Fueling Innovation and Growth Strategies with Corporate Venturing

by

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Submitted to the Alfred P. Sloan School of Management
in Partial Fulfillment of the Requirements for the Degree of

Master of Business Administration

at the

Massachusetts Institute of Technology

June 1999

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ABSTRACT

This thesis covers the broad topic of Corporate Venturing as used by large, established firms and focuses mainly on U.S. institutions. A comprehensive review of corporate R&D is presented, evaluating recent industry trends as contrasted with the use of corporate venturing as an R&D resource. The argument is made to use corporate venturing to bring radical innovation into the firm. The role of innovation as a critical component of a corporation's growth strategy is also presented.

The thesis considers basic principles of corporate venturing. Corporate venturing is analyzed and discussed from the perspective of strategy and formation. A framework for corporate venturing is presented that defines the "5C's" of corporate venturing.

The thesis looks at the development of corporate venture models (as outlined by Roberts) and how internal ventures innovate (as outlined by David), and suggests that entrepreneur-led strategies have the highest degree of commercial success with moderate degrees of diversification.

Finally, the thesis considers the role of corporate venturing as an innovation amplifier for firms to consider in their overall growth strategies. The results of a field study combined with a key literature analysis is presented, as well as information gathered from extensive personal and telephone interviews covering a variety of past and current players who use corporate venturing methods to fuel innovation and growth. A firm level analysis is made of corporate venturing programs.

The different analysis techniques and methods are brought together to highlight lessons learned and critical success factors from the various sources studied. Both the market and product analysis approach are used to develop a strategic corporate development framework, which suggests that corporate venturing is only one critical leg in the delta strategy for strategic development, combined with both incremental innovation of existing products and diversifying innovation strategies of mergers and acquisitions.

It is concluded that Corporate Venturing is a strategic resource for firms to sustain innovation and long-term growth in their industries.

Thesis Supervisor: D. Eleanor Westney
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Acknowledgements

To my wife Kathie: thanks for your patience and perseverance during many long family "absences" even though I was always there. To see me through all this took painstaking time, support and commitment. Your efforts are worthy of my love and devotion for the rest of our lives.

To my children, Billy, Nicole, and Thomas; let this be an inspiration and learning experience for you to take with you into your future. Remember that commitment, perseverance, persistence, and believing in yourself and your abilities are key to a successful future.

To the MIT "Academics": first, to Rebecca Henderson for providing the "technology strategy" inspiration from her enthusiasm, style, and vigor for the subject matter. Second, to my thesis advisor, Eleanor Westney -- your thoughtful listening, guidance and inspiration were key to giving me the flexibility I needed to pursue this thesis. Lastly, to Ed Roberts -- thanks for the wonderfully inspiring stories on corporate venturing. Your networks and knowledge are invaluable and will be helpful to Sloan Fellows for years to come – good luck in the Entrepreneurship Center. To the others at MIT who helped, encouraged and debated, Thanks.

To Cisco, Lucent Technologies, and Siemens, especially Janey Hoe, Paul Provost, Ralph Faison, Stefan Auerbach (SF '99) and Thomas Dollhopf -- thank you for opening your doors and minds to my inquisitiveness on CV.

To UTC, thanks for sponsoring me in this great year of learning. It has been a year that has truly changed my life.

Finally, to my parents, who started it all and gave me the will, courage, efficacy, and personality to see all this through to its successful conclusion. I leave, as a gift, my father's favorite poem about bigness, "Cemetery of Whales," in the Introduction.

To all those who read this far and consider themselves current or future corporate venturing supporters – let these pages inspire, motivate, challenge, and even contradict your inner spirit. Your challenge is to develop an even stronger corporate venturing strategy or a thesis that continues to develop the claims and enables it to become a lasting component of your strategic corporate development efforts to grow both you and your shareholders' future value.

See you in twenty years?

Knowledge is a comfortable and necessary retreat and shelter for us in an advanced age; and if we do not plant it while young, it will give us no shade when we grow old.

— Lord Chesterfield

CEMETERY OF WHALES

by Evgeny Evtushenko

You think you're God?

A risky bit of impudence

One harpoon, smack in the flank

Rewards enormity

Enormity commands everyone to hunt for it.

Whoever is big is stupid.

Who's smaller is wiser.

CHAPTER ONE

Introduction

"In today's global economy, companies that can quickly and effectively move new technologies out of the laboratory and into the marketplace through successful commercialization of new products and processes can gain significant competitive advantage."

– R&D Magazine

I believe this quote from Francis Honn, former President of the Commercial Development Association, sets the tone for this thesis on corporate venturing that fuels innovation and growth strategies.

How do firms innovate and sustain their innovation potential when they become large and well-established incumbents? What are the natural tendencies of well-established firms toward new product innovations? Can incumbent firms sustain their growth trajectories in existing product lines and markets? These questions are just a few facing large corporations as they move into the next millenium. Coupled with rapid growth in new technology areas, such as telecommunications, voice and data networks for the Internet, and biotechnology, incumbent and well-established firms face increasing pressure to innovate in unfamiliar areas.

Growth by innovation and determining the right areas for growth are no easy accomplishments, especially for incumbent firms. Tendencies toward incremental innovation are strongest for incumbents that have invested much of their intellectual capital and know-how into the well-established core products of the firm. Incumbent managers and engineers alike are comfortable solving the problems of cost containment and product differentiation. All the while, tremendous technology growth and development is occurring outside their organizations. The science and technology vice president of a major U.S. corporation said recently: "Much of what will be invented will occur outside of the corporation. The key is to get access to it and learn how to partner with those that create it."

Large firms are finding it increasingly difficult to sustain long-term growth and have begun to emphasize core competencies – "do what you do best and do it well and make it hard for others to copy you". This emphasis on a firm's core may stifle internal innovation by casting aside the very essence and motivation for invention inside the organization. Radical innovation is not driven by added emphasis on a firm's core (which incestuously drives incrementalism) but instead is driven by recognizing that markets can be shaped through new inventions. In the words of Jacob Rabinow, holder of more than 200 patents:

> *" The invention of a problem is a far greater achievement than inventing a solution. Great inventions are the mothers of necessity and not the other way around...An inventor may recognize a need before the rest of the world does, or he may create the need because he recognized that his invention could make life richer, easier, or in some other way, better. He uses his technology as an artist uses his. Technology is only a means to an end."* [i]

Roberts refers to the "innovation dilemma" among large corporations, and he suggests that "the further a company seeks to innovate, the greater the likelihood the innovating effort will fail. In retrospect, the less it seeks to innovate, the greater the likelihood the corporation will fail."[ii] Companies need to rely on a new set of rules, processes, or cultures that prescribe a solution to this problem of the innovation dilemma.

The recent increase in the number of independent entrepreneurs on the global scene suggests an important role for internal and external corporate venturing by the firm. Over the last decade, there has also been an explosion of new-business formations by these entrepreneurs.[iii] Block and MacMillan report that despite a failure rate of nearly 50% within five years (and notably better success rates for technology-based new business startups), these firms created nearly all the new jobs in the economy. The authors refer to a study showing that between 1980 and 1990, of the 3.4 million jobs eliminated by Fortune 500 firms, nearly 13 million jobs were created by small startup firms with less than 500 employees.[iv]

Among the 3.4 million jobs lost by "right-sizing" firms, one must seriously consider how many potential ideas and entrepreneurs those firms probably lost and just how many discharged employees went on to create inventions and businesses that ultimately provided those 13 million jobs. With an added incentive to deliver a healthy blow to their once-supportive firms, these individuals are increasingly likely to bring many of their ideas –

pushed aside by their former corporations -- into the private entrepreneurial environment of venture capital. In a study of high-technology firms, Roberts reinforces this claim and shows that a significant number of companies are created by the very employees who terminate employment with large firms, much to the surprise of the top management of those firms. Such individuals often feel a high need to achieve, combined with a moderate need for power – the classic definition of a typical entrepreneurial founder, according to Roberts. These employees are only enhanced by the fundamental shaping, education, and supervisory experience that has been provided by their large firm employer! Roberts finds in cases where individuals left large companies to form new businesses, nearly 90% occurred in the first year after leaving the source organization.[v]

Pinchot, in his study of the "intrapraneur" tries to instruct the well-established firm on how to become entrepreneurial.[vi] Unfortunately, it is not easy for large established firms to shed their old innovation tendencies and deliver such entrepreneurial potential. With a focus on core products and processes, short-term economic and market-driven factors, and the ever-present demands of the shareholder, a highly risk-averse culture emerges that emphasizes its existing product and technology bases. In contrast, start-up companies have the entrepreneurial and risk-taking "fire" that the large firm desires. A large firm with a corporate venturing strategy can use its financial status and complementary asset base as incentives to start up a venturing relationship.

Thus, Corporate Venturing, both internal and external, can be considered a strategic approach to accessing the entrepreneurial drive found in small startup firms. These types of firms, according to Roberts, will succeed if they have the following characteristics:

1. a high degree of advanced technology transfer;
2. having a core product orientation;
3. define competence in marketing and related practices;
4. having strong management;
5. a focused growth (single product/market) strategy.[vii]

Corporate Venturing, and in particular, internal corporate venturing, is a way for companies to throw out lots of seeds and see what comes up, according to AnnaLee Saxenian at University of California, Berkeley. Her research suggests that one reason California's

Silicon Valley has thrived more than the Route 128 corridor around Boston is that a steady stream of startups have been generated from firms already existing in California (perhaps not purposefully, but through the entrepreneurial talents of their departing staff!).[viii]

For corporations, spinning off ventures can be a relatively risk-free way to participate in new technologies without weakening their concentration on main product lines.[ix] Saxenian suggests, "Corporate chiefs are acknowledging that entrepreneurs can breathe life into quirky ideas, that, left within the bureaucracy of large firms, would be choked off or die from red tape. The result is that corporate America, once considered the anathema to all things entrepreneurial, is becoming a birthing group for start-up businesses."[x]

"The venture group is an important – albeit still at this point start-up – way of keeping technology and people in the company, because it gives people an alternative that otherwise might not have existed," says Tom Uhlman, President of Lucent New Ventures group.[xi]

Thesis Structure

With the enthusiasm developed in Chapter One, we are now ready to explore in greater depth the world of corporate venturing. In Chapter Two, a story of entrepreneurship that resulted in the formation of Pratt & Whitney, one of the great technological aircraft engine enterprises of the 20th century, is told. To set the stage for this story we must first ask the reader to consider if history might have been altered if the incumbent, Wright Aeronautical Company, had pursued a corporate venturing strategy? In Chapter Three, the world of corporate innovation is dissected in an attempt to evaluate why both large and small firms behave the way they do.

In Chapter Four, an overview of corporate venturing is provided and key frameworks for analysis are developed. In this chapter, a discussion of the venture capital industry is provided to form a foundation from which the essence of corporate venturing programs can be evaluated. In Chapter Five, the key claims of corporate venturing programs are evaluated to compare how these initiatives have performed over time. In Chapter Six, I summarize the corporate venturing programs of several firms, including a historical look at programs that have already been well-documented in the literature. In Chapter Seven, I tie the research together in the form of an analysis and evaluation of best practices for a successful corporate

venturing program. Finally, Chapter Eight provides the conclusions and analysis of this thesis study, recommending further study where appropriate.

---

[i] Jacob Rabinow, writing in Chemtech, March 1980, p145. Excerpted from Roberts, Edward B., "Managing Invention and Innovation", Research Technology Management, Volume 31, No. 1, January-February 1988.
[ii] Roberts, Ed, 15.355 Managing Technological Innovation (MTI) course notes, "Corporate New Venture Strategies" class lecture notes, Spring 1999.
[iii] Block, Zenas and MacMillan, Ian C., *Corporate Venturing – Creating New Businesses Within the Firm*, Harvard Business School Press, 1993 p.1
[iv] Roberts, op. cit., p.2
[v] Ibid.
[vi] Pinchot, Gifford III, "Introducing the Intraprenuer", IEEE Spectrum, April, 1985, pp. 74-79.
[vii] Roberts, op. cit.
[viii] Deutsch, Claudia H., "When a Big Company Hatches a Log of Little Ideas", New York Times, September 23, 1998, Entrepreneurs – Special Section, p. 4
[ix] Ibid
[x] Ibid
[xi] Rich, Laura, "Lucent Sprouts In-House Ventures", The Industry Standard, August 24, 1998 (online), p. 1

CHAPTER TWO

The Founding of Pratt & Whitney Aircraft Engine Company

2.1 ENTREPRENEURIAL INNOVATION AND COMPANY FORMATION

Why is it that radical product innovation from technologists associated with incumbent firms often spawns the creation of new companies that compete against them? Consider today's successful firms such as DEC/Compaq, Apple, Popsicle, and countless others that originated from technology developed inside an incumbent firm and entered the business scene in an era of venture capital-based startups. Dig deeper and you'll find that many of these corporations were vehicles for moving the innovator's invention closer reality.

Most innovators are not driven by financial incentive, but by the entrepreneurial spirit from within. They want to see their ideas, ideas that they passionately believe in, accepted in the market. The big companies that these innovators work for were unable or unwilling to accept the high risk and reward proposition that these inventors' ideas might entail. For instance, Steve Wozniak could not convince Hewlett Packard to back his small, easy-to-use personal computer system, so he left HP to form Apple Computer.

These technical pioneers create new wealth for themselves and ultimately for shareholders in the free capital asset markets. Often they leave their organizations to pursue their ideas and innovations. If successful, they form their own new companies and directly compete against their former employers! Many corporate stories, such as GM's Saturn and OnStar, and 3M's entrepreneurial culture that encourages product innovation, are examples of corporations that have spun off new but important enterprises that try new ideas and processes that may significantly alter the technological direction of the firm.

An era is dawning, one that has brought forth new enterprises in the telecommunications and information technology fields. Many of these enterprises take lessons from the past and pursue a legitimate corporate venturing posture to ensure that people and technology stay with their firms.

Before we look at the companies of today, we should review an important lesson from the past. We will go back to the early 20th century, to the 1920s, and put ourselves in a "new" technological era of aircraft transportation and its related technologies – with young, entrepreneurial spirits entering the scene to develop the technical and business principles for their emerging industry. To learn an early business lesson in entrepreneurial-driven technology and incumbent firms, we explore the development of air-cooled radial engine technology for the fast-growing U.S. airplane engine market in the 1920s.

A valuable lesson can be drawn from the archives of Pratt & Whitney. Without the entrepreneurial spirit of Frederick B. Rentschler, Pratt & Whitney would most likely still be a precision machine tool company – and by now probably reduced to a competitive casualty in the fierce global competition of this industry. Instead, Pratt & Whitney is a major producer of aircraft gas turbine engines for the world, with a large market share that contributes nearly 37% of United Technologies Corporation's operating profit. Pratt & Whitney's present-day success can be attributed, in part, to Wright Aeronautical Corporation's incumbent innovation tendencies in the 1920s.

In 1924, Wright was focused on developing water-cooled engines and, at the urging of Rentschler, had just begun to explore air-cooled technologies after acquiring the smaller Lawrence Aero Engine Company, which already had a low-horsepower air-cooled product. Wright's directors, however, were already focused on their successful water-cooled product line and insisted that the current customer base would satisfy the company's long-term growth needs.

2.2 THE WRIGHT AERONAUTICAL COMPANY

Frederick Rentschler, a pioneer in the field of aero-engines, had joined with a number of financiers to form the Wright Aeronautical Corporation in New Jersey in 1919.[i] During this period, American aero-engines were built by either Curtiss or Wright. When the production of Wright radials came to an end in the 1960s, long after the firm had stopped building airframes, Wright became the longest continuous producer of aircraft engines in the world.[ii] Rentschler reorganized the firm and assumed its presidency, then shaped the

company into a leading producer of radial piston engines. Rentschler was an engineer who oversaw the production of aircraft engines for the U.S. Army during WWI. He gained a great deal of experience and knowledge while improving and changing the designs of aero engines. Wright radial engines were water-cooled designs with horsepowers ranging from 4, 6, and 8-cylinder variations.

In 1923, Wright acquired Lawrence Aero Engine, a smaller and more nimble air-cooled engine maker. With its newly acquired air-cooled design capabilities, Wright developed a 200 H.P. air-cooled engine called the Whirlwind. The initiation of the air-cooled radial engine wars had begun, and Rentschler masterminded the merger with Lawrence in order to give Wright a competitive advantage.

Then, during the early 1920s, the American military services expressed a need for a new generation of air-cooled radial engines that would provide improved maintenance, reliability and thrust-to-weight maximization. As its military customers sought greater power ranges, Wright went through a series of trial-and-error innovations to improve performance that made the 1920s an era of "technical emancipation."[iii] However, Rentschler became increasingly frustrated with Wright's directors' desire to focus only on the 200 H.P Whirlwind and other water-cooled products, and their overall "lack of interest, enthusiasm, or technical awareness."[iv] After years of wrangling with them – they had, for example resisted his early proposals to take over Lawrence – he finally quit in 1924. "The directors seemed to feel that the future lay with water cooling, insofar as they had any sense of direction at all", Rentschler said.[v]

2.3 RENTSCHLER TAKES HIS IDEA TO PRATT & WHITNEY

Rentschler wanted to set up a new engine company that would engage in nothing but the production of high-power air-cooled aero-engines.[vi] With assurances from the Navy that they would buy "all the good, big radials he could make," Rentschler put together a design team, much of which came directly from Wright's engineering pool.[vii] For financing, Rentschler went to well-known Connecticut machine tool builder, Pratt and Whitney. His reasoning was that precision manufacturing and quality were critical components of machine

tools and these complementary assets would be good for an engine company. Pratt & Whitney agreed, and ultimately gave its name to the new venture.[viii]

The successful launch of Pratt & Whitney's 400 H.P. Wasp in 1926 engine forced Wright to rapidly react with a comparable product of its own. Rentschler had successfully left Wright and developed a competitive and leading platform against them – the early air-cooled piston engine wars had begun with "the engine that completed the radial revolution begun by the Whirlwind."[ix]

By 1927, both firms had a 500 H.P. radial engine in production. Pratt & Whitney was first to market with the Hornet, and Wright soon followed with the Cyclone. From 1927 on, the intense rivalry between these two American firms continued without abatement for nearly three decades.[x] It is likely that these were amazing times, with fierce competition and rivalry over competing products -- both conceived and initially supported by Rentschler's entrepreneurial talent from the original incumbent firm of Wright! Strong competition between Wright and Pratt & Whitney developed quickly, in less than two years. The drive and enthusiasm of Pratt & Whitney's product, launched in such short order against the incumbent firm, was an amazing display of entrepreneurial spirit and energy.

