, it has been found through research that if the founder of the company had a full-time mentor who was not part of the company’s management team, and who had actually run both a startup and a larger business, the success rate increased from less than 25% to over 80% [37].

Risk taking

As mentioned earlier, during the founding stage of the companies, owners do not undertake a lot of financial risk when they start new ventures. However, as the company matures, their financial risk increases. As the company starts generating profits, they must keep reinvesting their profits and cannot withdraw their share of the capital. Therefore, if the firm fails, they stand to loose much of their wealth. They also face the
risk that the new investors they take on will force them to relinquish control [3], which was the case with a number of founders in our data sample.

**Learning and adaptation**

The strategies for successful companies are not formulated in a day. In the high-technology environment, formulating long-term strategies may be impossible, because of the high uncertainty associated with technology and the market place. See section 2 above for details. Therefore, it is very important that the founder of the firm is able to deal with ambiguity and uncertainty and thrive under those circumstances. In such an environment, learning from the environment to adapt the strategy of the company becomes an essential ingredient to success. Most of the successful companies that we talked to, were able to learn from the marketplace, adapt the strategies of the companies after talking to the lead users and partners, and hence re-focussed their energies and efforts in the new direction. This finding is similar to the findings in [3]. However, in the high-technology market place, because of the technological diffusion process and crossing of the chasm effect, it is very important to discern and distinguish the requirements for different sets of users, the lead user or the mass adopter. This would depend on the state of evolution of the technology and its adoption by the marketplace. As mentioned earlier in section 2, depending on the position on the technological diffusion curve, it places an entirely different set of customer requirements for the new entrant, as per [18].

**5.2 Customer value**

To be successful, companies need to offer products and services that provide solutions to real problems of unique value to their customers. There should be a want, not just a need for the product [37]. The company needs to have a unique reason to succeed. High-technology companies which have been extremely successful, have been able to do just that. Hotmail Inc. and Inktomi, two companies that we studied had unique solutions to the problems that had a clear consumer need. Hotmail Inc. provided a solution to solve the problem of email access from any desktop with a browser, while Inktomi provided a solution to the Internet congestion problems for searching and accessing of content.
It is not always possible to provide a huge customer value to the consumers during the early stages of the company. Coming up with revolutionary ideas is not an easy task either. However, in order to grow rapidly, it is critical to choose a promising sector of the industry that has a high potential for growth and explosion. According to Michael Porter, it is very important to pick the right race to run [29]. Having picked the right race to run in, a number of successful companies start out with unique ideas, which are subsequently refined and adapted to suit the marketplace. Hence the need to learn from the market place. In order to learn from the market place, the founder(s) need to have a very good grasp of the high technology. Hence, most of the founders and CEOs of the high-tech companies are extremely technical people. In case the founder’s are not very technically well informed, they have access to a technically well-informed person in the core executive management team who can help them make decisions to deal with uncertainty.

During the early years of a business, it is very difficult to change the way that potential customers think. The firm needs to find an immediate source of pain that people will pay to eliminate. For example, when Lotus 123 came out, it was a more sophisticated product than VisiCalc because it integrated database, graphic, and spreadsheet tools. However, the reason it was successful was that the product had variable column widths. Financial analysts were screaming for variable column widths and Lotus had it; they made the pain disappear [37]. They had learnt from the marketplace.

None of the companies studied had come up with successful strategies to compete in the market place during the first iteration. The founders learnt about the company as they progressed. Most of them had changed their initial strategies to include the effect of Internet and e-commerce that has had the single biggest impact on high-tech companies. As mentioned earlier, willingness to change and adapt is essential to the survival and subsequent success of the companies. In most of the cases, the number of customer segments addressed by the company’s products and services increases with time to incorporate learning from the market place.

The impact of externalities (network and informational), the standards setting process, and complementary goods is huge. This increases the total customer value
proposition dramatically. Understanding the strategic impact of each of these effects is crucial to the success of companies. In the information economy, some of these effects are more pronounced than in the earlier days of industrial goods based economy as explained in section 2 above.

Setting standards, and licensing technologies to the competition are signals that create consumer confidence and could make all the difference in tipping the network effects in the firm’s favor [24]. Hence, it is very important to understand products and services, which are inherently prone to the above effects and exploit it through appropriate means.