Wright eventually merged with Curtis in 1929 and continued to develop its radial engines through the early 1960s. Pratt & Whitney emerged as a technological engine powerhouse, developing new trajectories with the advent of the axial compression engines in the following decades. To this day, they ***still*** maintain a competitive advantage in designing engine systems with advanced air-cooling technology.

2.4 THE REST IS HISTORY

The Rentschler story is only one example of many that presage the kind of innovation and potential that exists in the hearts and minds of corporate employees. With enough motivation and sponsorship, Rentschler was able to pull together the talents of an engineering team at the incumbent level (Wright Aeronautical) and they created a radically new engine concept in a new organization called Pratt & Whitney.

But the questions remain: Why was Wright unable to capitalize on the same talents under its own roof? Why was this innovation and potential for increased new growth opportunities squandered away with short-term thinking and bureaucracy? What would have happened to the aircraft engine industry if Wright had opted to support Rentschler internally with venturing funds?

Before looking at the nature of corporate venturing, we should explore the innovation models that exist in the corporate setting and consider some academic models and related literature on the subject.

---

[i] Pratt & Whitney Corporation, "In the Company of Eagles", unpublished work ©, 1990 (sectional references throughout)
[ii] Smith, Herschel, Aircraft Piston Engines – From the Manly Baltzer to the Continental Tiara, McGraw-Hill Book Company, New York, 1981, p. 15
[iii] Setright, L. J. K., The Power to Fly – The Development of the Piston Engine in Aviation, George Allen & Unwin Ltd., London, 1971, p. 67
[iv] Ibid, p. 67
[v] Smith, H., p. 106
[vi] Setright, L, p. 67
[vii] Smith, H., p. 106
[viii] Smith, H. p. 106
[ix] Ibid, p. 106
[x] Setright, L, p. 68.

CHAPTER THREE

A Discussion of Corporate Innovation

In order to understand the implications of corporate venturing and the essence of innovation, we need to take a step back and look into the basic principles behind corporate innovation.

My evaluation starts with Schumpter's classic economic treatise on the dynamics of capitalism and the essence of what he terms the process of "creative destruction" in industrial markets.[i] Carrying his theory forward, I evaluate the role of innovation as a growth element in corporate strategy. As is commonly the case, research and development (R&D) is the typical point of initiation for technology. However, in order to incorporate all the elements of innovation I have defined R&D as encompassing the entire technology development organization of the firm rather than a centralized function. As corporate innovation is driven by its technology organization, I look at both roles and responsibilities and trends in the R&D organization. Finally, I revisit modern corporate innovation academic models and explore how Henderson, Christensen, and Utterback describe the dynamics of innovation in today's corporate climate.

The foundation of corporate innovation and market-driven technology development is rooted in Joseph Schumpter's classic work on "Creative Destruction" which he developed during the world-war era of the 20th century. Schumpter attempts to weigh the balance of capitalism against other social institutions. Firms behave in almost Darwinian fashion, prospering through natural selection at the outset, then attempting to survive as the introduction of new emergent forms threatens their existence. Schumpter introduces us to the process of what he terms "creative destruction" which is an essential ingredient of capitalism and drives the economics of a capitalist society. Fundamentally speaking, "in dealing with capitalism, we are dealing with an evolutionary process."

> *The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumer goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates.*[ii]

He suggests that industries evolve and "mutate" as products, technologies, and markets mature and expand.

> *The opening of new markets, foreign or domestic, and the organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the same process of industrial mutation–if I may use that biological term–that incessantly revolutionizes the economic structure from within, incessantly destroying the old, incessantly creating a new one. This process of* ***Creative Destruction*** *is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in.*[iii]

Schumpter suggests that business cycles are simply revolutions in which industrial surges of creative destruction occur. We may see these cycles as industrial booms, in fact, its quite apparent that the technological innovations associated with the Internet are fueling the current revolution of creative destruction and the emergence of new firms and the disappearance of the old. Consider the market success of *Amazon.com*, which is beginning to threaten the existence of the traditional bricks-and-mortar approach to bookselling by Barnes & Noble, which has responded to this threat with an Internet marketing approach of its own.

> *These revolutions are not strictly incessant; they occur in discrete rushes that are separated from each other by spans of comparative quiet. The process as a whole works incessantly however in the sense that there always is either revolution or absorption of the results of revolution both together forming what are known as business cycles.*[iv]

Schumpter's process of creative destruction in these revolution periods is quite pragmatic. He suggests that the new firm emerges and, with its small scale, can strike at the margins of incumbent organizations. This competition is extremely powerful and suggests that, depending on the speed at which the incumbents react, will determine the competitive landscape in the short run. In contrast, in a classic microeconomic process, over the long run, firms in competitive, non-monopolistic industries will have margins that will be driven to zero profit.

> *But in capitalist reality as distinguished from its textbook picture, it is not that kind of competition which counts but the competition from the new commodity, the new*

technology, the new source of supply, the new type of organization (the largest-scale unit of control for instance)—competition which commands a decisive cost or quality advantage which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives. This kind of competition is as much more effective than the other as a bombardment is in comparison with forcing a door, and so much more important that it becomes a matter of comparative indifference whether competition in the ordinary sense functions more or less promptly; the powerful lever that in the long run expands output and brings down prices is in any case made of some of other stuff.[v] *(emphasis added)*

This kind of competition is an ever-present threat in a capitalist economy and, although it may be difficult to detect, it will continue to drive the capitalist engine that feeds the economy.

It disciplines before it attacks. The businessman feels himself to be in a competitive situation even if he is alone in his field or if, though not alone, he holds a position such that investigating government experts fail to see any effective competition between him in any other firms in the same or a neighboring field and in consequence conclude that his talk, under examination, about his competitive sorrows is all make believe.[vi]

In summary, the capitalist model that sustains our corporate engines is also the same driver that provides new sources of competition. Novel innovations, in the general sense, are potentially sourced from all participants but are predominantly introduced by new entrants into an industry, not by the incumbents. This is an ever-present threat to established firms that are too slow to move and focused on existing products and processes.

The process of creative destruction, as defined by Schumpter, is the mechanism that threatens all established corporations. But does it have to end that way? In essence, corporate venturing is both an outlet and an inlet to the innovation needs of existing corporations, as depicted in Exhibit 3.1. Firms need to realize that corporate venturing can shield them from creative destruction, allowing them to be a source and inspiration for the agents that can commit the acts of creative destruction.

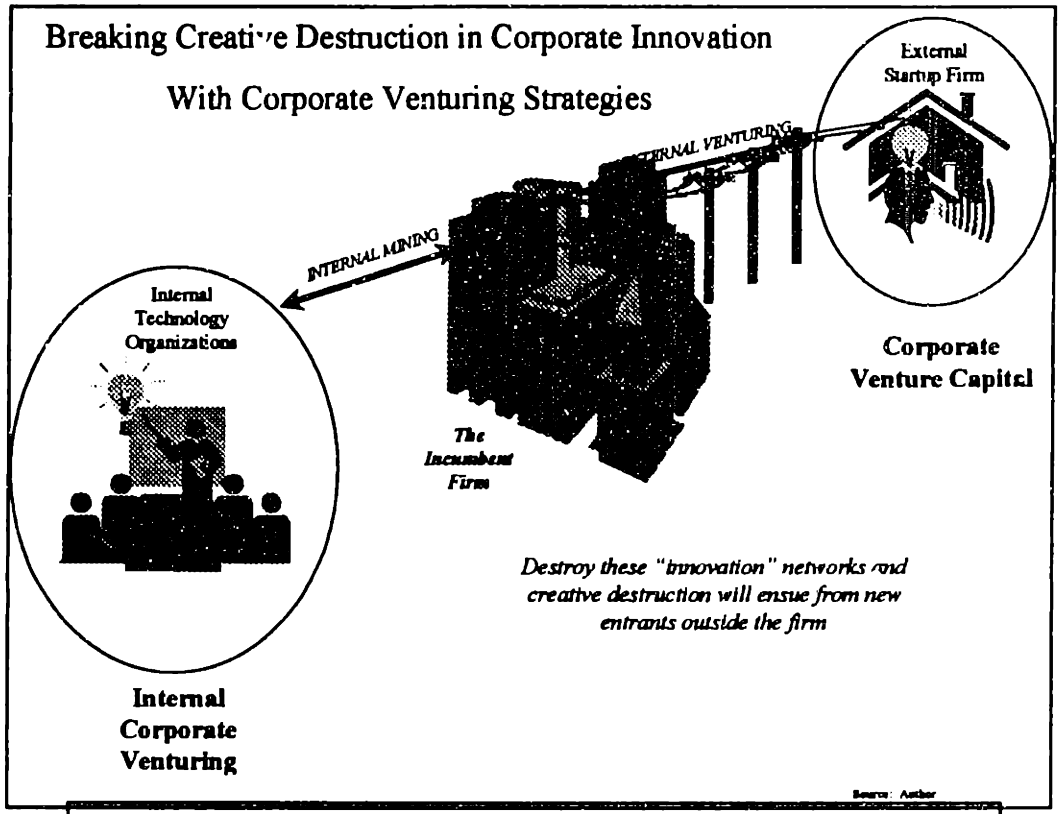


Exhibit 3.1 Breaking Down Creative Destruction in Corporate Innovation with Corporate Venturing Strategies Source: Author

3.1 THE ROLE OF INNOVATION IN TODAY'S BUSINESS

In today's business enterprises, corporations look for growth opportunities in classic, fundamental ways. Growth, in its classic form, comes with a corporation's wise internal investments that prescribe that overall returns on equity (ROE) be greater then the equity cost of capital (k_e), or ROE>k_e. ROE can be broken down further into its components:

ROE = Profit margin x Asset turnover x Adjusted leverage

Asset margin tends to be relatively stable as it is a function of the technology of an industry. Leverage also tends to be stable as management policies on capital structure do not often change. Profit margins thus stand out as the most variable component of ROE and if the forces of competition drive abnormal ROEs, the effect of profit margins will most likely be the cause. Profit margins vary widely but are influenced both by the technology employed

in an industry and the corporate strategy pursued by the firm which will influence both turnover and leverage.[vii] In highly competitive industries, the profit margins and thus ROE will tend to an asymptotic level depending on industry and investments. Can firms maintain strong ROEs in highly competitive industries through the use of judicious investments offering long-term growth?

Internal investments that boost profitability and thus ROE can take the form of new product initiatives, new markets, expanded product lines through merger or acquisition, or divestiture of unprofitable operations. In this vein, corporations wisely choose investments that allow for growth that will maximize total returns to shareholder (TRS). However, if TRS is decomposed, we discover that there is both a short-term component and a long-term component that must be considered.

Unfortunately, in the corporation's survival instincts there tends to be an over-emphasis on short-term performance. Corporations are biased toward annual stock performance by meeting current earnings targets that emphasize cost reduction and increased revenue over long-term investment with projected future cash flows. Year after year short-term earnings emphasis shades a long-term view, and more importantly de-emphasizes the innovation potential and desire within the management of the corporation.

Long-term innovation is a key survival ingredient that corporations should be considering. Let's summarize successful and innovative firms over a 70-year period in the 20th century.

In a study by McKinsey of the top 100 Forbes firms in 1917, nearly 61% were dissolved by 1987 and of the remaining 39 firms, only 18 were still in the top 100. Is it likely that 61 of these firms were pushed out of the market by a poor choice of management emphasis on long-term growth? Of the 18 remaining firms, only one firm showed TRS that was greater than the market return in that same period. In other words, 94% of the remaining "successful" firms were under-performing against the market, on average by as much as 20 basis points, suggesting that their growth was contributing to ROE at less then their k_e! The one successful firm that remained in the Forbes 100 in the McKinsey analysis, General Electric, was performing at nearly 100 basis points above the market return for that period. GE has evolved with a continued emphasis on growth through innovation. Whether by

acquisition or divestiture, GE has continually reinvented its core to maintain a strong ROE against its cost of doing business.[viii]

In general, we can classify two distinct types of corporations: the operating organization and the innovating organization. The operating organization focuses its control cycles (managerial, strategic, and cultural) along an existing and expected technology trajectory. These organizations exhibit the essence of economic wisdom described in Adam Smith's pin factory – emphasis on increasing productivity for an existing, commoditized product. Utterback refers to this organization as a *competency-enhancing organization* and exemplifies this in numerous examples such as the photographic glass plate manufacturers of the late 19th century.[ix] Christensen refers to this organization as focused on sustaining technologies and provides a case analysis of computer disk drives. In this analysis, the incumbent producer of disk drives increased its emphasis on the company's existing product technologies for its existing customer base rather than pursing emerging customer and market-based needs with newer, market-defining, disruptive technologies.[x]

The *innovating organization*, on the other hand, emphasizes nurturing new ideas, providing a variation in culture and a belief that the core business and competency will wear out over time. Companies that adopt this model continually look for new markets and new ideas. They adopt a mental model that believes cannibalization of existing product lines and product functions is a healthy component for their long-run existence. Two companies that thrive on this approach include Thermo Electron Corporation and Raychem Corporation. Thermo Electron's core business proposition is to create new businesses from within. Raychem's proposition, as stated by former CEO Paul Cook, is: "To be an innovative company you have to ask for innovation . . . it's that simple and that hard."

In a more general sense, the equity market itself operates as an innovating organization. The market is keen on investing in opportunities that have long-term growth prospects. Consider the Internet stock of *Amazon.com* which, as of this writing, has yet to show a business profit but has sustainable long-term "potential" in the view of the market. In contrast, the market weeds out under-performers, making it clear that over-emphasis on sustaining technologies and weak long-term strategies offers no risk rewards or incentive for long-term equity holdings.

The role of innovation for growth is thus quite simple: innovation is essential for growth over the long run in existing corporations. Corporations must continuously challenge their future, relying not on the "cash cow" mentality for profit extraction, but looking forward toward new markets and new opportunities. Corporations must exhibit a ruthless mentality toward innovative growth, challenging its managers, scientists, engineers and business marketers to create a forward-looking vision. Corporations must purposefully and selectively ask their innovating organizations, such as R&D, to seek new areas and develop new core capabilities aligned with their products and market strategies.

3.2 THE S-CURVE

When considering the purpose of technological innovation, the generic technical trajectory of any product or process should be considered. The S-curve concept describes the overall life cycle of an innovative product, from its early, slow, and meticulous inception, along a period of rapid growth and progress, ultimately to a life of diminishing returns where either physical technological or production saturation limits yield marginal returns. As Exhibit 3.2 describes, the S-curve illustrates a way of mapping the role of R&D into the innovation cycle or process. R&D provides the essential innovative "jump" needed to move the corporation toward a new technical trajectory (Cycle 1). Then R&D must exercise its absorptive capacity and innovation potential to move technological developments along the slow and meticulous trial-and-error phase (Cycle 2). This cycle typically results in a discontinuous innovation process where the original "invention" is modified, sometimes dramatically, from its initial inception. Next, as the corporation develops interest, R&D pursues the innovation beyond the technology "neck" in the S-curve, where the initiation of rapid development is presumed to occur. It is at this point that close partnerships with the product organizations bring the level of innovation along the rapid technology progress/ process part of the S-curve. Upon successful product deployment and natural technological evolution and trajectory, R&D must be exploring the next set of technological invention to prepare the strategic business unit (SBU) for the next "jump".

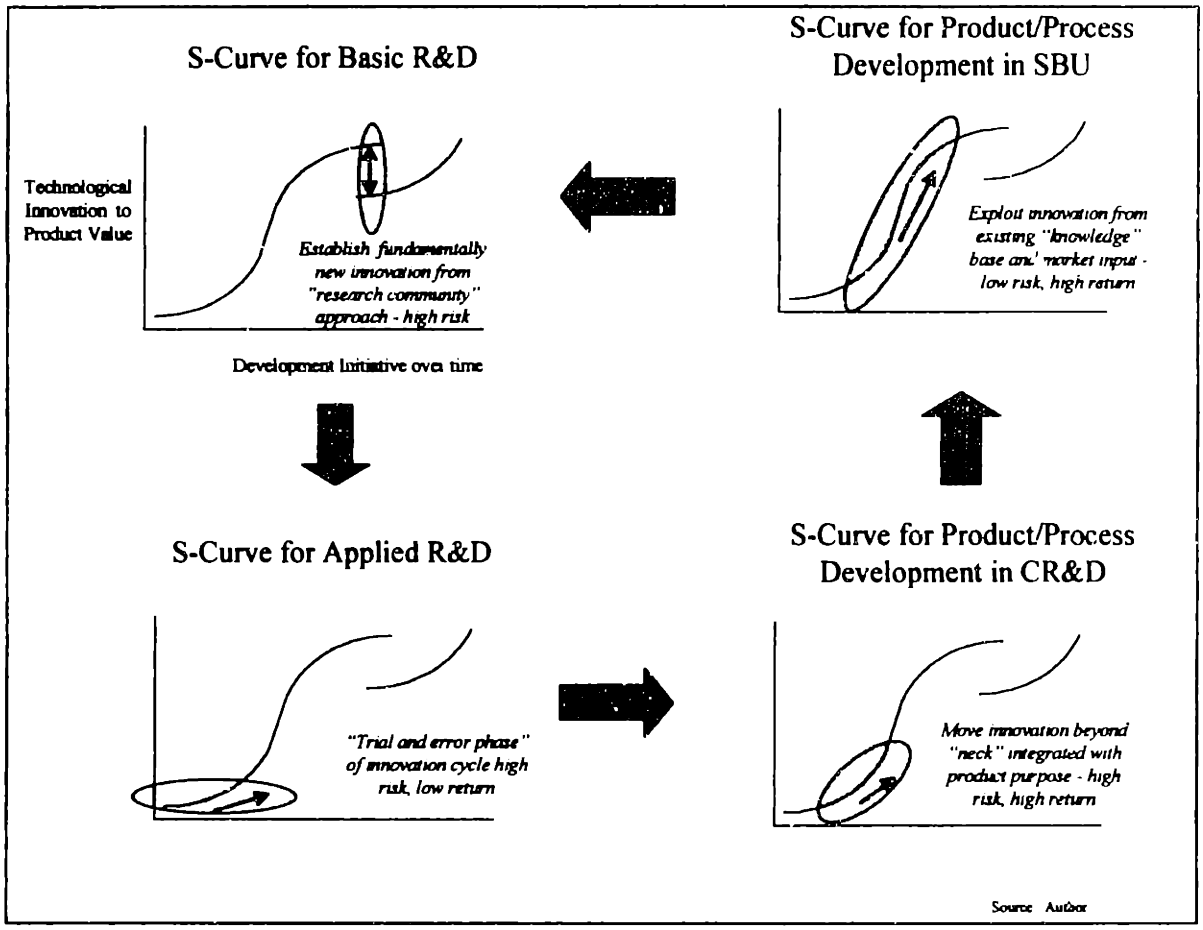


Exhibit 3.2 The S-curve of Corporate Innovation typified in large firms
Source: Author

Throughout this entire S-curve process, it is imperative that thinking is extended beyond this simple series model to consider the asynchronous timing and multiplicity of these events.