Providing enhanced customer value through versioning of products and services is another way to increase customer value. As detailed in [35], this involves segmenting them severally, and offering different versions of the product addressed to the specific consumer segment, which suit their needs. Creating different versions of the product may entail additional costs to produce a downgraded version, but this cost is justified due to the additional number of consumers who end up buying the product at the end. This is another form of third degree price discrimination [25] that maximizes the consumer surplus.

Managing customer lock-in by adding switching costs is another strategy used by suppliers of products and services to increase customer loyalty. For details about managing the lock-in process, see [35].

Understanding the technological diffusion process [17] is also very important. As described in section 2 above, determining which part of the diffusion curve is in action, and its relative position with respect to the chasm, will make a big difference to the kind of products and services offered by the company.
5.3 Competition

This sub-section details the various determinants of the competitive environment, and describes ways in which the firm can create value for the customers, in the face of competition.

Industry Structure

As discussed in [3], there are exogenous variables that limit the number of competitors in the market and which contribute to the longevity of the incumbents. A high irreversible investment required to reach the minimum efficient scale, the argument goes, protect the “first movers” against the new entrants. So, if the “minimum efficient scale” of production is one-tenth the total demand, we will find no more than 10 firms serving the market at any time, and over time, we would find the same 10 firms.

Business historians echo the claim of IO research that exogenous factors such as technology determine the longevity of the firms. Alfred Chandler has observed about the “clustering” of the large modern industrial enterprise in “industries having similar characteristics” [3]. The clustering of large companies in certain industries, according to Chandler, reflects the invention or vast improvement in “process of production” that led to “unprecedented” opportunities to realize “cost advantages of the economies of scale and scope”. In apparel, lumber furniture, printing and other such industries in which “large modern firm remained relatively rare” improvements in equipment and plant design did not bring “extensive” economies of scale. Large companies could not enjoy “striking” cost advantages over smaller competitors in these industries.

General

Among the various means of gaining a competitive advantage within the high-tech industry, product differentiation through a better technology offering or added consumer value seems the preferred mechanism. Cost leadership as a product differentiation strategy is seldom used. Most of the companies use other means of differentiation to separate them from the competition and crowd. Having a clear technological edge is one
of the primary means of differentiation in the high tech market place. In fact, most of the companies studied had very little cost advantages over the competition. This is because most of the value in the high-tech economy comes from gaining the technological edge in uncertain markets. However, if the technological edge can be combined with reduced costs, that can lead to a sustainable cost advantage.

Very few companies tried to imitate the technology strategy of other high-tech companies to succeed in the market place. This is because in an emerging market place, the lead users are more excited by functionality of the product, and not by the features. For the mass market, feature based competition is more common. The above observations are different than those made in [3] where most of the new businesses relied on imitation or small modification of the existing ideas to serve niche markets. We believe this is due to the unique characteristics of the high-tech market place where time to market pressures abound, network effects could be huge, and hence first movers advantages can be large. Therefore, coming up with unique technologies, which create a new market segment, could be a key to success in the high-tech market place.

Because of their unique product offering, most of the companies faced little competition during the early stages of the firm, provided they were first to market with their product offering. As mentioned earlier in section 2, time to market is one of the primary sources of competitive advantage in the high-technology arena. Soon, the competition catches up and comes up with similar value offerings to the consumer. The marketplace gets crowded and it becomes important to differentiate a firm’s product with respect to the competition. Imitation of high-technology products and services is extremely difficult, when it comes to a specific piece of software or hardware, since it could require very specialized knowledge and specialized resources. Instead, imitation of concepts and “ideas” is very common and hence a lot of secrecy is maintained before the announcement of the initial idea to the market place.

First mover’s advantage is prevalent in industries with brand specific externalities. The pharmaceutical industry is an example where network externalities are category specific. Hence, there is not much of an incentive to be the first mover to create
the category for the new entrant to clear up all the profits later. Understanding the kind of network externality will be key to creating enhanced customer value.