From these cycles, it can be seen that R&D plays a critical role in the early phases of the innovation cycle, moving the organization toward radical leaps. R&D's role should diminish, but not be eliminated, as the innovation progresses through its lifecycle.

3.3 THE USE OF R&D ORGANIZATIONS IN CORPORATIONS

Teece suggests a number of factors that contribute to the approach taken by established firms in their R&D.

> *If an innovating firm does not target its R&D resources toward new products and processes that it can commercialize advantageously relative to potential imitators or followers, it is unlikely to profit from its investment in R&D. In this sense, a firm's history – and the assets it already has in place – ought to condition its R&D investment decisions. Clearly, an innovating firm with considerable assets already in place is free to strike out in new directions as long as in doing so it is aware of the kinds of capabilities required to commercialize the innovation successfully.*[xi]

> *It is therefore rather clear that the R&D investment decision cannot be divorced from the strategic analysis of markets and industries and the firm's position within them.*[xii]

> *Large firms are more likely to possess the relevant specialized and cospecialized assets within their boundaries at the time of new-product introduction. They can therefore do a better job of milking their new technology, however meager, to maximum advantage.*[xiii]

> *As technologically progressive industries mature and a greater proportion of the relevant co-specialized assets are brought in under the corporate umbrellas of incumbents, new entry becomes increasingly difficult. Moreover, when it does occur, it is more likely to involve coalition formation very early on. Incumbents will certainly own the cospecialized assets, and new entrants will find it necessary to forge links with them. Here lies the explanation for the sudden surge in strategic partnering now occurring internationally, and particularly in the computer and telecommunications industry. These coalitions should be seen as lowering the entry barriers for innovators.*[xiv]

In terms of R&D capability with their specialized assets, corporate venturing is poised to exploit these benefits for the firm. Both internal and external venture opportunities can leverage these complementary assets to enhance value.

A. Survey of R&D Metrics and Performance Related to Corporate Innovation

With R&D organizations providing innovations for firms, a number of periodic surveys have been performed to benchmark R&D performance with respect to a peer group among both national and country-level comparisons. One study, performed by the Industrial Research Institute (IRI), provides a number of comparisons and trends from today's R&D organizations. In the 1995 study, a number of performance, management, and operational measures were surveyed among the largest R&D-performing companies in the United States, Western Europe, and Japan. I have presented some of these measures with respect to corporate innovation and offer a comparison that develops a logic toward corporate venturing as a mechanism for improving the R&D function. These measures include R&D effectiveness, term focus, business unit biases, leadership influence, and external sources for R&D.

R&D Effectiveness

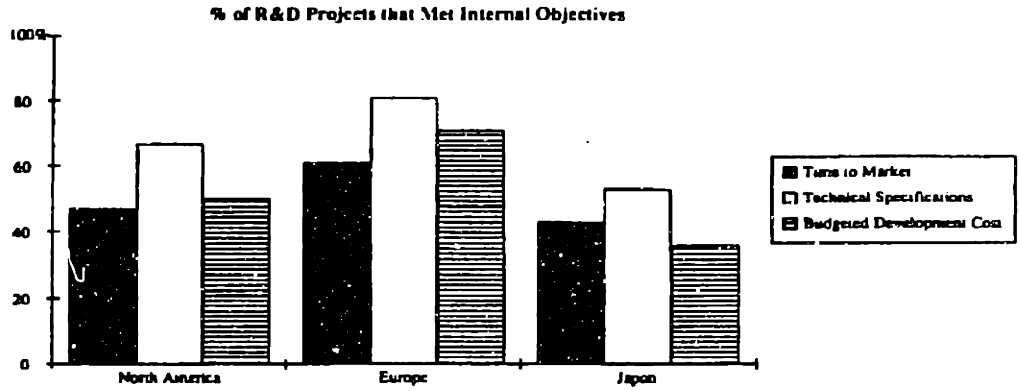


Figure 4.—Data were collected on evaluations of project performance in regard to meeting internal objectives for the three traditional measures of technical specs, time-to-market, and budgeted development costs. European firms outperformed all others on all three evaluations, but these data are contradicted by other survey results.

Exhibit 3.4 Percent of R&D Projects that Met Original Objectives
Source: Roberts, 1995

Perhaps the single most influential measure for an R&D organization is whether expectations and effectiveness were met. In the IRI survey, the data in Exhibit 3.4 clearly show that while U.S. firms typically met technical specification, they were not as consistent in meeting the time to market demands and budgetary development demands. Thus, R&D organizations were shown to be consistently poor performers in getting their outputs into markets. In this vein, its important to establish that, while R&D organizations are staffed with high-caliber technical talent and thus meet the technical specifications of their projects, they lack the business and marketing skills to reduce technology to marketable levels. Therefore, R&D organizations would benefit from an infusion of entrepreneurial skill in order to provide a capability for improving time to market elements.

Term Focus of R&D and Business Unit Biases

Technology programs pursued in an R&D portfolio require both short and long-term elements in order to provide the firm with future opportunities for growth, while at the same time supporting the current needs of the business units. In this sense, corporations must place emphasis on R&D that is well balanced and contains both mixes of process and product technologies for existing and future products of the firm. In the IRI survey, it is clear that US organizations are not supporting a well-balanced portfolio. In fact nearly half the firms surveyed, as shown in Exhibit 3.5, were over-emphasizing product development in contrast to process development. Further, the IRI survey concluded an emphasis on short-term technology emphasis on this product development.

However, when contrasted between the corporate levels and the business unit levels of analysis, as shown in Exhibit 3.6, it becomes clear that while corporate operations tend to bias their portfolios more toward research, the business units prefer the development track. This is consistent with the view that the business units are more product-oriented then their corporate level counterparts. Thus, it is important to view the relevance of the short-term R&D bias in the business unit organizations. It is for this reason that long-term emphasis be maintained at the corporate level and subsequent methods for exploiting this view be considered.

Influences on R&D Effectiveness

U.S. Technical Executives are Concerned about Imbalance in their R&D Portfolios

They sense overemphasis upon the short-term and the "familiar", at the expense of longer-range and more novel undertakings. As shown in the chart Americas R&D portfolios are also perceived as more likely to overemphasize product development in contrast to process development

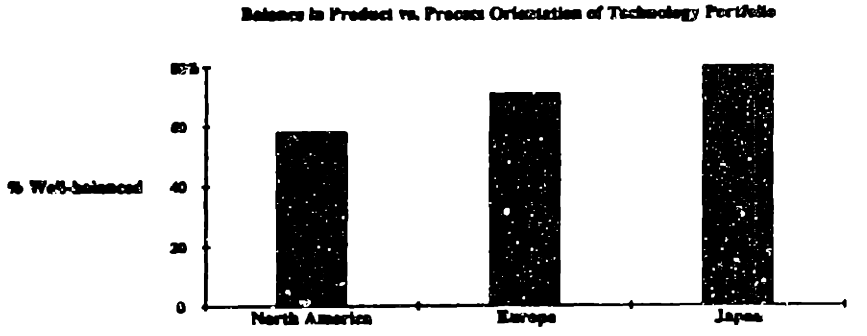


Exhibit 3.5 Influences on R&D Effectiveness
Source: Roberts, 1995

RD&E Budgets

RD&E Budgets at the Corporate Level Reflect a Longer Term View than at the Business-Unit Level

But significant differences exist in regional spending patterns, with Japanese firms spending far less on research and far more on development at the corporate level than either U.S. or European companies.

Overall global sample's R&D spending pattern

	Corporate	*Business-Unit*
Research	42%	13%
Development	37	47
Product Technical Support	11	24
Process Technical Support	10	15
	100	99

Exhibit 3.6 RD&E Budgets at Corporate and Business Unit Levels
Source: Roberts, 1995

In further consideration, industry can also bias the level of long-term research investment. As shown in Exhibit 3.7, the maturity levels of the electronics industry tend to put less resources into research and more into development within their R&D portfolio. This is likely attributed to the degree of technological innovation that this industry chooses to pursue in its current market. The chemical industry, however, continues to invest more heavily in research in the corporate setting.

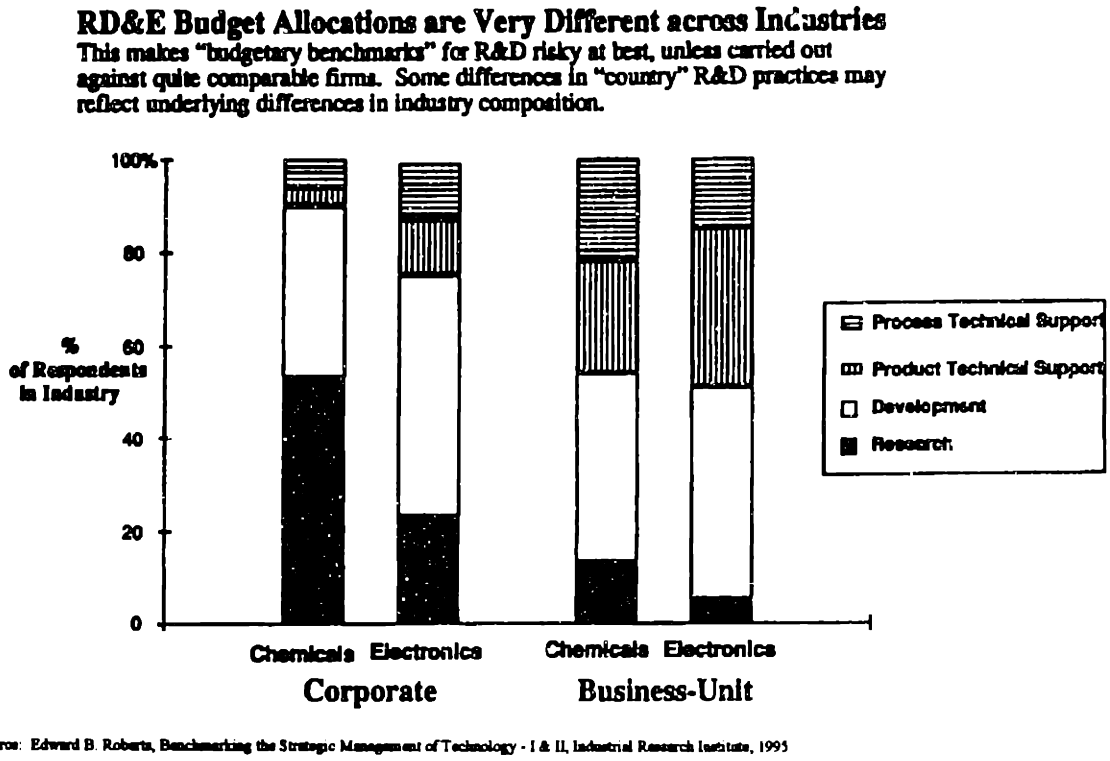


Exhibit 3.7 RD&E Budgets Allocations between Different Industries
Source: Roberts, 1995

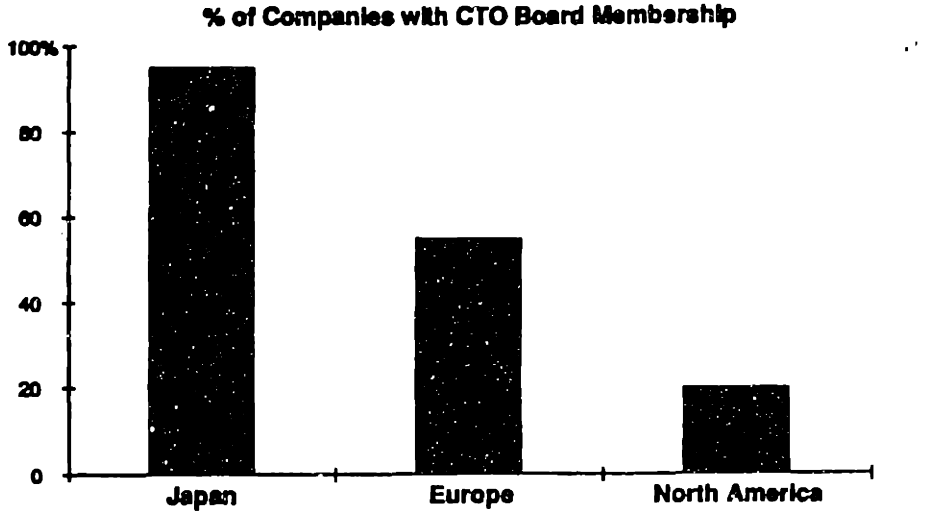
Leadership Influence of R&D

Perhaps the most startling results of the IRI study were related to the influence of leadership on the strategic direction of the firm. As shown in Exhibit 3.8, in at least four of five U.S. companies, the CTO is not on the board of the firm. This can tend to disconnect both the board and the CTO from strategic discussions involving both short- and long-term directions of the firm as well as opportunities for growth. Compounding this potential

source of strategic disconnection is the influence that the CTO has on the technology strategy of the business units within the firm. As shown in Exhibit 3.9, the CTO in 90% of the firms does not have direct influence on the technology strategy of the business unit. This seems to be consistent with both the decentralized role that R&D plays in most major US corporations and aligns with the short term, product focused, view defined in the business units.

U.S. Chief Technology Officers Have Less Senior Exposure in their Corporations

Chief Technology Officers (CTOs) have Board-level membership in almost all Japanese companies and over half the European companies. Only 20 percent of U.S. CTOs are on their firms' Boards, depriving most U.S. CTOs of opportunity for ongoing strategic dialogue.



Source: Edward B. Roberts, Benchmarking the Strategic Management of Technology - I & II, Industrial Research Institute, 1995

Exhibit 3.8 Chief Technology Officers' Roles in Corporation Boards Source: Roberts,1995

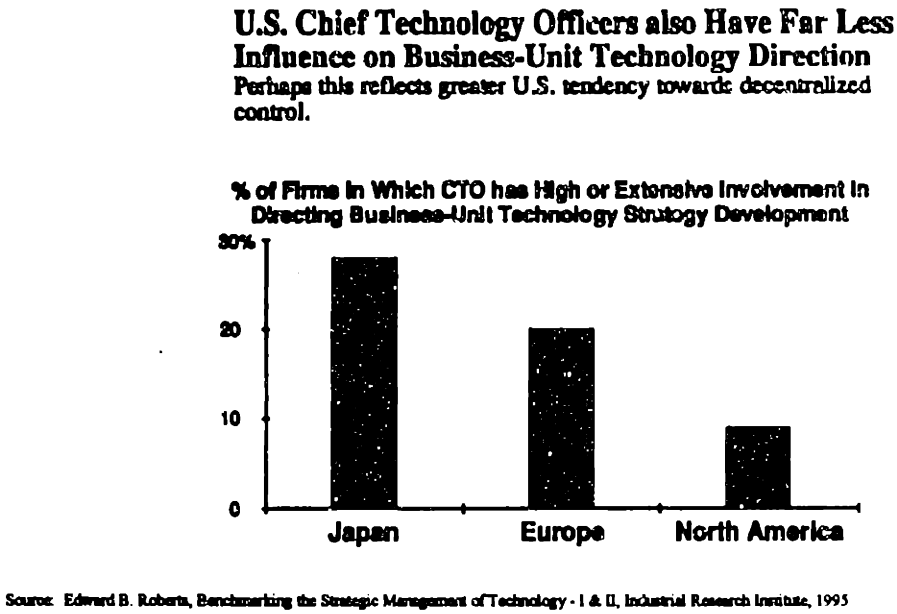


Exhibit 3.9 CTO Influence on Business Unit Technology Direction
Source: Roberts. 1995

External Sourcing Trends for R&D

It is apparent that corporate and business unit level R&D organizations view the role of external technology sourcing differently. For R&D organizations, as shown in Exhibit 3.10, to a great degree the research organization is supplementing university research programs. This apparent trend still maintains a high degree of emphasis on technical superiority over time to market. Thus, the research organization is still largely biased, even in its technology sourcing options, toward technological relevance than business/market relevance. On the other hand, development organizations are moving more rapidly toward the use of joint ventures and alliances. Additionally, acquisition of technology is also identifiable as an opportunity. Finally, as shown in Exhibit 3.11, the trends for outsourcing of technology are increasing across all countries and applications. As organizations search for greater and more external opportunities, improved methods for forming these ventures earlier in the maturity cycle of the technology will need to be developed. It is with this emphasis that the remaining chapters in this thesis are written.

External Sources are Different for Research than for Development

Internal sources are still primary for both research and development. But universities are moving up fast as supplements to internal research, and joint ventures, alliances and suppliers are increasingly keys to technological development.

Overall rank-ordered importance of sources

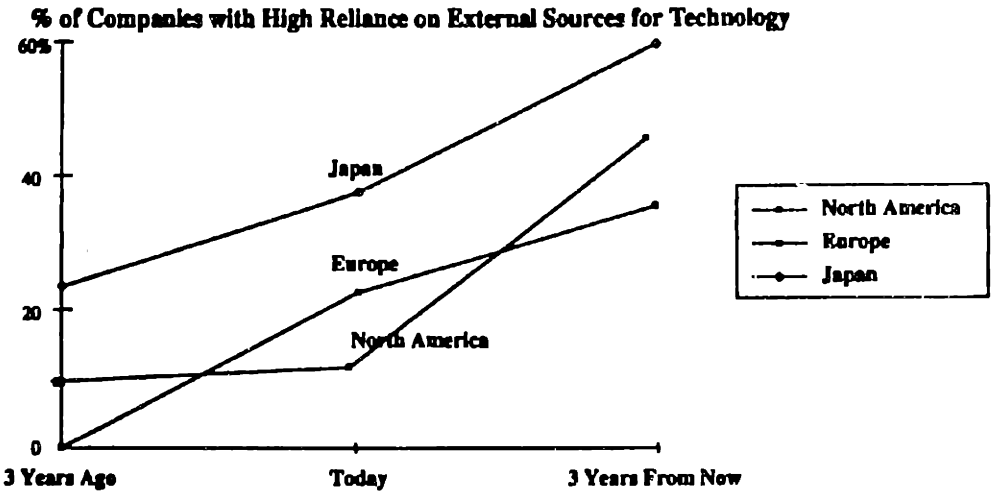
	For Research Work:	For Development Work:
1.	Central corporate research	Internal R&D within divisions
2.	Internal R&D within division	Joint ventures/alliances
3.	Sponsored university research	Central corporate research
4.	Recruiting students	Incorporating supplier technology
5.	University liaison programs	Licensing
6.	Consultants/contract R&D	Acquisition of external technologies
7.	Continuing education	Acquisition of products
8.	Joint ventures/alliances	Consultants/contract R&D

Source: Edward B. Roberts, Benchmarking the Strategic Management of Technology - I & II, Industrial Research Institute, 1995

Exhibit 3.10 External Sources of R&D for Corporations Source: Roberts, 1995

All Major Countries are Increasing their External Technology Sourcing

Japanese firms have a longer history of highly leveraging external sources for technology, with the rest of the world following behind. Most major companies worldwide are expecting to become increasingly dependent on "outsiders".