Deciding when to create standards by competing or cooperating with the competition requires careful cost benefits analysis. The process by which standards are established is a rich area of competitive strategy [2]. By promoting standards, or preventing their adoption, firms crucially affect the competitive environment in which they will operate. Firms can expect very large returns if they prevail in a standards battle, but in deciding whether to engage in such battles, each firm must assess the extent to which industry profits will be dissipated by the competitive tactics that are used. Whether a firm tried to establish its technology as a proprietary standard, chooses to join a rival’s “network”, or offers its technologies to its rivals as a proposed industry standard will, therefore, depend not only on its views about how likely it is going to prevail in each form of competition but on the nature of the competition itself.

If the firms are similar, they will probably choose the same compatibility strategy. If all the firms are willing to offer compatible products, standards are likely to emerge easily. If all want compatibility, but only on their own preferred technologies, each will try to encourage its rival to join its network. Finally, if all try to establish proprietary standards, an all out standards battle will ensue.

If the firms are dissimilar, conflicting strategies are more likely. In particular, newcomers may prefer to join the network of an industry leader while the leader tries to prevent them from doing so. Here, firms do not choose how to compete but fight over how to compete.

5.4 Organization

This sub-section describes how various aspects of the internal and external organization can be used to create a technology choice and how they contribute towards the overall competitive strategy for the firm.
Organizational Variables

As mentioned earlier in section 2, most of the strategy literature does not explicitly look at the organizational variables. However, the strategy literature on the resources based view of the firm does consider this. Recent work by [16], looks into the organizational aspects of the firm. From the point of view of the executive of an established company, organizational policies are much more difficult to change compared to traditional strategic variables of product lines, markets, capacity expansion and so on. Researchers cannot readily quantify the efforts and investments that go into building an organization, as they can the expenditure on R&D, advertising or physical plant. In a young enterprise however, whose routines have not yet been established, consciously formulated organizational policies have a significant influence over the firm’s ability to develop a portfolio of assets and to overcome growth constraints [3]. Hence, the founder of the company has a profound impact on the organizational structure of the firm in the following ways as described in section 2 earlier.

To begin with, startup firms have very informal organizational structures during the early stages. The roles and responsibilities are clearly defined, but every member of the early founding team has an almost equal say in running the company’s affairs in multiple roles. The organizational hierarchy is much unstructured. In order to attract skilled human resources to the firm, it is important to provide market competitive salaries so that the new employees have little risk in joining the startup firm. Further, providing stock options provides incentive to the new employee to associate itself with the firm leading to a higher commitment and effort towards its success. It is very important to lay down guidelines for recruitment of new human resources into the organization and sufficient time must be spent on formulating such organizational policies.

Financing

Most of the high technology firms who have a good technology offering addressing a good market opportunity, didn’t have much problems in securing external funding as mentioned in section 4 above. Among the companies studied, most of them were funded by venture capital firms during some stage of their life, or were on the lookout for some venture capital funding.
A round of venture capital funding brings in more rigor and formal processes into the organization. In most cases, this implies that the inexperienced founder(s) of the firm may have to relinquish the top executive management positions for more “seasoned” executive management staff to achieve growth targets for the company. Whether a startup company should go in for venture capital funding is a big decision in the life of the firm and needs to be weighed carefully.

**Coherence of initiatives**

Startup companies try to diversify their company very early in their business life. This diversification is due to the learning from the marketplace, feedback from customers and strategic alliance partners. These initiatives are aligned with the long-term visions of the founder. A startup firm has limited resources at its disposal so it is important that the various diversification initiatives also be consistent with the core competencies of the company.

The long-term vision laid down by the founder defines the boundary conditions or the envelope, within which the new initiatives are likely to be pursued, than if, they were randomly selected. Besides promoting synergies across different initiatives and investments, rules and boundary conditions also help firms develop assets such as know-how, core competencies and reputations that require repetition and constancy of effort [3].

These opportunities for diversification come up due to the rapid change in technologies in the marketplace. As per our study, Internet and e-commerce are the largest influences on high-tech startup companies and their operations, which have dramatically affected the technology and re-defined the market determinants. As mentioned earlier in section 2 above, technological and market uncertainty are the important characteristics of the high-technology market place. Hence, the need of constantly learning and adapting to changes in the technology and the market place. In order to learn and adapt from the market place, the founders should be willing to do so in the first instance.
Most of them took early bets on emerging technologies, which turns out to be a sustainable competitive advantage in the medium to long term. E.g., one of the companies jumped on the emerging directory standard, LDAP during the early stages of the standard formulation process because of its association with its strategic partner, leading to long-term competitive advantages. As a startup company, lack of resources constrains early diversification and hedging of the bets, hence the need to take excessive risks which are aligned with the long-term goals of the company.