Source: Edward B. Roberts, Benchmarking the Strategic Management of Technology - I & II, Industrial Research Institute, 1995

Exhibit 3.11 Trends of External Technology Sourcing for Firms
Source: Roberts, 1995

B. Summary Of Metrics

The R&D industry metrics and comparisons performed by IRI help confirm that the R&D organization cannot independently sustain the technology strategy for the firm. Its very performance and effectiveness is also largely influenced by the technical depth of the organization, over and above its market or business knowledge. Additionally, when the research organization looks to its business units for guidance, it typically receives a short-term, product-level response. Not surprisingly, these survey results are predictable if one considers the roles and responsibility of R&D and the S-curve relationship discussed in the previous section.

Integrating the influence of senior leadership, specifically the CTO, sheds some interesting light on the subject. The CTO appears to be in a dominant a corporate vantage point but is typically disconnected from the corporate level firm strategy dialog and does not influence the technology strategy of the business unit. In this position, the CTO must emphasize the longer-term view, while at the same time providing this sense of direction to elements of the firm that do not have a consistent view on getting products to market. If maintained in this manner, the CTO will sustain mediocre results for the corporation's technology investments. However, given the increased desire to externally source its technology, the CTO can use external resources to leverage the internal marketing and business weakness of the research organization. In addition, the CTO must have greater access to both developing the sustaining technologies at the business unit level and identifying the required disruptive technologies on which the firm should focus its long-term emphasis.

In this sense, the CTO must provide the driving force to develop the disruptive technologies for the firm. This must be done by alignment with the strategic business direction of the firm and the identifying emerging market needs. One source of this knowledge can both be discovered in the internal and external technology organizations related to the firm.

By revisiting the role of venturing, it is proposed that the research organization can, in fact, improve its time-to-market performance and sustain its longer-term view for innovation growth in the firm. The CTO should, with the backing of the senior management team,

establish an internal and external corporate venturing element as a critical ingredient of its strategic corporate development program.

3.4 INCUMBENT MODELS REVISITED

A. Incremental versus Radical Innovation

The notion of radical versus incremental innovation suggests that there are two general types of innovation in the pursuit of technological advancement. In classical economic theory, this is shown to be true by evaluating the microeconomic trends of a firm in a particular industry. As developed by Henderson, Exhibit 3.12 shows how incremental innovation is determined to occur where the optimum monopoly price for the new technology is greater then the marginal cost of the old technology. It improves upon the old technology but does not displace it.

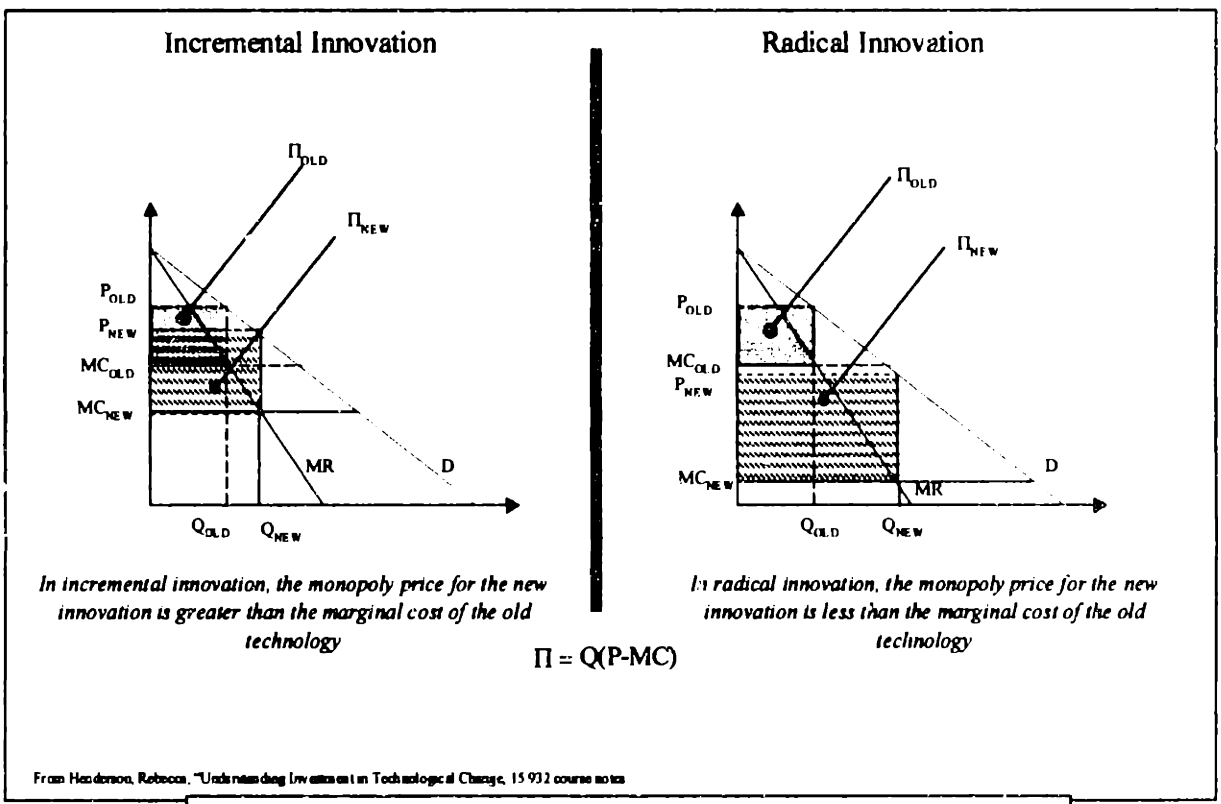


Exhibit 3.12 Micro-Economic Characteristics of Incremental vs. Radical Innovation
Source: Henderson, 1998

On the other hand, in radical innovation, the monopoly price for the innovation is likely less then the marginal cost of the technology it replaces. Its improvement in quality or other features is so substantial that customers, given the choice to purchase the new technology at its new price versus the old technology at its marginal cost, would purchase the new product.

Given this theoretical economic definition, it is easy to see why entrants are more likely to invest in radical innovation over incumbents. There is more economic profit or value to the entrant for delivering a radical innovation to market, combined with the likely implicit know-how of the incumbent to deliver incremental product and process innovations for their existing core products. Henderson points to Gilbert and Newbury whom suggested that if there is free entry to the industry, incumbent firms with monopoly power would preempt potential entrant investment in innovation in order to continue to profit from the extension of its existing market power to a new generation of technology.

However, Henderson also suggests that Reinganum emphasized that incumbents will rationally invest less in innovation than entrants for fear of cannibalizing the stream of rents from their existing products. Their result is intuitively driven by the fact that incumbents have an incentive to extend their monopoly power when an innovation is incremental, but have no opportunity to do so when an innovation is sufficiently radical. Thus, we have both sound economic and organizational capability arguments capturing the essence of innovation. There are other effects which should also be considered, and these are addressed in further sections. These are cannibalization effects and the effect of market power.

From the analysis of various authors, we can conclude that existing neoclassical theory suggests that entrants will replace incumbent firms during periods of radical technological change because they have greater strategic incentives to invest in radical innovation, while organization theory suggests that established firms often fail in the face of radical innovation because their research efforts are significantly less productive than those of entrants.[xv]

Henderson subsequently notes that Schumpter initially suggests that small, entrepreneurial firms were likely to be the source of most innovation (1934). But he later claimed that large established firms that possess some monopoly power were likely to be the driving force behind technical progress (1950).[xvi] She suggests that their superior access to

capital and skilled labor, in combination with their ability to effectively appropriate innovation, gave them considerable advantages over small firms and new entrants.[xvii] This notion, when applied to corporate venturing, satisfies the rational reasons why incumbents can be good innovators for all types of innovation. Through their scale and complementary asset base, they are positioned to deliver a powerful advantage over the entrant firms if they can maintain their large scale but act as a small-scale agent. Henderson shows that the failure of many established firms in the industry cannot be understood without examining both under investment and incompetence as responses to radical innovation.

Finally, Henderson suggests the following:

> *Large established firms have an advantage over entrants in the pursuit of incremental innovation because incremental innovation builds upon their existing knowledge and capabilities, but these assets can simultaneously reduce substantially the effectiveness of their attempts to exploit radical innovation. These assets are a source of considerable advantage as long as innovation in an industry remains incremental or competence enhancing. Incremental innovation, in this context, is defined as routine, predictable change that is a logical extension of existing knowledge. These same assets may significantly reduce the research productivity of established firms attempting to exploit innovation that is radical in the sense of competence destroying. In this context, an innovation is radical if it requires the firm to process quite different kinds of information. The information filters and organizational procedures and routines that have developed through the firm's experience with a sequence of incremental innovations founded upon quite different scientific or technological principles become partially obsolete. If the costs of developing these more appropriate set of assets are greater then the costs of using the existing asset base, then the research productivity of established firms pursuing radical innovation will be significantly lower than that of entrants.*[xviii]

B. Short-term versus Long-term

The short-term focus on incumbent performance clearly decreases the overall desire and motivation to make long-term investments. This is differentiated from the smaller, less encumbered, new firms that desire to establish a baseline performance. While one can argue that either one is likely to be performance-oriented, the incumbent has the added dimension of satisfying shareholder value through risk-managed propositions. The new entrant, on the other hand, desires performance that satisfies its risk capital positions, such as venture

capitalists, but are more likely to pursue risky ventures and aggressive posturing in its entrepreneurial climate.

In Roberts and Yates' study on corporate venture capital, in which 49 firms responded to a survey of questions related to corporate venturing performance, the authors concluded that companies that sustain long-term programs of equity investment in young companies can realize critical contributions to their strategic objectives, which further suggests that small, entrepreneurial firms offer potential sources of new product and new business growth and diversification to the larger corporation.[xix]

3.5 SUMMARY OF CORPORATE INNOVATION

A careful evaluation of corporate innovation, both historical and from the perspectives of modern business academics provides some interesting insights into the role of new tactics to provide sources of innovative growth. As will be discussed in later chapters, growth by innovation can be essentially broken into three distinct approaches:

1. Incremental product growth
2. Growth by merger and acquisition (M&A)
3. Growth by new product and market penetrations

Incremental product growth can be managed by an incumbent organization. The management and leadership cultures are driven toward this result. Likewise, ***growth by merger and acquisition*** has a flair of corporate strategy and development attached to it. Recognition of product and market diversity can lead to both favorable tactical and financial reasons for a successful M&A program.

The category of ***growth by new product and market penetrations*** is the most challenging of all for the incumbent firm. As described by Schumpter and supported by countless modern academics, the sources of innovation for new products and markets will not likely come from incumbents. Thus, the use of a corporate venturing strategy is strongly suggested by the corporate innovation literature. As summarized in Exhibit 3.13, increasing

evidence in the literature supports the existence of a venturing organization within the firm that is designed to exploit both the internal and external disruptive technologies that form new product and market opportunities.

Perspective	Summary	Relation to Venturing
Creative Destruction provided by Schumpter	Entrants provide the source for firm level destruction by eroding its product base and redirecting the incumbents markets	Suggests that if firms can exploit the relationship with the entrants, the displace-ment of firms by creative destruction can be minimized
Growth by Innovation	Provide a portfolio of investments that favor both short-term needs and long-term opportunities	Longer-term, higher-risk, propositions are likely explored outside of the incumbent organizations
The "Innovating" Organization	Nurtures new ideas and endorses the view that the core of the firm will "wear out" if not redefined	Likely that candidates will develop venturing organiza-tions.
R&D	Research organizations are inherently technologically focused while development organizations put emphasis on short-term, current product needs.	Internal venturing can unleash innovation from the technologically biased organization. Additionally, the CTO must establish a role with external sources for new technologies.
Incremental versus Radical	The entrant has a greater propensity to explore radical innovation for pure economic reasons. Greater risks are taken to explore and discover new product platforms in new or emerging markets	Corporate venturing can capture the more radical technologies being developed by new entrants and preempt creative destruction.

Exhibit 3.13 Summary of corporate innovation perspectives and their relationship to corporate venturing strategies

Source: Author

With a fully defined view of corporate innovation, I conclude that one logical element of the corporate strategy should be the use of venturing as an ingredient in corporate development strategy.

It is clear from this conclusion that the strong tendency among incumbent to miss opportunities offered by the external environment, combined with the short-term nature and existing product-level emphasis of the firm, can mask apparent threats from new entrants. While other strategic options may exist for exploiting the development of new products and markets within the firm, none bear the promise or the prospects for sensible use of corporate venturing as a way to ensure growth.

The remaining chapters of this thesis describe the details of the corporate venturing approach to evolving a corporate development strategy, and offer a series of current industry models that are being used by major corporations today to develop their new product and market strategies.

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[i] Schumpter, Joseph (London: George Allen and Unwin, 1943), second edition, Capitalism, Socialism, And Democracy, pp. 81-86.
[ii] Ibid
[iii] Ibid
[iv] Ibid
[v] Ibid
[vi] Ibid
[vii] Palepu, Bernard, and Healy, Paul, Introduction to Business Analysis and Valuation, South Western College Publishing, 1997, p. 5-6.
[viii] Foster, Richard N., Notes from Seminar on "Outperformers", MIT/Sloan School, February 10, 1999.
[ix] Utterback, James M., "Developing Technologies: The Eastman Kodak Story", The McKinsey Quarterly, Number 1, 1995, pp. 131-144.
[x] Christensen, Clayton M. and Bower, Joseph L., "Customer Power, Strategic Investment, and the Failure of Leading Firms", Strategic Management Journal, Vol. 17, 1996, 197-218.
[xi] Ibid
[xii] Teece, David J. (ed), The Competitive Challenge, (Cambridge, MA: Ballinger Publishing, 1987), p. 211
[xiii] Teece, p. 212
[xiv] Teece, p. 213
[xv] Henderson, Rebecca, "Underinvestment and incompetence as responses to radical innovation: evidence from the photolithographic alignment equipment industry", Rand Journal of Economics, Vol 24, No. 2, Summer 1993, p. 251
[xvi] Ibid., p. 248
[xvii] Ibid.
[xviii] Ibid., pp. 251-252
[xix] Roberts, Edward B. and Yates, Ian C., "Large Company Efforts to Invest Successfully in Small Firms", unpublished paper, 1991, p. 15.

CHAPTER FOUR

The Corporate Venture

4.1 DEFINING CORPORATE VENTURING

Corporate venturing can be defined as the use of venture capital practices by large firms to foster either internal or external innovations, or both, which offer long-term growth potential for the firm. Corporate venture groups, typically found in high market-capitalization firms, are usually formed as separate businesses or tied to business development organizations that manage this task. Promising and core-aligned innovations are pursued to preempt creative destruction within an industry, and they offer firms the prospect of a sustainable future with a steady stream of new technology.

Venture capital practices involve the use of risk capital to invest in innovations that offer significant return potential. These investments typically span technological innovations that change or alter markets and product adoptions within these markets. Internal innovation implies the use of a firm's internal technology resource, such as its research and development organizations, to foster and develop radical new product innovations that can then be exploited as a new venture. External innovation suggests the firm has opened a window on external technological development in small start-up firms that align in some way to the strategic product and market needs of the firm. Separately, or combined, these often unpursued investment areas offer great potential for firms intent on expanding into new markets and products via disruptive and radical innovations. Corporate venturing, by definition, offers firms the opportunity to pursue a long-term growth strategy through disruptive innovations.

Corporate venturing is a growth vehicle for corporations that need to expand markets, broaden product lines, and form new businesses in a rapidly changing technological world. It requires senior leadership commitment, demands entrepreneurial spirit from within, and suggests a ruthless but courageous drive from management. A corporate venturing program should accomplish four main objectives:

1. to improve the capture of value from strategic assets;
2. improve the capture of value from good ideas;
3. respond more competitively in rapidly evolving markets; and,
4. to support demand for core products of the firm.[i]

1. Improve the capture of value from strategic assets

Asset value and effective utilization are critical elements in corporate valuation. Return on Assets (ROA) indicates how well a company uses it assets to generate increased profitability. Specifically, ROA indicates how much profit a company is able to generate for each dollar of assets invested. Once adjusted for long-run indicators, Return on Net Assets (RONA) can be a powerful measure of effective asset utilization, specifically when benchmarked against the firm's cost of debt and equity capital. If a company lacks the wherewithal to sustain an effective benchmark of its asset indicators -- for example innovations in product, process, or market distribution channels -- then a venture program can provide a more robust flow of ideas and the champions needed to turn them into income enhancing approaches[ii]. Companies such as 3M, DuPont, and Merck pursue venture programs for these reasons.

2. Improve the capture of value from good ideas

Human intellectual capital is probably the most important resource a company can own. Yet, as portrayed in the earlier discussions of innovation, its potential is inefficiently used. Technologically intensive organizations are good at generating ideas but lack the mechanisms, communication channels, and incentives to adequately bring them to market, as was discussed in Chapter 3.3. Further, established firms tend to place a significant portion of their innovation emphasis on existing product lines. Thus, many radical ideas exist inside every corporation but few, if any, receive adequate support. Technology-driven R&D often produces new knowledge that has no practical utility unless a new business is created to make use of it.[iii]

More importantly, the speed at which large companies can pursue ideas is often hampered by their size, which is directly proportional to the bureaucracy that evaluates, discourages, and distracts the technologist's initiatives. Small, independent, entrepreneurial

firm are much less constrained and can quickly capitalize on new, radical ideas. However, for the incumbent, a well-tailored venture program can provide an avenue for pursuing a greater number of ideas or inject a much-needed dose of market focus and entrepreneurial spirit. Companies such as Thermo Electron Corp. and RayChem thrive on this innovation engine that fuels new innovations for product and market businesses. They develop a tendency to "cannibalize" existing products and services in order to continually reinvent their cores.

3. Respond more competitively in rapidly evolving industry

Certain industries in the global markets are moving at an exceptionally fast technological pace. Telecommunications, computer hardware/software and peripherals, smart products, and Internet (broad-based communication) technologies are all experiencing heavy venture capital investment.[iv] As described by the S-curve introduced in Chapter 3, the rapid succession of technology evolution in these industries can place firms that were once in a dominant design position into threatened market and technology positions.

In Christensen's classic study of the computer disk drive industry, companies that secured a dominant product position with specific drive size, density, and cost over-emphasized current market demands with sustaining technology. Fast-moving innovative competitors quickly entered emerging markets with more innovative products (disruptive technology) and eventually, overtook the original market from the entrenched incumbents even thought their customers initially saw no special value in the new technology. This pattern continued through five dominant designs, from the 14-inch disk drive manufacturer in 1974 through to the 3.5-inch drive manufacturers in 1988.

Christensen points out, however, that the only firms that survived the market disruptive-technology attacks were those that created new venture groups designed specifically to behave as "small firm" agents pursuing the disruptive technology under the incumbent umbrella, albeit as separate organizations in separate locations. A venture program can provide a platform for boosting successful new product innovation in rapidly evolving industries.

4. Support demand for core products

Niche industries developed around core products of major established firms can destroy the economic value of those firms. Thus, the demand for a company's core products can be influenced by the evolution of separate industry niches. A well-structured venture capital program can be used to shape this evolution by securing interest in start-up niche players and guiding their product portfolios in ways that enhance the core products of existing firms. Both Adobe Systems and Intel have successfully pursued venture programs that support this purpose.[v]

Fundamentally, all firms should view venturing as a function of timing and some level of investment. Venturing is an absolute necessity if business and strategic goals require innovation and the transformation of innovation into new businesses, related or otherwise.[vi] The model each innovating firm chooses to adopt is critical to establishing a successful venturing enterprise, as commitment, resourcefulness, ruthlessness, and courage will combine to lead the effort forward.

4.2 HISTORICAL ANALYSIS AND CYCLES

In 1997 the venture capital industry in the U.S. committed about $46B in management to new ventures, with a combined annual growth rate (CAGR) of 10% since 1985 and a 15% CAGR since 1992. In 1997 a range of investment interests invested over $10B in new money. However, recent trends suggest that there will be too much capital chasing after too few deals, and firms will need to emphasize more than monetary value added (e.g., management and technological support) to venture relationships. Venture capital tends to follow "hot" industries, recent examples of which are the Internet, electronics, and biotechnology. These investments are often made at the onset of a viable product that is deemed ready for significant market expansion. Venture fund capital commitments have historically originated from pension fund but in recent years there has been an increase in corporate investments as shown in Exhibit 4.1.

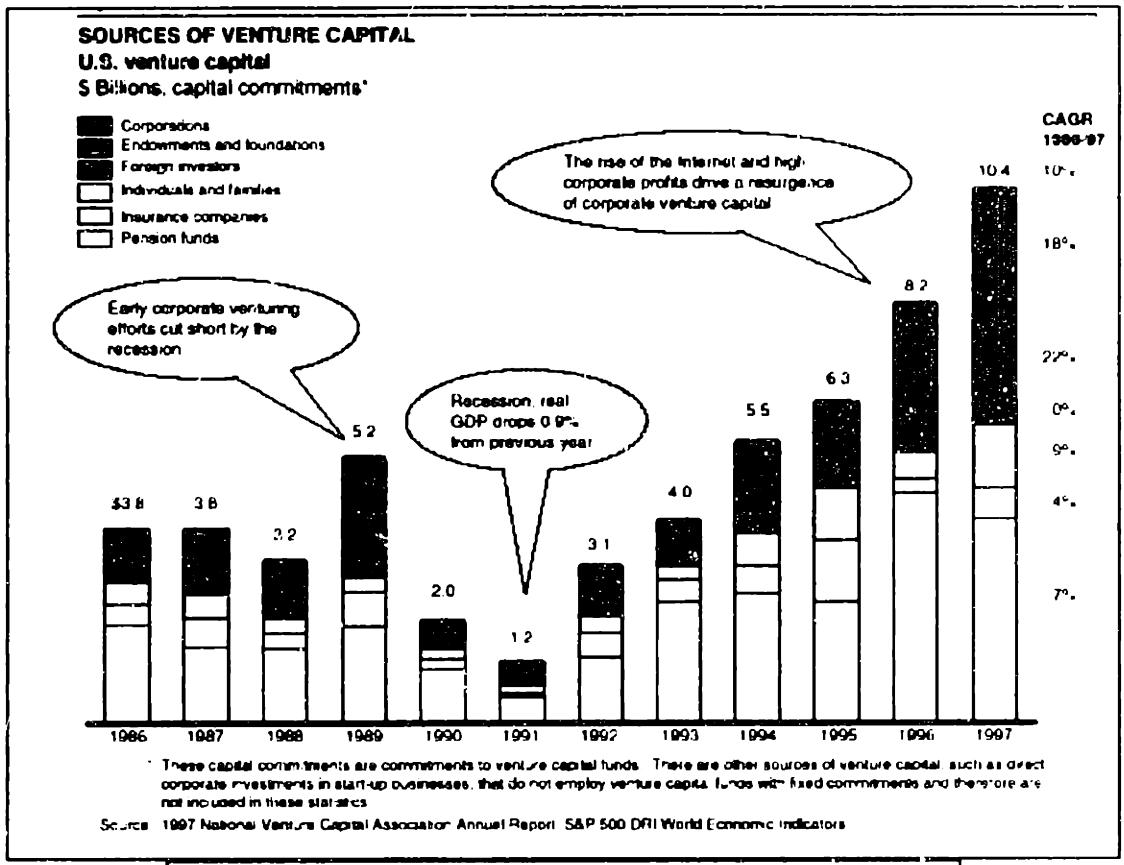


Exhibit 4.1 Sources of Venture Capital in 1997
Source: McKinsey, 1998

Larger venture capital funds that dominate much of the disbursements can achieve internal rates of return (IRR) of 20-35% and normally produce these equity returns in approximately four to eight years. Median venture capital fund returns are mediocre when compared to stock market returns and risk. Overall, these funds have contributed more than $40B in initial public offerings since 1990. These results are tabulated and presented in Exhibit 4.2.

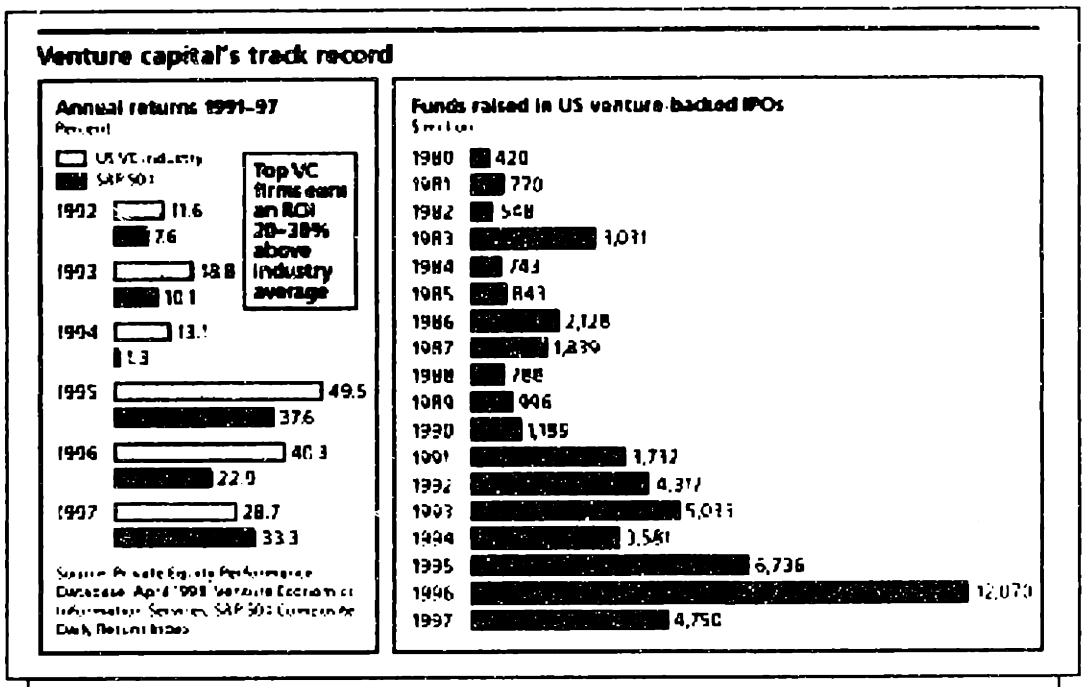
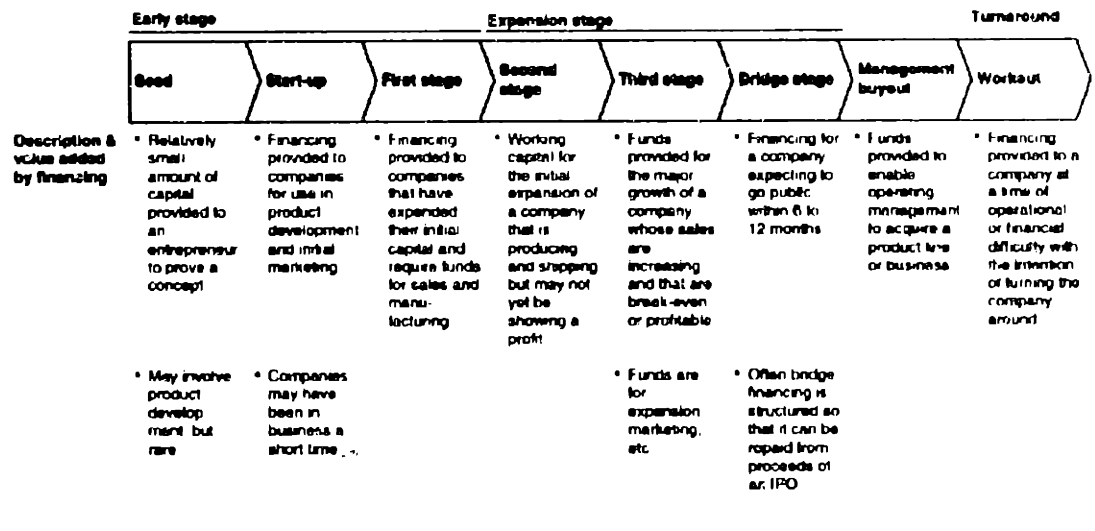


Exhibit 4.2 Venture Capital Track Record vs. S&P 500 and IPO Funds Raised 1980-97
Source: McKinsey, 1998

Venture capital can be categorized in three distinct stages based on a firm's evolution: (1) early stage, (2) expansion stage, and (3) turnaround as shown in Exhibit 4.3.[vii] The early



Source: Venture Economics Investor Services Annual Review, Pratt's Guide to Venture Capital

Exhibit 4.3 Venture Capital Financing Stages Source: McKinsey, 1998

stage encompasses the seed, start-up, and first stage of a company's life cycle. During these periods, the company moves from proof of concept through initial capital required to secure sales distribution and manufacturing capabilities.

In the expansion stage, the company evolves from its early inception of working capital to the stage at which the company can be expected to go public with an IPO within six to twelve months. The expansion stage uses the largest amount of venture capital resources to fund the asset intensity typically associated with these periods. It is estimated that over 80% of a venture capital firm's investment goes into building the infrastructure required to build the business in terms of working capital and a solid asset base for initiating profits.[viii] In contrast, it is estimated that venture capital plays only a minor role in funding basic innovation in core R&D, with less than 10% of the 1997 total investment pool directed toward R&D. Thus, there is a potential advantage to corporate venture capitalists who can capitalize on internal R&D investments that generate new innovations. The turnaround stage refers to buyout or workout options of emerging firms or established businesses required to return the operations to private management or management turnaround.

Venture capital (VC) firms tend to be independent, private firms seeking financial returns on committed capital from limited partners. The firm's familiarity with industry expertise, including communication and intellectual networks, is a fundamental ingredient for a successful VC firm, suggesting that such firms bring more than money to the prospective companies. Smaller VC firms tend to be industry-focused, but larger firms diversify their investment portfolios to increase investment opportunities and manage their industry risk.

The well-documented economic cycles of industry also prevail in the VC industry, with abundant capital and availability of deals alternating with over-supply, typically as a function of regional economic cycles. A McKinsey study suggests that the VC industry is "talent-driven" as the best firms continue to maintain by attracting top entrepreneurial prospects and thus deals that offer better returns.

In a Porter-like model, the venture capital industry can be assessed using an analogous five-forces configuration. Exhibit 4.4 provides an overview of this analysis, as performed by McKinsey.

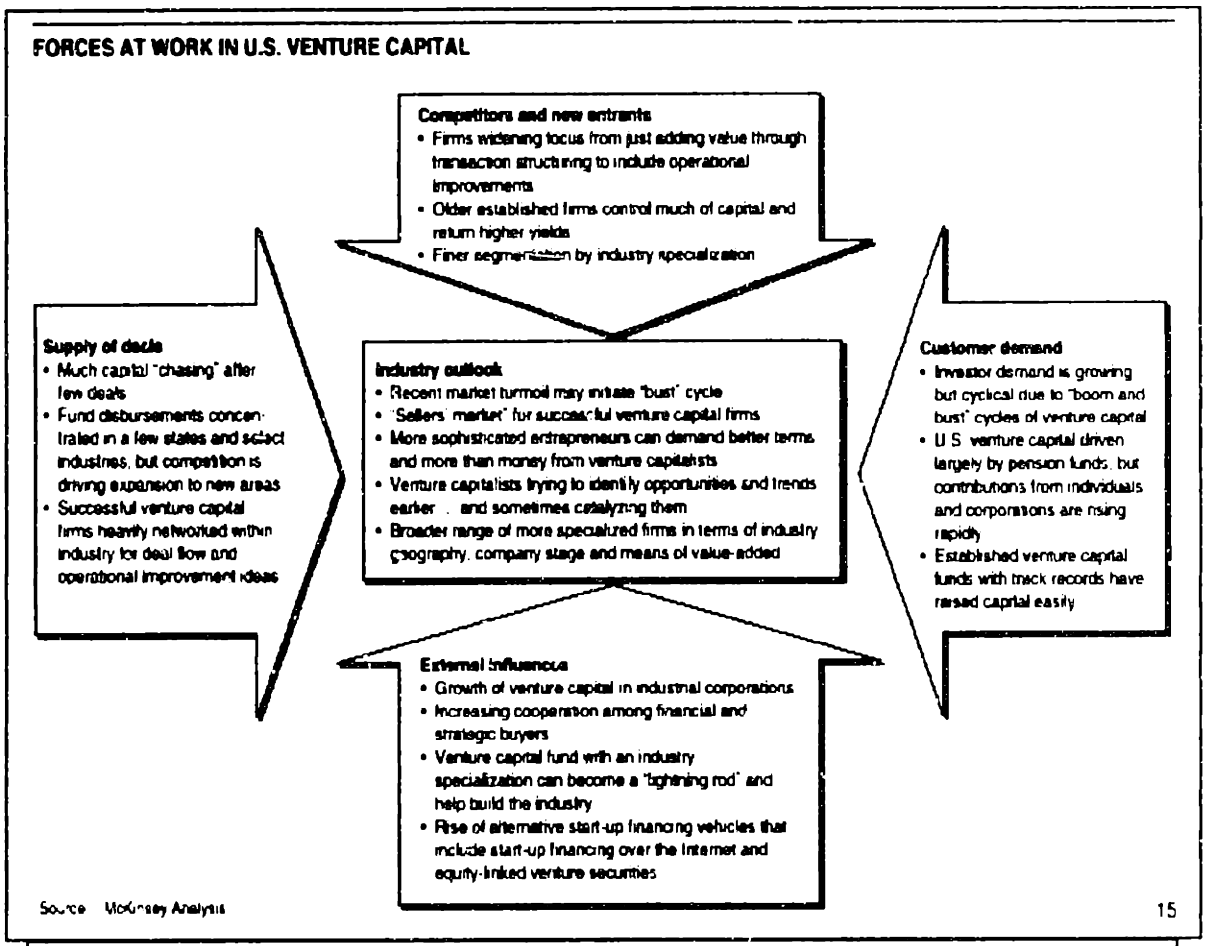


Exhibit 4.4 The Forces at Work in the U.S. Venture Capital Industry Source: McKinsey, 1998

In 1997, the greatest share of VC disbursements, over 56%, was in the electronics and information technology industry sectors (see Exhibit 4.5). One myth about VCs is that they invest in only good ideas and good people. The reality is that VCs invest in good industries, ones that are more competitively forgiving then the market as a whole. In the 1980s it was the energy firms, then attention shifted to bioengineering and computer hardware. Today interest centers on software, multimedia, and the Internet. In effect, it appears that the VCs emphasize the "rapid growth" and "weeding out" stages of the classic technology S-curve, investing heavily in companies that are searching for the dominant designs in their industries.

In a typical startup deal, a 40% preferred-equity ownership position is negotiated in exchange for an initial investment (recent equity positions have been higher).[ix] In 1997,

these initial investments ranged, on average, from about $2M for seed ventures, to $3.5M for startups, and over $4M for expansion, with an overall investment average of $3.86M. For larger funds (in excess of $100M) significantly larger investments can be expected.[x] The preferred provisions provide downside risk protection in the form of asset liquidation. This position is typically held as simulated debt collateral while the initial investment is still unfulfilled by the invested company. The VC also maintains the strength of its equity position in the form of anti-dilution clauses. Such a clause is necessary should the invested company falter and require additional venture resources at lower valuation, without which the original investors' equity would dilute in the overall equity position of the company.