If possible, forging strategic alliances with other larger established companies seems to be a necessary step for success. In most cases, establishing a first strategic alliance with another well-reputed firm, who buys into the firm’s strategy and its products, could make all the difference between long-term success and failure. These alliances create reference relationships that serve to enhance the credibility of the new entrant. This sometimes implies buying into the standards established by the incumbent firm. However, creating reference account(s) helps the new entrant to become more credible, allowing it to flaunt its relationship to establish more relationships, thus creating the positive reinforcing spiral. Hence, securing the first big customer and partner to place confidence in the company and its products should be an essential part of any new firm’s strategy. In fact, in the roadmap laid out by a number of successful startup companies, there were similar business specific milestones mentioned in the business plan of the company. It is important to lay down these milestones for the company along with the various technological milestones. This is not really emphasized in [3].

5.5 Overall decision making process and strategy

This sub-section describes the decision making process within the firm and how that influences the technology strategy formulation process.

Strategy Formulation Process

Very little advance planning, if any, is used by the founders to devise the business strategy for the company. Although entrepreneurs formulate their strategies in a purposeful and goal-oriented way, little formal analysis or research informs their choices.
Long-term goals for the company are established based on the founders' background and technical expertise. In some cases, a passion, which has emotive appeal to the founders, drives the company's long term strategy. They pick long term rules without much study of whether an alternative set would lead to superior results. This is inspite of the fact that some of the company founders were professional managers who had prior experience running other companies. In case the startup firm lacks professional management, during the early startup phase of the company, the founders along with the early group of management employees make most of the strategic decisions for the company. Entrepreneurs thus make satisficing rather than “maximizing” strategic choices. The risks of seemingly arbitrary choices are, somewhat, mitigated by the gradual evolution of a firms strategy [3].

In the absence of seasoned management and initial breakthroughs in moving the product, the company should go in for VC funding to help guide it through sophisticated business process and general management. Bootstrapping and early VC funding does not affect the company’s valuation, given the current IPO boom. However securing external funding has a number of disadvantages as well [34]. A thorough cost-benefit analysis must precede such a decision.

The founders of the firms should have the willingness to adapt and learn from the marketplace to evolve the firm’s strategy. Feedback from the customers and strategic partners are incorporated into the product planning process and the strategy formulation process to make the next short-term decision for the company. The highly specialized technical background knowledge of the founders (or the early startup team) allows them to internalize the change requests from external sources, interpret them and incorporate those changes into the product strategy. As mentioned earlier, all of these decisions are made in the context of a bigger envelope of long-term strategy established by the founder. They have been able to learn from the marketplace that was rapidly evolving. Inktomi changed its business model of being a search engine infrastructure company to a “web cache” company. This was possible because of the core technology that it had, namely a scalable computing solution that could be reoriented and focussed on this new business segment.
5.6 Strategy for the high-tech information economy

As mentioned in section 2 above, there are unique characteristics about the high technology environment and the information economy, that lends itself to a different set of strategies. It is important for the founders of high-tech firms to recognize some of these well-understood economic effects and act to derive advantages from them.

The impact of externalities (network and informational), the standards setting process and complementary goods is huge. As mentioned earlier, these effects increase the total customer value proposition dramatically. Understanding the strategic impact of each of these effects is crucial to the success of companies. In the information economy, some of these effects are more pronounced than the earlier days of industrial goods based economy.

Network externalities can be of two types, brand specific or category specific [24]. E.g., In the pharmaceutical industry, the network externalities are category specific. Customers and physicians derive value due to the availability of an entire category of drugs and not due to a particular drug. For example, there might be a network externality associated with the anti-ulcer category of drugs and not a specific drug, Tagamet or Zantac. An example of a brand specific network externality is the Windows and the Mac example. The network effects for PC’s is due to a specific type of operating system, namely the windows operating system, and not due to the entire category of operating system (which would also benefit the Mac operating system).