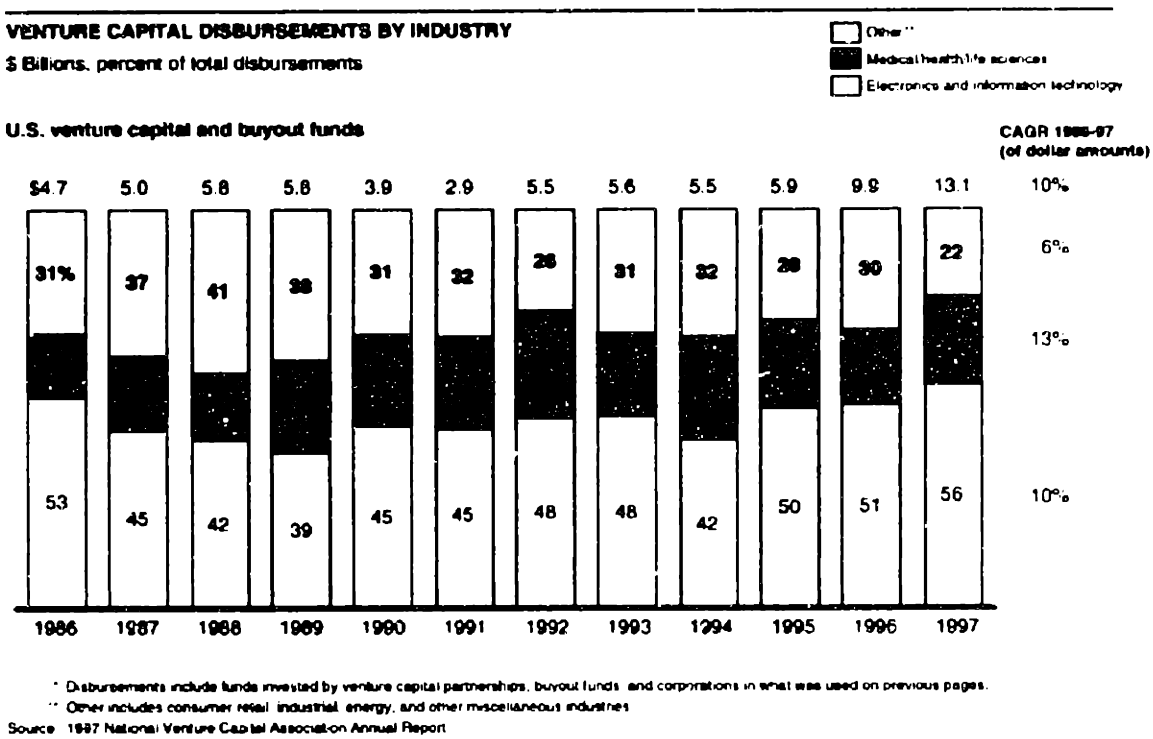


Exhibit 4.5 Venture Capital Disbursements by Industry Source: McKinsey, 1998

The VC thus has a claim on all assets, tangible and intangible, to protect its investment, along with a guaranteed equity position in the investment. To maintain this preferred position, the VC may also negotiate blocking or disproportionate voting rights over key business decisions facing the invested company. On the upside, VCs can increase their equity positions at below-market prices, preferentially, should the company's performance be favorable.

VC firms protect themselves from risk by co-investing with other firms, with some firms taking the "lead" investor along with several "followers". Rarely do VC firms finance an individual company entirely, and often portfolio companies will have two or three funds involved in the financing stages. VC companies use this portfolio diversification strategy as a way to reduce risk by managing the degree of investment in multiple opportunities that have different volatilities, much the way equity portfolios are managed in the stock market. A second reason cited for co-investing is associated with workload reduction for firms. A third reason is multiple evaluations that allowing the strengths of one firm to be aligned with those of other firms to make assessments of due diligence and portfolio valuation. Lastly, co-investing provides the opportunity to increase the credibility of the VC company, both in terms of track record and whom they do business with. The size of individual private venture capital funds has increased by more than an order of magnitude since 1980 (20M in 1980, 200M in 1997), and each firm's partners manage more and more investments. Thus, specialization is occurring while industry knowledge declines, thus providing an advantage to both the entrepreneur and the corporate venture investor.

In terms of fund performance and expected returns, the typical VC company expects a good investment to return at least ten times the initial capital investment over a five-year period (the typical fund produces after 2-3 years of investment and harvests returns after 7-10 years of market maturity or exit). Thus, the average good fund will produce an internal return rate of nearly 58%. Given that a portfolio of investments expects that only 10-20% of the firms will succeed, the fund averages returns between 25-35%.

A more detailed look at expected outcomes as a function of event probability is shown in Exhibit 4.6. In this table, developed by Zider, he considers that there are a number of equal-weighted parameters that each company must possess in order to achieve success.[xi] If a truly good firm can manage to have an 80% probability of success in each of these parameters, then the aggregate average success rate is less then 20%. If one of these parameters only has a 50% success probability (e.g., sufficient capital to proceed), the success rate falls to 10%. Thus, even a well-managed investment has only a 10% to 20% chance of succeeding. Portfolios of investments should consider these odds and select judiciously, nurturing high potential investments and continuous portfolio management. Achieving one successfully performing investment can yield significant individual returns

and average portfolio to return levels that exceed market returns and thus the market cost of equity capital.

INDIVIDUAL EVENT PROBABILITY	a	b
Company has sufficient capital	80%	50%
Management is capable and focused	80%	80%
Product development goes as planned	80%	80%
Production and component sourcing goes as planned	80%	80%
Competitors behave as expected	80%	80%
Customers want product	80%	80%
Pricing is forecast correctly	80%	80%
Patents are issued and are enforceable	80%	80%
Combined probability of success (equal weights)	17%	10%

Exhibit 4.6 Event Probability Analysis for Successful Venture
Source: Zider, 11/1/98, p5

Venture capital as part of a corporate strategy has grown in popularity in recent years. This interest, as discussed in subsequent sections of this chapter, tends to be cyclical and follows closely the economic cycles of industry. However, as one looks over the fundamental elements of the venture capitalist, the advantages that corporations can gain in this endeavor should be obvious. As shown in Exhibit 4.7, a comparison is made between the "successful" VC firm and major corporations.

	Access to available capital	Managerial and technological networks	Ability to diversify portfolio risks	"Talent-driven" potential
Moderate VC Firms	Smaller investment funds preclude larger investments and thus relate to smaller equity share	Tend to be industry and network focused	Limited ability to venture out of core areas of expertise. Portfolio management is limited within an industry segment	Smaller funds drive smaller industry participation. This is a self-fulfilling position in the VC industry.
Successful VC Firms	New funds require new investors	Build-up expert networks over time dependent on industry emphasis	Larger VC firms diversify industry portfolios, in itself a moderate risk (requires broader expertise and portfolio management)	Success ratios and strength of non-monetary factors
Existing Corporations	Investment capital available in plowback strategies for growth	Core products and markets build up managerial and technological networks	Corporations have risk diversity through existing product offerings	Tend to be known for industry expertise, success rates, and "brands".

Exhibit 4.7 Comparison of Venturing Firms: Moderate, Successful, and Corporate

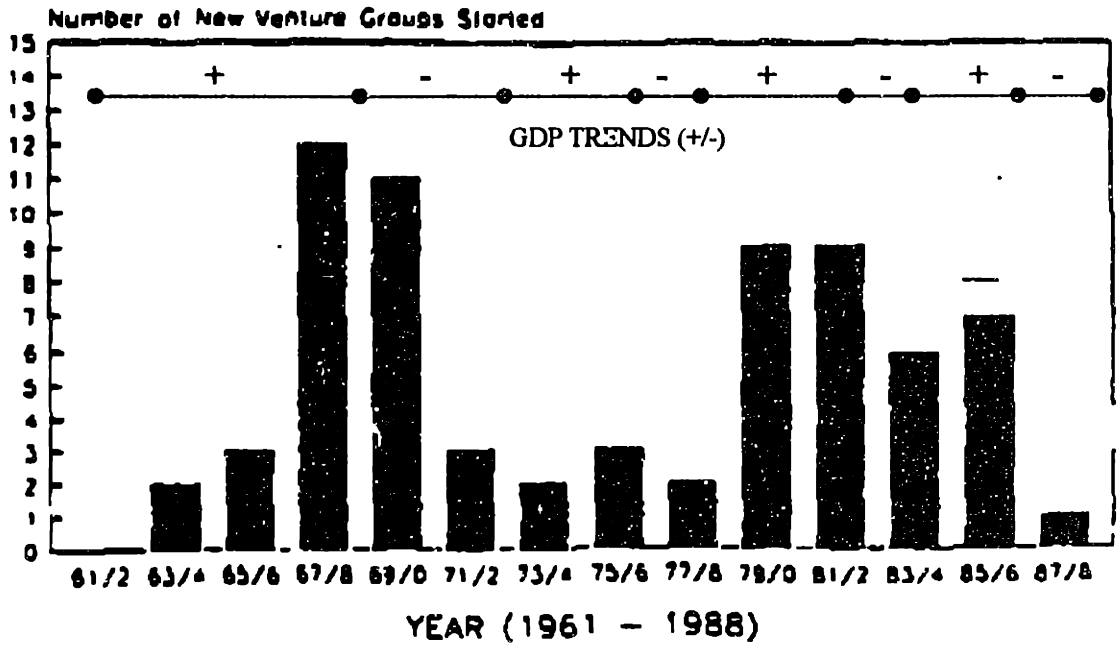
Source: Author

Another irony for major corporations is that a far greater percentage of VC funding in 1997 went to follow-on funding for projects that originated through the R&D expenditures of both the government ($63B) and industry ($133B).

4.3 CORPORATE VENTURING AS A COMPONENT OF STRATEGIC CORPORATE DEVELOPMENT

The use of venturing as a growth strategy by corporations continues to evolve. Many corporations, as reported by Roberts, have instituted a Corporate Venturing program only to abandon the effort later. Roberts reports that venturing by corporations takes on a cyclical nature that is tied to business cycles. Every ten years or so there is a surge of interest in internally generated new businesses.[xii] Over one hundred major US corporations have tried using corporate venture capital programs as a way of promoting new business development.[xiii] Sykes and Block suggest that the demise of new venture divisions is due, in part, to the fact that such divisions are highly visible and involve a concentration of expenses,

making them an inviting target when the company is squeezed and goes into consolidation mode.[xiv] Gee provides a non-statistical sampling of U.S. companies that started venture groups between 1960 and 1988 (see Exhibit 4.8) along with an overlay of real GDP trends over the same period, showing significant increases in corporate venturing as related to economic cycles.



Source: Robert E. Gee, Finding and Commercializing New Businesses, Research Technology Management, 1994 and Taylor, John B. Economics, 2nd Edition

Exhibit 4.8 Comparison of Initiated Venture Groups and Economic Cycles

Starting with the 1960s, a few pioneers, notably 3M and DuPont, initiated business innovation processes. From 1965 to 1970, with excess cash and a need to diversify, at least one-quarter of the Fortune 500 firms had "new venture" groups.[xv] But the economic downturn of the early 1970s caused many companies to reconsider their venture initiatives. In many cases, the difficulty of realizing a short-term profitable portfolio and the suspected degree of longer-term nurturing caused many of these venturing groups to be classified as failures. Nonetheless, some firms in this period still created venturing groups to exploit internal and external opportunities.

The "intrapraneuring" of the early 1980s created a new zeal for venturing organizations and a resurgence in these groups ensued. In spite of the strong economic and business level justifications, the development of corporate venture organizations has, at best, been a difficult challenge. A great degree of short-term interest, lack of adequate resources and venture expertise, lack of leadership commitment, and lack of clear expectation and criteria are primary reasons for its variable existence.

Now I will explore how corporations seem to evolve a corporate venturing strategy. Roberts suggests the following path for corporate venturing in a corporate setting:

→ Good Intentions brought forward by CV motivated personnel
→ Muddle along as firms grapple with strategic basis
→ Re-organize the efforts to further refine the CV role
→ Find Glimmer of success but are unsustainable with weak strategy
→ Become Disappointed with long term nature and nurturing
→ Drop Ventures favoring elimination over further refinement

Each phase of this sequence will be scrutinized in the corporate venturing examples of the next section. In general, these phases can be briefly described as follows.

Good intentions are important in any business enterprise. Venturing offers the possibility for growth and prosperity for its shareholders. Clearly, the data show favorable ROI for successful ventures, despite their 10% to 20% success rate. For instance, with only one in ten venture opportunities succeeding, the returns from a well-selected candidate can approach an IRR of 60%. Good intentions also stream from the corporate culture that wants to explore new opportunities in innovation growth in both sustaining and disruptive technologies. Every organization is interested in top-line growth and the perceived economic benefits of a venturing organization are logical for this outcome.

Unfortunately, there are commitments and varying degrees of resource investments that are critical success elements of the venturing organization. These elements include strong senior leadership buy-in, support and tolerance; provisos for sources of sustained

funding; moderated expectations; and communication of the entrepreneurial mode the corporation is looking for. With only a portion of these typically in place, developed organizations tend to seek autonomy and separation of power from the main corporate culture. As is evident by the now-defunct Xerox Technology Ventures organization, "the mainstream corporation just divorced itself from the venture group. So the intimate bond that you need to be able to understand what the opportunities are, just the access to everything, generally collapsed. So now we have to be sure what we are setting up is a sustainable business in the long run".[xvi] Xerox has subsequently replaced its organization with a more mainstream operation.

Corporate venturing organizations also tend to test the patience of their senior leadership, typically looking for quick winners in a field of slow, nurtured businesses. This translates into a culture that is slow to make critical investment decisions while looking for the best candidate for investment – overlooking riskier but more venturesome opportunities. Ultimately, this can have a self-fulfilling result when the venturing organization gets a reputation for a limited field of vision for entrepreneurial opportunities and the system collapses in on itself.

As was the case in the Xerox Technology Ventures organization, the logical outcome is a reorganization of the venturing organization to pull back into a favorable operation. While this may mean replacing key staff with more veteran venture capital resources, it may also mean the demise of the operation. Block and MacMillan define the following methodology, or screening criteria regarding their venturing organization (Exhibit 4.9).

These criteria, when considered together provide a corporation with a decision basis for considering both the existence of the venturing organization and the degree to which it should consider the ventures to pursue. The degree at which firms use and weight this criteria has been studied by various authors, and is tabulated for both U.S. and Japanese firms in Exhibit 4.10.

Criteria	Criteria Description
Strategic Fit	Define focus on types of markets, products and technology. Or define desired diversity from present strategy for focus.
Potential Size	Venture limits on investment size, time to reach a certain size, overall size of potential relative to time
Market Position	Market share position of potential investment (specified level expected).
Investment Limitations	Total amount of investment required to achieve profitability. Typically performed by stages of venture position.
Financial Performance Requirements	Criteria established regarding ROI, IRR, gross margins, sales growth rates, and overall potential sales.
Time Horizon	Time period to become profitable. Typically ranges from under 3 years to 10 years or more, depending on whether target market exists or must be developed. Overall business life should also be considered.
Risk Levels	Level of financial risk and external risk factors (regulatory, market specific, rivalry)
Social Responsibility and Corporate Values	How closely do venture opportunities align with corporate mission, value systems, and its role in the local community/social system in which it operates its business
Feasibility	Specific fundamental determinants for feasibility include: - Likelihood of gaining strong proprietary position - Availability of the systems, management and leadership required to run the venture - Degree of existing knowledge that can be applied to the venture
Impact	Ventures impact on the company's reputation or existing customer base

Exhibit 4.9 Screening Criteria for Venturing Organizations
Source: Block and MacMillan, 1993.

Selection Criteria	United States (39 Companies)	Japan (126 companies)
Strategic Fit	4.1	3.9
Competitive Advantage	4.0	3.8
Potential ROI	3.9	3.6
Existence of Market	3.9	4.4
Potential Sales	3.9	3.9
Risk/reward ratio	3.8	3.6
Presence of product champion	3.6	4.0
Synergy	3.5	3.7
Amount of Money risked	3.3	3.6
Closeness of the present market	3.3	3.6
Presence of an executive protector	3.3	3.3
Opportunity to create a new market	3.1	3.8
Closeness to present products	3.1	3.2
Closeness to present technology	2.9	3.5
Patentability	2.3	2.9

Exhibit 4.10 U.S./ Japan Comparison of Weighting of Selection Criteria for Venturing Strategies
Source: Block and MacMillan, 1993.

Overall, companies that tended to deliver ventures with higher performance (better ROI and profit contribution) were most sensitive to the risk/reward and potential sales criteria for selecting ventures.[xvi] Poorer performing companies weighed existence of a venture champion as highest for selection.[xvii] There was no correlation between venture program performance and the criteria of "closeness of present products" or "closeness to present technology", indicative of the value of diversification.[xviii] It is postulated that the high overall rating for strategic fit is consistent with the corporate desire to meet strategic goals set forth buy its shareholders.

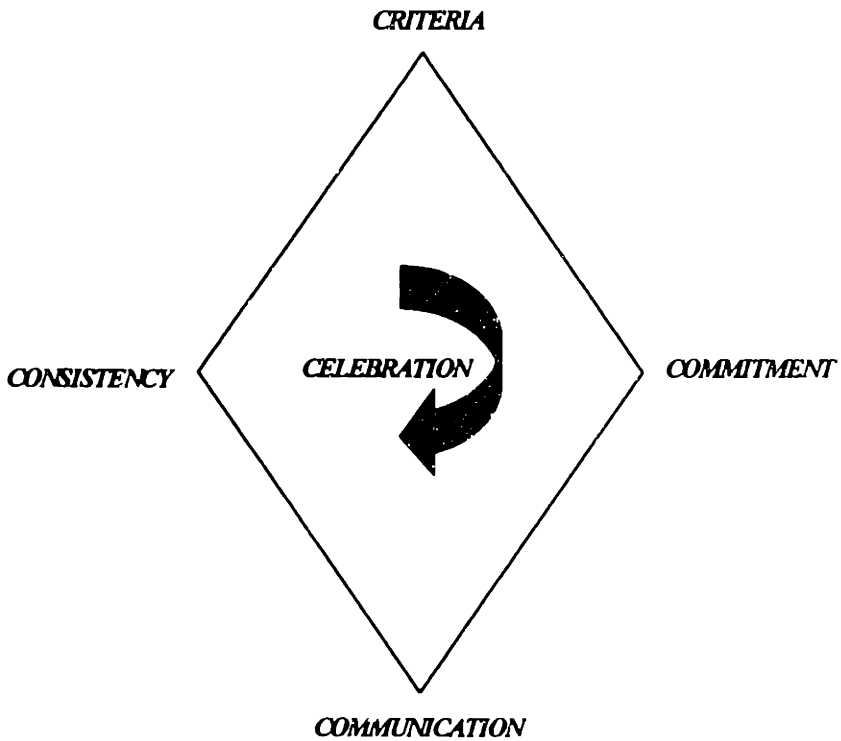
As many organizations tend to enter their venturing operations with limited experience and strategy, their potential for success diminishes. In a study performed on successful versus unsuccessful venturing organizations, it was found that senior management was often a source of limitations:

1. Senior managers in unsuccessful venturing organizations often required fully developed business plans to be submitted to management committees, often resulting in an arduous decision process and generally negative results with little explanation. The results tended to discourage innovation in the organization.
2. In successful organizations, managers developed the set of key criteria necessary for initial screening of proposals. These criteria were clearly communicated to the organization. This in turn stimulated the flow of ideas and intensity of innovation within the organization.
3. A widely communicated selection criteria, backed and supported by senior management, tends to create a self-screening process in the subordinate organization and results in a voluntary reduction in the number of unsuitable ideas from within. This in turn allows the decision organization to focus on better ideas for evaluation against the developed criteria.
4. The way senior management handles the rejection of ideas was significant between successful and unsuccessful venturing programs. In unsuccessful programs, the use of selection committees (composed of high-level staff) was used to decide by committee each idea, and impersonalized the entire process. In successful companies, delegates took the time to personally explain the rationale for non-selection based on the criteria,

making certain the information was provided privately and individually to the person who submitted the proposal. [xix]

Each of these methods shapes the organization's commitment to the venturing organization and its role in stimulating the desired innovation output from the knowledge community. Selecting key criteria, disseminating them to the community, and endorsing their meaning directly and consistently with the innovator tends to reinforce belief in the desired objectives of senior leadership. Not taking the time to support the critical ingredients of the venture organization only develops disappointment and ultimately the dismantling of the venture organization.

The 5C's of successful venturing can be developed from these experiences: Criteria, Commitment, Communication, Consistency and Celebration (Exhibit 4.11 and Exhibit 4.12). These are the critical strategic management elements for a successful venture organization to sustain in the corporate setting.



Source: Author

Exhibit 4.11 The 5C's of Corporate Venturing

Critical Element	Purpose
CRITERIA	Develop critical success criteria for establishing its alignment with corporate objectives
COMMITMENT	Establish a clear management commitment to these criteria through their application
COMMUNICATION	Deliver this clear commitment through corporate communication, suggesting application and providing clear examples of their application
CONSISTENCY	Never waiver in their application and do not instill a sense of bureaucracy or political agenda in their meaning. Clear, consistent application of the key criteria is critical
CELEBRATION	Not only should senior management publicize and highlight successful venture proposals that meet the specified criteria, but they should nurture and celebrate, personally, those individuals and proposals that didn't meet the criteria. By instilling a sense of pride of courage and innovation output, the organization will sustain its commitment to venturing – to strive for success, but to make attempts is critically important!

Exhibit 4.12 The 5 C's of Corporate Venturing Defined
Source: Author

4.4 DEVELOPMENT AND DISCUSSION OF VENTURE MODELS

Roberts develops a range of alternate strategies for launching new ventures. The range is also a function of perceived corporate involvement with these functions. At one end of the spectrum are Venture Capital or venture capital-like corporate investments in external start-ups. At the other end of the spectrum is Internal Ventures, or purposefully setting up a new venture organization inside the company to launch new growth businesses for the firm. In between, the corporate involvement increases from low to high as the degree of venture activity and encouragement inside the firm increases. Exhibit 4.13 provides the spectrum of venture strategies as defined by Roberts.

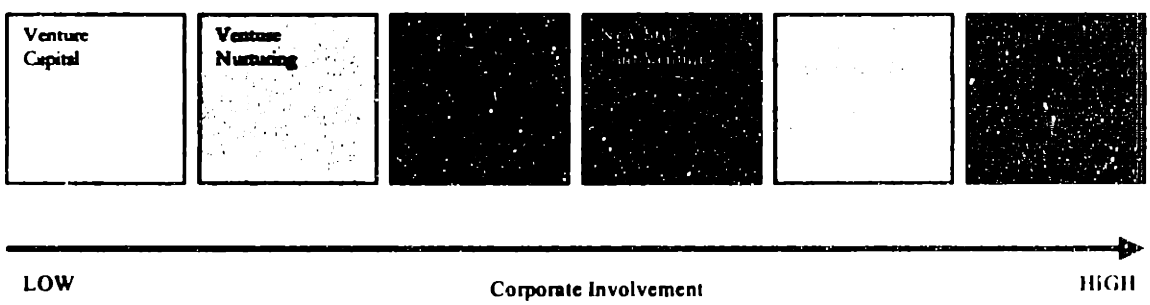


Exhibit 4.13 Corporate Venturing Strategies and Level of Corporate Involvement
Source: Roberts, 1995

A. Venture Capital Model

In this venturing paradigm, the corporation takes equity positions in young firms that exhibit potential growth opportunities in either new or existing product lines related to the corporations core areas. Companies seek to establish a "window" on promising technologies. In years past, companies such as DuPont, Exxon, Ford, and General Electric have taken this route, but few of them have been able to make the venture capital approach, by itself, an important factor in their growth or profitability strategies. In more recent times, Microsoft has made a habit of acquiring youthful, enterprising, software companies to increase their product portfolio positions. Microsoft has used this external community as a way of effectively creating out-sourced R&D strategy for new product development. In many cases, Microsoft brings these companies into their management structure, but allows them to operate as separate business within the Microsoft Corporation.

B. Venture Nurturing

To nurture means to assist in growth and development. In venture nurturing, the investing firm commits technical and managerial resources to assist the investment's potential. In this scenario, the likelihood of successful ventures must be integrated with the nurturing company's management agenda and strategy. Failure in this scenario derives more from forceful management expectations and impatience that often drives the corporate philosophy. Start-ups are simply unable to resist the temptations of corporate "assistance" without fully recognizing they are selling their entrepreneurial spirit to the devil!

C. Venture Spin-off

Corporations that invest heavily in R&D, may find that the resulting innovations and product opportunities might not fit with mainstream core product emphasis. In these cases, the corporations are forced to either abandon unaligned innovations, or more preferably, spin them off. One such company that has made tremendous gains in this area is Massachusetts-based Thermo Electron Corporation. This company pursues a strategy they call "spin-outs". The corporation benefit from the spun-off company's venture into the public markets as capital, market efficiencies, and freedom to grow under separate control help the small, entrepreneurial enterprise prosper. Roberts suggests that this strategy may be a good way to

hold on to entrepreneurial human capital or to exploit a by-product technology. However, returns may be limited given the limited corporate involvement.

D. New-Style Joint Ventures

In this joint venture model, the joint venture theme is present with an entrepreneurial twist. Large corporations take a capital position in small companies that can provide entrepreneurial enthusiasm, vigor, flexibility, and technology. The large corporation provides the required capital, and in some cases the marketing and distribution channels that can help to diffuse new technologies into global markets faster then through traditional start-up routes. In this scenario, the corporations also have the added advantage of allowing the small companies to behave as such, while still providing them with capital and resource incentives to grow.

E. Venture Merging and Melding

Since many of these venture approaches seem logical, the natural consequence in corporations will be bring or merge together all these approaches. While sounding logical at the outset, corporations must carefully craft these multi-faceted venture enterprises and be careful not to overburden the initiatives. It is likely that the venturing organization will increase its profitable contributions by scouring the innovation world for new opportunities. Behind all of these initiatives, however, are conditional elements that lend to the success of the venturing organization. Roberts documents the case of Exxon in which, under the role of the Exxon Enterprises company, a number of venture efforts ensued that allowed Exxon to transform itself from a huge – though unglamorous – one-product, narrow-technology oil company to an exciting company that is expanding into computers and communications, advanced composite materials, and alternative energy devices in the early 1980s. Exxon has subsequently retreated from this position, as will be discussed later.

F. Internal Ventures

Perhaps the single most internally motivating approach in corporate venturing comes from what Roberts classifies as "internal ventures". In this model, the corporation sets up a separate division or operation for the purpose of entering different markets or developing

radical new technologies that could lead to new product formation. As will be documented in subsequent sections, there is a mixed track record regarding the results of such activities. The most documented of these companies is 3M, but new cases are emerging in companies such as Lucent Technologies, Xerox, Siemens, and others that will be further documented in Chapter Six.

These internal corporate venturing strategies offer the opportunity for corporations to position themselves as both a venture capitalist and an entrepreneur. This potential conflict of interest can, if organized correctly, add significant advantage to the corporation. In particular, the corporation plays the role of the VC, buying a stake in the entrepreneur's idea, nurturing it for a short period, and then exiting the relationship with additional options for the firm. The corporation's role as entrepreneur gives it the ability to understand technological positions, markets and other strategic elements.

A successful venture thus blends two strengths, leaving the corporation with the additional option of folding the successful ventured company back into its mainstream for long-term growth or spin it out into the public market. The company is also able to tap into its resources, assets, and human capital to work out problems associated with the venture. Its keen awareness of technological issues and changing market conditions also allows the firm to make qualified termination decisions.

4.5 HOW DO INTERNAL VENTURES INNOVATE?

When considering how internal venture groups innovate, Byron David indicates that the degree of product innovation is influenced by the mode of venturing that is chosen and the relationship that exists between the internal entrepreneurs, venture managers, and the R&D function.[xxi] Three distinct modes of internal championing of internal ventures were identified from his field research of 139 Fortune 500 firms surveyed in which 49 of 51 firms responded with some form of internal venturing. These three modes were identified as (1) Entrepreneur-less, (2) Entrepreneur-led, and (3) Entrepreneur-Venture Manager, as illustrated in Exhibit 4.4.

Mode	Description	Performance
Entrepreneur-less	Venture emerges from an R&D led activity and is led by an assigned venture manager	Highest degree of technical diversity but lowest commercial success rate
Entrepreneur-Venture Manager	Venture is initiated by a goal-oriented entrepreneur and followed by a process-oriented venture manager	Moderate degree of commercial success, high product performance, and overall diversification
Entrepreneur-led	Venture is initiated and led by the entrepreneur through its critical less-structured engineering phases through its more structured product development phases.	Highest degree of commercial success and moderate overall diversification.

Exhibit 4.14 Performance of Three Different Types of Venture Leadership Modes
Source: Author

In summary, David determined, through data reduction and model analysis, that the highest commercial success was achieved in ventures that were Entrepreneur-led and offered moderate overall diversification. The least successful were those in which the products evolved from the Entrepreneur-less mode, although the concepts involved the highest degree of technical diversity (radicalness). Lastly, moderate overall commercial success was found in the Entrepreneur-Venture Manager mode, which had the highest degree of product performance, marketing diversification, and overall diversification – producing six out of the seven venture products that were spun off.[xxii]

It is clear from David's study that internal venturing organizations should operate their ventures using a venture capital model, separating the source and management of the fund resources from the venture itself. In retrospect, David's study suggests that the lack of an entrepreneur to lead the effort will cause the venture to perform poorly; likewise, replacing the key entrepreneur with a venture manager will undermine the venture's innovation from a successful commercialization.

These ventures can be developed independently or, as is more common, shared or syndicated with external venture capital agents that can add credibility and validity to the venturing operation. In such relations, multiple agents provide core competencies that typically complement each other. For the corporate firm, the knowledge of markets, technology, and competition are critical for assessing strategic issues. The corporate firm brings Porter's Five Forces view to the relationship, emphasizing keen awareness of the five forces that likely drive a new or emerging industry. On the other hand, the venturing firm

brings knowledge of the financial possibilities related to the opportunity. Venture firms typically are keenly aware of valuation-related knowledge. Additionally, the venture firms understand the nurturing and stage processes of venturing and can contribute knowledgeably to the entry and exit criteria and stage management venturing areas. Exhibit 4.14 provides a typical overview of the corporate venture relations that may exist with external venture firms.

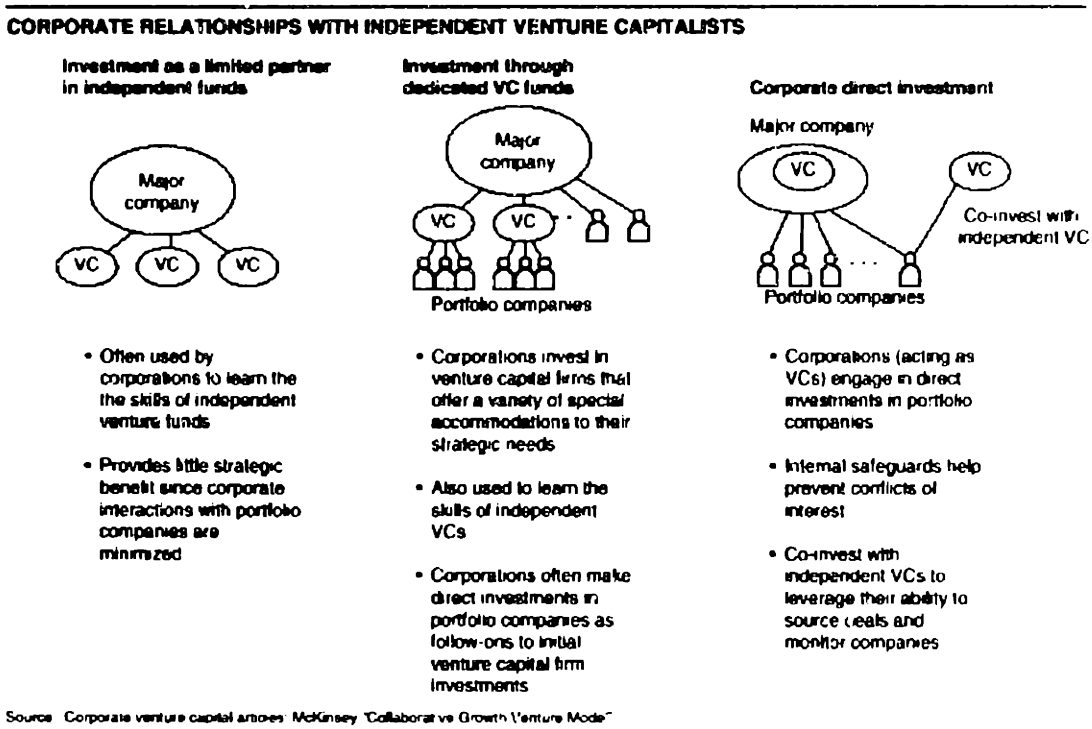


Exhibit 4.14 Corporate Relationships with Independent Venture Capitalists
Source: McKinsey, 1998

4.6 ANALYZING CORPORATE VENTURING AS AN INNOVATION AMPLIFIER

An "innovation amplifier" causes the innovation organization to perform at amplified levels and heightened technology output. Consider Bell Labs Innovations (now part of Lucent Technologies after to its divestiture from AT&T). Bell Labs was producing less than a single patent a day from among its 20,000 member innovation community. Bell Labs was

a prestigious environment and was the source of many of the technological marvels of the 20th century – from semiconductors to lasers. At its peak of invention performance, Bell Labs was a science factory, continually pursuing radical innovation and home to basic research and a number of Nobel Laureates in science.

Lucent Technologies, after divestiture and its subsequent retention of Bell Labs, pushed a venturing organization from the top. The 5C's, discussed in previous sections, are instrumental to this organization. Bell Labs went from 1 patent per day to almost 3.5 patents per day. Was corporate venturing at least partially underpinning this innovation amplifier? Was the entrepreneurial engine of Lucent enhanced by its Corporate Venturing program? In considering the answers to these questions, one should recognize that most firms that support a corporate venturing initiative suggest that a key objective is to **create and nurture a new entrepreneurial spirit in their organizations** – an innovation amplifier!

4.7 CAN CORPORATE VENTURING RENEW AN ENTRENCHED INCUMBENT?

The threat of new technologies from outside the firm often encounters a typical response. Richard Foster of McKinsey points out that firms typically go through responses ranging from ignorance to despair when threatened from the outside with new, competing, technologies.[xxiii] Under the threat of new entrants with potentially competing innovation, Foster states that "firms often go through stages of denial, then anger, the bargaining, and finally, acceptance."[xxiv] In many cases, new entrants are motivated by a "underdog" mentality and they seek to intercept both the emerging and current markets of the incumbent firms.

Christensen's study of the disk drive market clearly points out the significance of new ventures competing with the entrenched, customer focused, incumbent. He showed that the disk drive industry was consistently focused on the *entrenched incumbent* or "incumbent inertia" position of pursuing sustaining technology in the threat of disruptive technologies that didn't necessarily threaten, or for that matter excite, their existing market base. The disk drive industry often switched to the newest entrant with the technology that was most attractive to the emerging market. In this case, weight and size were critical to the emerging

PC markets. Ultimately, the improved drive storage density returned back to feed the needs of the once captured market of the incumbents. Only the firms that ventured out, according to Christensen, were able to sustain their position and ward off serious threats to their market position and technological dominance. Christensen writes,

> *In the disk drive industry's history, three established firms achieved a measure of commercial success in disruptive technologies. Two did so by spinning out organizations that were completely independent, in terms of customer relationships, from the mainstream group. The third launched the disruptive technology with extreme managerial effort, from within the mainstream organization.*[xxv]

In terms of corporate venturing strategy, the first two firms succeeded by creating the independent organizations and the third firm failed as it tried to develop the disruptive technology from within the mainstream organization.

The *entrenched incumbent* notion is thus truly affected by the implications considered in Robert's familiarity matrix. In this case, both market factors and technological innovation factors that test familiarity influence the incumbent. Inside the mainstream firm, the innovation engine is focused on process improvement and incremental advances in the core products. The few entrepreneurial agents inside the firm are pushed aside for process improvements that increase incremental product performance and shave dollars off manufacturing costs. Margins and earnings performance will drive the decisions of these firms without a strong regard for the threats of the new entrants – their markets are sacred and their customers supposedly know what they want!

Outside the firm, as markets become more familiar with the current technology and products are adopted within these markets, both customers and incumbent firms become comfortable with the current trajectory. If new entrants emerge with disruptive technology, the lack of familiarity with the technological innovation in the existing market creates an aversion to adopt it. As new entrants offer new technologies in new markets, adoption forces drive new users which eventually launches the new technology into the adoption process. Once adoption surpasses the early adopter stage, markets tend to self-reinforce. Consequently, technological progress ensues and market economics force out low-efficiency producers and competition becomes fierce. Once the adoption is fully engaged, existing markets begin to benefit from the technological process and market factors begin to take hold

in the incumbent markets. With no available competing technology, incumbents scramble to provide the market with improved existing products to no avail. Market adoption dynamics take hold in the old markets and counter the market position of the incumbent firms. In a last-ditch effort, incumbents that are not prepared will launch competing technologies but do have the benefit of technological progress and drop out of the competitive landscape.