If there is a brand specific network externality associated with the product, there is huge first mover advantage associated with the first mover who creates the network of enhanced value for the consumers. Whereas in a network environment with category specific externality, since there is no first mover advantage, the new entrant firm could do better to wait and observe how the market evolves for the category. Once the market is fully developed, it could then introduce its own product and derive the advantages due to the category-specific network effect.
Deciding on when to compete or cooperate with other firms to set standards and when to license technologies could make all the difference between successful companies and abysmal failures. Some of the details are mentioned in section 2 above. As a startup firm, the founders of the firm have very little negotiating power due to the lack of resources. In most cases, the startup firm will be like the annoying little brother who is trying to latch on to the standards initiated by a larger company [2]. In that case, it is crucial to understand the implications of joining one standard over the other. Picking the right standard to join is an important decision. Licensing technologies to the competition are a signal that creates consumer confidence and could make all the difference in tipping the network effects in your favor [24].

As mentioned in Section 2 above, disruptive technologies cause the failure of established firms [6]. However, there are no definite ways to discern disruptive technologies. The only criterion used to evaluate a disruptive technology is that it should be viable and affordable for mass consumption, at some later point in time. That is, although, the new technology may not satisfy the performance requirements for the mass market as it is, but, the rate of change for the new technology will cause it to exceed that minimum performance bar, provided enough time and effort is expended towards improving the technology. New firms with disruptive technologies should recognize disruptive technologies and take steps to leverage it.

Similarly, as described by Henderson and Clark, [16], product architectural innovations can also lead to failure of established firms. See section 2 above for details. This is because of the information processing structures and procedures that are entrenched in an organization, leading to inability of incumbent organizations to recognize such innovations. The result is that new firms with an innovative product architecture can essentially destroy the core competence of a larger organization, causing it to fail in the face of fresh competition. Realizing such product architectural innovations and using it as a strategic variable to compete is an effective strategy that could be used by high-tech startup firms.

Understanding the technological diffusion process [17] for high-technology products is also very important. The existence of a chasm in the technology adoption
process is a very subtle but powerful one, and should be internalized by all high-technologists. It is also important to understand the current point of technology adoption and its position in the technology diffusion curve. Geoffrey Moore [18], recommends a bowling alley effect based strategy to effect the adoption of high technology in the mass-consumer market place as described in section 2 above.

5.7 Summary

Successful strategies for high-tech startup companies are quite different from that of traditional firms. In this section, we analyzed the differences from various perspectives namely, the founder’s influence on the startup firm, customer value proposition offered by the firm, successful strategies in the face of competition, the organizational variables and the overall decision making process in the firm. We also described successful strategies that work in the high-tech market place.

Some of the results obtained were revealing as well as surprising. We find that the founders of high-tech companies have a strong technical background that helps them to understand the technological landscape better than it helps others. This understanding is a source of competitive advantage for the firm, given the technology and market related uncertainty associated with high technology. Their background also allows them to learn from the marketplace, through creative synthesis of the feedback from their lead customers and their key strategic partners. Further, the financial risk borne by the founders is minimal due to the easy access of internal and external funding to the high-tech industry.

During the initial stages, a startup firm needs to formulate ambitious goals. Ambitious goals help it to secure internal and external resources and to instill confidence in various stakeholders to repose their confidence and faith with the firm. This is essential for the long-term survival of the firm.

We find that product differentiation is the most effective strategy used by the startup firms to differentiate itself. Very few competitors enter the marketplace through imitation of the incumbent firm’s strategies. In some case, first mover’s advantages were
large and the requirement of specialized resources protected the first entrant from the subsequent ones.

Forging strategic alliance with larger well-established companies in order to gain support for the new firm’s technology is an essential step towards success. This provides a key reference account for the startup firm, which it can then leverage with their other partners and customers.

The strategy formulation process is sub-optimal. The entrepreneur makes most of the decisions based on a satisficing principle. The effect of this sub-optimality is minimized by the fact that the founders of these firms are willing to adapt by learning from the market place.

The framework given below summarizes the key determinants of the technology strategy formulation process for high-tech firms as determined through our research. Elaborate description of each of the above strategic variables is available in the earlier part of this section.

<table>
<thead>
<tr>
<th>BROAD CATEGORY</th>
<th>STRATEGY VARIABLES</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influence of the Founder</td>
<td>Background, Goals and vision of the founder</td>
<td>Should have a good technology background. Ability to set ambitious goals.</td>
</tr>
<tr>
<td></td>
<td>Nature of ambitions</td>
<td>Profit maximizing individual?</td>
</tr>
<tr>
<td>Risk taking nature</td>
<td></td>
<td>Easy access to funding with very little personal financial risk undertaken.</td>
</tr>
<tr>
<td>Learning and adaptation</td>
<td></td>
<td>Formulate a strategy and improvise by learning from customers and</td>
</tr>
<tr>
<td><strong>Customer value</strong></td>
<td>Picking the right industry sector.</td>
<td>Determining the customer Who is it? How many segments? Use versioning whenever possible.</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Solving a real customer problem</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Determining the need to establish standards</td>
<td>Will it increase customer value?</td>
</tr>
<tr>
<td><strong>Competition</strong></td>
<td>Understanding the industry structure to determine scale limits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preparing for the increased competition</td>
<td>Little competition to begin with. Soon market gets crowded.</td>
</tr>
<tr>
<td></td>
<td>Choosing an appropriate product differentiation technique</td>
<td>Cost leadership and Intellectual property protection seldom used. Imitation of strategies rare.</td>
</tr>
<tr>
<td></td>
<td>Understanding time to market issues</td>
<td>First mover’s advantages could be big.</td>
</tr>
<tr>
<td></td>
<td>Competing or cooperating for standards?</td>
<td>Perform cost benefits analysis.</td>
</tr>
<tr>
<td><strong>Organizational Variables</strong></td>
<td>Securing financing</td>
<td>How? Boot strapping v/s Angel v/s Friends and families v/s Venture capital</td>
</tr>
<tr>
<td></td>
<td>Creating strategic alliances</td>
<td>Do we need a key reference customer/partner?</td>
</tr>
<tr>
<td></td>
<td>Diversifying the company</td>
<td>Are the initiatives coherent?</td>
</tr>
<tr>
<td>Decision Making Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deciding upon the core decision making team</td>
<td></td>
</tr>
<tr>
<td>Learning and adaptation</td>
<td>Use listening to the customer/partner techniques</td>
<td></td>
</tr>
<tr>
<td>Evaluating the need for professional management</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>High-tech</strong></td>
<td>Determining and exploiting Externalities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information v/s Network externalities? Brand v/s Category specific?</td>
<td></td>
</tr>
<tr>
<td>Understanding the technology diffusion process</td>
<td>Which side of the chasm are we in? Can the Bowling alley effect strategy be used?</td>
<td></td>
</tr>
<tr>
<td>Understanding the effect of disruptive technologies</td>
<td>Does the firm have a disruptive technology?</td>
<td></td>
</tr>
<tr>
<td>Understanding the impact of a change in product architecture</td>
<td>Does the product have an innovative architecture, which could destroy the core competency of the dominant organization?</td>
<td></td>
</tr>
</tbody>
</table>
Section 6: CONCLUSIONS AND FUTURE DIRECTIONS

This section concludes this thesis by summarizing our research findings in section 6.1. Section 6.2 provides some future directions to extend this study.

6.1 Conclusions

To recapitulate, the thesis begins with a review of the existing literature in the fields of technology strategy, business strategy, and entrepreneurship, with special attention to each of these as applied to the development and evolution of technology strategy in high-technology environments. The methodology and data collection associated with the thesis are then reviewed; the key data come from a detailed questionnaire used to interview the founders of nine startup companies. After reviewing the results from the data collection process through statistical analysis, the thesis attempts to draw some preliminary conclusions. First, the data suggest several strategic recommendations for high technology firms with respect to organizational structure, the development of a customer value proposition, and competitive strategy. Recommendations are also developed about the qualities required for a high-tech entrepreneur to succeed in the high-tech market place.

As mentioned earlier, as part of our data collection process, we did a detailed research and analysis of 11 high tech firms. Clearly, this is a small data sample set, although being representative of the high-technology startup firms, it is not large enough to provide definitive clues about the field of technology strategy for startup firms. These findings need to be further studied with a larger set of companies to verify the recommendations and findings therein.

We realize that proposing a complete set of recommendations for technology strategy for high-tech startup firms is an enormous task. Given the limited amount of time available to us to study this field, and to formulate our insights, we hope that these results are valid for the broader spectrum of high-technology companies.
Finally, this analysis needs to be modified and adapted to the changes in the environment, if it is to be valid in the longer term. This implies that the companies studied herein should be studied over a longer period, their strategy monitored and verified to see whether their strategic actions are indeed impacted by the recommendations made herein. Our recommendations are based on hindsight analysis of these firms, and on forward-looking research. To be of greater value, the validity of the recommendations needs to be verified over a period, and changed and adapted to the variable environment needs. Some of this analysis could be common parlance in the future and hence the recommendations need to be constantly renewed and evolved. Sustained competitive advantages for firms are derived from constantly surging ahead of the competition through foresight, abstract thinking and synthesis of the future.

6.2 Future Directions

As previously mentioned in section 6.1, having studied a small set of companies as part of our research study, the results may not be generalizable to the broad category of successful high-tech firms. More research is required, to study a larger set of companies over a longer period, so that the firms, their strategies and its evolution, can be monitored.

Our analysis uses representative successful high-tech firms as a benchmark to formulate our recommendations for successful strategies. However, we realize that it is also important to study unsuccessful companies, in order to understand what strategic variables are unimportant during the strategy formulation process. While some of this analysis for unsuccessful firms is available in the existing strategy literature, as was mentioned earlier, the validity of the existing strategy literature and its applicability to high-tech startup firms is questionable. Therefore, it would be a good idea to explicitly include some of the unsuccessful high-tech firms in the data collection process. We did not have sufficient time to do that.

Finally, the positive aura surrounding high-tech firms may have tainted some of the recommendations made in this thesis. The high-tech economy has been one of the primary economic drivers for the US and the world economy for the last 10 years, and is
undergoing unprecedented economic growth. Hence, it is possible that some of the conclusions drawn may be erroneous and therefore, needs to be re-confirmed when there is a downturn in the economic conditions.
7 REFERENCES


Appendix A: TECHNOLOGY STRATEGY EVOLUTION SURVEY

MIT SLOAN SCHOOL

STRATEGY EVOLUTION SURVEY

Principal Investigators
Professor Scott Stern, MIT Sloan School & NBER
Anupam Sahai, MIT & Microsoft Corporation

The goal of this project is to study the business strategy of early startup companies that have gone public or have been successfully acquired by other companies. In this context, we would like to understand the evolution of the business strategy through the various stages of growth of your company. In answering each of the specific questions, please provide an example to illustrate the most salient points about this process wherever possible.

Participation in this study is voluntary. You can decline to answer any questions or decline further participation at any time without prejudice. Responses will be kept confidential and anonymous. Please let us know if you have any other special needs and requests.

Please direct enquiries to:

Prof. Scott Stern, sstern@mit.edu or,
Anupam Sahai, anupam@mit.edu

Thank you for your participation!
Name of the Company:

Year Founded:

Revenues (approx.):

Why is the company successful?

1. **The Entrepreneur's Goals and Vision**

This section contains questions pertaining to the objectives of the company’s initial founders, and how that might have influenced the firm’s strategy, organization, and operations.

1. At the time of the founding of this company, what were the principal goals and/or objectives of the founder? Relative to other entrepreneurial ventures being started at around the same time, would you characterize the initial business plan and strategy as ambitious?

   - Overall vision
   - Technology
   - Impact
   - Growth
   - Exit criteria

2. What were the initial sources of funding for the venture? How much financial risk was borne by decision-makers within the firm?

3. During the early stages of the firm’s development, how did the goals and ambitions of the founder affect the organization, strategy, or operations of the firm? What are some of the principal long-term impacts of the founder’s goals and vision on the organization,
strategy, and operation of the firm? Did some of the unique aspects of the founder’s vision affect how the firm evolved relative to other firms in the industry?

4. What were the principal positive benefits the firm received as a result of the unique elements of the founder’s goals/vision? How did the firms exploit such benefits? What were the principal negative consequences of the founder’s goals/vision? How were such negative consequences overcome?

2. **The Customer Value Proposition**

This section focuses on the evolution of the customer base for the company and the key value proposition underlying this company’s competitive advantage.

1. At the founding of the company, what customer segments were targeted most centrally? What was the value proposition for achieving market penetration into these first markets? How did the initial positioning of the company’s products reflect the founder’s goals and/or vision?

   - What are the current customer segments targeted by this company? How has the value proposition to customers evolved over time? What were some of the main drivers of this evolution? To what extent does the company’s current positioning still reflect the goals and/or vision of the founder?

3. **The Competitive Environment**

This section focuses on the evolution of the competitive environment for this firm and how the competitive environment determines how the company has been able to achieve and sustain competitive advantage over time.

1. At the time of the founding of the company, what was the initial state of the competitive environment?
2. How would you describe the current competitive environment facing the company? What were the key events in the industry which shaped this evolution of the competitive environment?

- Have companies entered which have substantially mimicked or imitated your company's initially unique characteristics? Have companies entered with their own strategies, which posed substantial competitive difficulty, given the strategy you were pursuing?

- Have any of the key players at the time of the founding of the company either exited or been substantially overturned in terms of the market leadership? What do you think was the source of this decline?

3. Consider each of the following mechanisms for protecting the value of entrepreneurial ideas:

- Product Differentiation
- Cost Leadership
- Intellectual Property
- Control or participation in key technological standards which have come to dominate an industry or sector
- Control over distribution channels or a brand-name image
- Control over key factor inputs

4. Which of these have been important for ensuring competitive advantage over the long term for your company? How has control over these factors shifted over time?
4. **The Organizational Environment**

This section focuses on the evolution of the organizational environment and how the evolution of this organization reflects the company's changing basis of competitive advantage.

1. At the time of the founding of the company, what were some of the distinctive organizational aspects of the company (e.g., recruitment or compensation policies, communication and/or decision-making structures, arrangement or the organizational hierarchy)? In what ways did these organizational characteristics reflect the initial goals and/or vision for the company?

2. How would you describe the current organizational structure of the company? What were key events or reorganizations which shaped this evolution?

3. When did you try to diversify the company? Why do you think that was necessary and what prompted you to do that?

   - Are the various diversification initiatives mutually consistent and serves a predetermined objective(s)? How has that evolved with time?

4. Vertical Linkages, Mergers, acquisitions and strategic alliances: Why did you decide to work with other companies (or agencies, standard bodies etc.) and how? What prompted the move?

   - Did this decision emerge out of your internal planning process? Alternatively, was it forced upon you by the competition? Was there an underlying thread to the various linkages with other companies, standard bodies or outside agencies? Alternatively, was it randomly decided upon?

5. What would you say are the key sources of competency for the company today? What do you think are the reasons the company has been able to achieve excellence in this area?
6. When the company approaches a new opportunity today, how are new business units or teams structured? What is the rationale in choosing such an organizational structure? How has the company’s perspective on the role of the organizational environment evolved over time?

7. What was the evolution of the company in terms of the sources of financing and the mechanisms for delivering returns to investors? When (and did) the company undertake an IPO? Was the company ever merged with a more established firm resulting in a large return to earlier investors?

5. The Strategy and Decision Process

1. Looking back on the company’s history, what were some of the main criteria for decisions for this company early in its history? Who chose these criteria and how consistently were they applied? Can you think of examples where the company’s stated strategy was actually pursued? What stated initiatives were not achieved in the company’s early years?

2. How were decisions actually made at the time of the founding of the company? Who was involved in the process? What types of information were available? Who made sure that decisions, once made, were acted upon in terms of the company’s actual strategy? How have each of these changed over time? What were the circumstances, which shaped this evolution?

3. Looking back on the company’s history, what were some of the main ways in which the initial goals or objectives of the company have actually been achieved?

   - What goals or objectives were discarded or reformulated as the company evolved and as the set of stakeholders in the company increased? What are some of the long-lasting influences associated with this early vision? Are there negative consequences from “too strong” of an entrepreneurial vision?

4. On hindsight, what were the main reasons for your planned success, failure? Given the learning that has taken place, what would you have done differently?