In corporations where venturing programs are established, either formally or in reaction to entrant threats, the success of these firms seems to indicate that corporate venturing can renew an entrenched incumbent. Christensen's disk drive analysis is a documented academic case that supports this claim. However, this needs to be further elevated to other industries and firms before this claim can be reinforced. Particularly troubling is the cyclic nature of corporate venturing, as discussed in Chapter 3, and the seemingly intentional foray into and out of corporate venturing programs by some firms. In some cases there seems to be a "once bitten, twice shy" mentality among firms that have been undermined in the past by new entrant technologies, some of which were their own, especially when firms are seemingly at the forefront of the technological race in the beginning.

This is exemplified in Xerox's story described in "Fumbling the Future" which talked about the company's unwillingness to pursue personal computing peripherals and graphical operating systems, despite their apparent internal ability to do so. Alas, Xerox vowed to commit to venturing only after a book was published describing this debacle. Christensen points some of this out in his disk drive study, suggesting that some of the incumbents had grass roots engineering efforts focused on the technological competencies of the disruptive technology, only to be shut down by the entrenched incumbent mentality. Hewlett-Packard responded the same way with their stodgy attitude toward Steve Wozniak's plan to create a computer. Others have spawned into venturing by the dynamics of their industry.

Today, firms are re-entering the corporate venturing arena. Some have suggested that firms are prepared not to replicate their attempts in the "first crop" from the 1970s and mid-1980s. Tom Bentley of Alliant Partners suggests, "They were driven by a fascination with technology, any technology..."[xxvi] In that particular case of external venturing, they didn't understand the nature of venture funding and were not prepared for the long-term commitment and nurturing that accompanies the venture capital model.

A documented study by Josh Lerner and Paul Gompers at Harvard Business School found that a traditional venture fund exists for about ten years, while corporate investors typically stay invested for only four years.[xxvii] According to Lerner and Gompers, with improved commitment to venturing against market, strategic, and financial factors firms today can perform as well as traditional venture funds.

4.8 CAN CV SPARK NEW INNOVATION?

Many firms are looking to corporate venturing as a means to replace internal R&D functions and seek their innovations from the external agents outside of the firm. The "not

PRIMARY PURPOSES OF CORPORATE VENTURE CAPITAL EFFORTS

	Purpose of venture capital initiative	Characteristics of companies	Examples
Strengthening webs	1. **Pure financial gain**	• Companies have a competitive advantage in access to cash or special investment expertise	• Allstate Insurance • Schroder Ventures • Chase Capital Partners
	2. **Cross-sell investment banking products** (focusing more on growing market share than growing entire market)	• Investment banks earn profits through fees for IPO, M&A, and high-yield services to portfolio companies	• DLJ (Sprout Fund) • Goldman Sachs • Morgan Stanley
	3. **Strengthen webs to support products or grow new applications for products** (focusing more on growing market as a whole)	• Usually the dominant or semi-dominant player in a web-based marketplace • Products often have short life cycles with high R&D costs to create next generation applications	• Intel • Texas Instrument Ventures • Adobe Ventures • Novell
Leveraging technology/ideas	4. **Access technology/products in a different industry**	• Industries are not technology-intensive, but face turning points where new technologies will cause dramatic changes (e.g., media/publishing and the Internet or credit cards and e-commerce)	• Visa • American Express • Tribune Ventures • McGraw-Hill
	5. **Acquire technology/products in the same industry**	• Rapidly changing technology-intensive industries • Many companies offer a portfolio of products (e.g., networking solutions for businesses) that are completed by acquiring start-ups	• NEC • Lucent • Siemens • Smith-Kline Beecham • Schering-Plough
	6. **Commercialize the results of internal research**	• Technology-intensive industries • Large R&D expenditures on programs that yield discoveries outside of core businesses	• Xerox New Ventures • Monsanto Growth Enterprises • Lucent New Ventures • Thermo Electron

Source: Corporate venturing articles; McKinsey analyses

Exhibit 4.15 Primary Purpose of Corporate Venture Capital Efforts Source: McKinsey, 1998

your typical venture capitalists" are taking small fractions of their R&D budgets and directing them to fledgling companies. There are ranges of documented purposes for these initiatives that span pure financial gain to commercialization of internal research to fuel long-term growth. As shown in Exhibit 4.15, there are a variety of example companies that can be categorized in each of these areas.

In particular, with all these reasons to pursue new ventures for the financial well-being of the firm, there should be internal effects related to the pursuit of new technologies. Will the commitment to venturing create an internal feedback loop that increases the innovation engine of the firm? Will sustaining technologies benefit from the pursuit of disruptive technologies? Will the enthusiasm and network of the innovation community increase with the incentives of the venturing opportunity? These questions will be considered in Chapter Six, which examines the efforts of specific companies, each of which developed a venturing organization for their own purpose.

Before discussing the specific examples of corporate venturing, an exploration and evaluation of key claims will be conducted. The true value proposition of corporate venturing in terms of past and present studies will be performed.

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[i] Brody, Paul and Ehrlich, David, " Strategy – Can big companies become successful venture capitalists?", The McKinsey Quarterly, Number2, 1998, p. 55
[ii] Ibid
[iii] Block, Zenas and MacMillan, Ian C., *Corporate Venturing – Creating New Businesses Within the Firm*, Harvard Business School Press, 1993, p.22
[iv] McKinsey & Company, US Venture Capital – Industry Overview and Economics, Summary Document, September 1998.
[v] Brody, p. 56
[vi] Block, Zenas and MacMillan, Ian C., *Corporate Venturing – Creating New Businesses Within the Firm*, Harvard Business School Press, 1993, p. 29.
[vii] McKinsey & Company, p. 2
[viii] Zider, Bob, "How Venture Capital Works", Harvard Business Review, 11/1/98, pp. 106(10)
[ix] Ibid
[x] McKinsey, p. 6
[xi] Zider, p. 4
[xii] Block, Zenas and MacMillan, Ian C., *Corporate Venturing – Creating New Businesses Within the Firm*, Harvard Business School Press, 1993, p. 13
[xiii] Ibid, p. 30
[xiv] Ibid, 0. 28
[xv] Gee, Robert E., "Finding and Commercializing New Businesses", Research-Technology Management, January-February, 1994, pp. 49-56

[xvi] Stevens, T., "Divide and Conquer", *Industry Week*, Vol. 247, p. 3.
[xvii] Block & MacMillen
[xviii] Ibid
[xix] Ibid
[xx] Ibid
[xxi] David, Byron. L., "How Internal Venture Groups Innovate", Research/Technology Management, March-April 1994, pp. 38-43
[xxii] Ibid.
[xxiii] Foster, Richard N., Seminar in Technology and Innovation Management and Strategy, MIT Sloan School, February 10, 1999, Personal Notes.
[xxiv] Ibid
[xxv] Christensen, Clayton M. and Bower, Joseph L., "Customer Power, Strategic Investment, and the Failure of Leading Firms", Strategic Management Journal, Vol. 17, 1996, 197-218.
[xxvi] Gunn, Eileen P., "Staying Smart/Managing Companies and Careers In : Venture Capital Is the New R&D. Tiny Investments by large corporations can have an outsized impact on the future of technology and on the bottom line." Fortune, 12/21/98, pp. 235.
[xxvii] Ibid.

CHAPTER FIVE

Analysis of Corporate Venturing's Key Claims

5.1 ASSESSMENT OF CORPORATE VENTURING PERFORMANCE

Perhaps one of the most comprehensive analyses of CV performance can be found in Appendix A of Block & MacMillan's corporate venturing text. While some of these studies are somewhat dated, the validity of performance and measures used cannot be debated. In this section, these results will be integrated with the findings of current field research, forecasts by individuals, and current publications.

A. Success Rate of CV Strategies

Exhibit 5.1 summarizes the findings of a number of authors over the last twenty years. The table provides the author, date, analysis criteria, measured success, and key findings in the study.

Author and Date of Study	Analysis Criteria	Success Rates	Key Findings
Biggadyke, 1979	35 Fortune 500 companies, 68 ventures started	1. 18% profitable in 2 years 2. 38% profitable in 4 years 3. Median Performance was 7% ROI in years 7 & 8.	1. Ventures pursing market share performed better 2. New Ventures need 8 years to reach profitability (on average). 3. Companies should "think big, enter big, go for share, and not be impatient.
Fast, 1981	11 Start-ups by VC (not Corporate Ventures)	1. 18% ROI by year 3 2. 230% ROI by year 8 (Note these results contrast those of Biggadyke)	1. VC's use of Limited Partnership format locks in he pool of invested capital while Corporate VCs tend to withdraw support after a few years. 2. Suggests that corporations invest in VC pools to learn how to handle new ventures more effectively.
von Hippel, 1977	18 ventures studied	1. 60% achieved a 10% pretax profit and rapid sales growth within 3 to 5 years. 2. 40% were failures	1. Ventures were successful if they were directed at existing markets familiar to the firm 2. Successes break even in 1 to 8 years 3. The best ideas come from customers.
Porter, 1987	Diversified acquisitions, joint ventures, and startups of 33 large Corps. From 1950-86	1. On average, 56% of start-ups successful (still in existence at time of study) vs 46.6% of acquisitions 2. Reported wide variation between companies	1. Venturing into new fields and industries can be as successful then an acquisition strategy. 2. The wide variation in results gives credence to individual analysis of the successful and unsuccessful firms.
Sykes, 1986	Exxon's New Venture Program from 1970-81 19 internal ventures,18 VC investments	1. No internal ventures became profitable 2. Venture capital investments yielded 18 times return on initial capital over the period.	1. Venture capital should be used as a "primary probe" strategy 2. Venturing in mainstream areas essential to fit strategic orientation and commitment 3. Entrepreneurial environment impossible to maintain in a large, multi-product setting. 4. An environment that encourages resourcefulness is more important that ample financing
Block and Ornati, 1987	Evaluation of 42 Fortune 1000 companies and 207 ventures (seeking correlation to compensation practices)	1. 50% reported as successful 2. 20% failures 3. 30% "too soon to tell" No relationship was discovered between successful ventures and compensation method.	1. Financial incentives may not affect venture performance but do affect retention of the key personnel.
Block and Subbanara simha, 1989	43 U.S. and 149 Japanese (large, public) firms, 1077 ventures studied	1. 59% of U.S. firms reported profitable venturing operations 2. 31% of Japanese firms reported profitable 3. 13% of U.S. and 16% of Japanese reported ROI's equal or better then the companies core businesses.	1. Portfolio effects of the overall firms performance must be considered 2. Key venture performance considerations should be given to market, competition, and resource effects 3. A separate venturing organization appears less desirable then an integrated venturing activity in the firm 4. No performance correlation were made to "sticking to your knitting" 5. The mean time for ventures to achieve profitability was 2.7 to 3 years for both U.S. and Japanese companies 6. Financial incentives, designed to help mitigate losses, need to be a part of the venturing program along with consistent management practices.

Exhibit 5.1 Comparison of Various Corporate Venturing Studies by Different Research Teams
Source: Block, Zenas and MacMillan. 1993. Appendix A

B. Return Rate of CV Strategies

Both documented analyses and findings in field research suggest that corporate venturing strategies typically tend to pursue return rates equal to or greater than their venture capital relatives. The corporate venturing organization has the added dimension of meeting internal hurdle rates established by the industry and market factors related to the firm's core businesses.

It was found that CVs tend to pursue returns that exceed 20% IRR over a 5 to 7 year period. The data suggest that it is often likely for firms to achieve this level in as few as 2 to 3 years. Additionally, as high as 50% of U.S. companies that pursue ventures achieve profitability within a six-year period.[i] Unfortunately, the data also suggest that only one in seven firms find that its overall venturing activity delivers a return better then its core businesses in that six-year period. In the companies that produced returns greater then their core businesses, the average venture age was 2.8 years, significantly lower then the commonly referenced 5 to 7 years for a venture to mature.

When one considers the industry effects of some of these ventures, such as the rapid market capitalizations of Internet stocks in the late 1990s, time considerations become highly compressed. According to a panel discussion at the 1999 Harvard VC conference, the Internet frenzy has caused VC investors to become less stringent in their financial valuations and they are making deals based on a "gut feel" for an opportunity. The time horizons for deal making and analysis have simply been discarded for businesses in this industry. Thus, the normal gestation period of ventures should be considered, along with industry bias, in determining how long a venture may take to achieve profitable performance.

Taking a closer look at industry sectors for venture investment, Exhibit 5.2 provides a summary of the invested areas, as of March, 1998. It is suspected that in these sectors, with nearly 86% of "deals" going into the Information Technology (Internet and Telecom) and Healthcare-related areas, corporate venturing initiatives are most likely to occur and be most profitable. Looking in particular at Lucent Technologies, this company has only had its venture capital operation for less then two years. Already, its forecasted performance is expected to exceed a 20% IRR in about a two-year timeframe. Its overall portfolio return, located primarily in the IT sector, will exceed the industry average by a significant amount

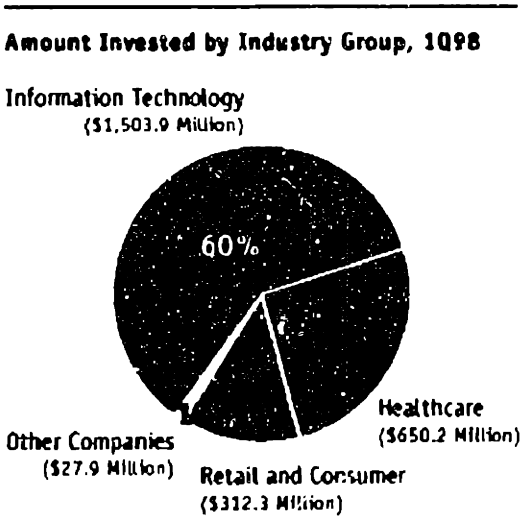

Exhibit 5.2 1Q98 VC Industry Group
Source: VentureOne, 1998

with at least 80% of their portfolio companies exceeding a 5 times return on initial capital and 50% of those investments exceeding a 10 times return on initial capital.[ii]

C. Value Added from CV Strategies

The value proposition of corporate venturing can be considered on an individual, firm by firm level or on the more elevated level of the economy as a whole. Considering the aforementioned data which stated that nearly 50% of ventures exceed the firm's hurdle rates, it suggests that venturing is at least as profitable as other businesses in a successful firm. But it is not an overwhelming success rate, and much has to be learned as to why and how a successful venturing program can be developed. However, given that economic value was added nearly 50% of the time, it is safe to conclude that value from CV strategies does exist.

Another factor that should be weighed is the scale of contributions. On the whole, early ventures tend to contribute a small percentages of total wealth to their sponsoring firms. In this perspective, the firm must strategically understand the value of its investments beyond its financial underpinnings:

1. Does the investment provide opportunities to expand markets and product lines?
2. How does the investment complement existing products?
3. In time, does the investment prevent competitors from achieving firm value destruction (e.g., is cannibalization preferred over rent extraction of existing products)?

Only time will provide answers to many of these questions, but the point is that firms must understand not only the short-term implications to their investment returns but the long-term strategic expectations that also drive earnings performance and shareholder returns. Scale is merely a temporary issue, provided returns are consistently higher then the invested opportunity cost of capital.

In another perspective, on the whole venturing provides more altruistic benefits to the economy, if one considers that in the past decade there has been an "explosion of new business formations by independent entrepreneurs." According to Block and MacMillan, new corporations reached the rate of 600,000 per year and now account for almost all new jobs in the economy, while large corporate workforces have hit a plateau or declined.[iii] In a study of Fortune 500 firms, between 1980 and 1990 nearly 3.5 million jobs were eliminated by companies while new companies with more than 500 employees created more then 13 million jobs. Considering the eventual 50% success rates of corporate ventures sponsoring or forming new venture based businesses, this market economic value can hardly be discounted.

5.2 ANALYSIS OF CORPORATION VENTURING VALUATION

Portfolio analysis methods are the most commonly used to value corporate venturing activities. These methods were described in detail in Chapter Four. In the many cases studied, the ventures are considered in much the same approach as those used by venture capitalists. In particular, many of these corporate venture organizations consider themselves to be "venture funds inside the corporate walls of their organization". Compensation to the fund managers is thus critical to the fund's performance. In the case of Lucent, the fund

"partners" each contribute to the fund through an exchange of guaranteed stock options, tying the portfolio's performance to their own individual wealth. This position extends not only to the fund portfolio managers, but also to the operational managers who are focused on financial and legal issues (i.e., the CFO and the Legal Counsel).

When valuing individual portfolio opportunities, the criteria vary by organization, but each uses a variant of the Net Present Value method of business valuation, in which they ascribe a cash flow method for valuing revenue streams over a fixed number of high growth years and then add to it a terminal value as a function of defined long-term characteristics for the business and industry. Additionally, the venture value must be apportioned by the share of equity position that each investment holds. In many of these investment cases, the corporate venture organization has "syndicated" its investment with outside VC firms. This not only provides the corporate venture with a higher credibility position, but it allows them to benefit from the management experiences of the VC firms. The decision to syndicate, lead, or follow is usually defined by internal strategic considerations that depend on the familiarity considerations discussed previously.

With the development of key claims of corporate venturing now complete, the analysis and assessment of firms performing corporate venturing in their strategic operations will be presented. In this analysis, the key business models will be evaluated along with a discussion of lesson's learned and overall impact on their innovation organizations.

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[i] Block, Zenas and MacMillan, Ian C., *Corporate Venturing – Creating New Businesses Within the Firm*, Harvard Business School Press, 1993.p. 24

[ii] Interview notes with Ralph Faison, Lucent Technologies

[iii] Block and MacMillan, op cit., 1993.

CHAPTER SIX

Research on Corporate Venture Organizations in Existing Firms

6.1 OVERVIEW OF FIRM CORPORATE VENTURING RESEARCH

Two basic approaches were developed to study firms that have implemented, either recently or in the past, a corporate venturing program. One approach used information existing in the literature and the other pursued an interview format to ascertain the current practices of a number of firms. The objective is to develop not only a best practices approach by benchmarking the various corporate venturing approaches but also to establish a direct, cross-industry comparison of corporate venturing.

The direct industry comparison in this study focused specifically on the telecommunications industry, where digital voice and data technologies are rapidly developing and competition is fierce. This comparison adds a particularly interesting perspective to this thesis. For the best practice objective, the intention was to survey the methods and implementation approaches of various firms and develop a set of uniquely applied practices that, from my perspective have particular merit. Exhibit 6.1 lists the companies studied, the type of information sources used, and the industry in which the firm functions.

Company and Venture Organization	Industry	Information Sources
Becton Dickinson, B-D Ventures, LLC 1998 – present	Medical Devices	Literature and Interview
Exxon, Exxon Enterprises 1970-1981	Petroleum Products (Ventures in IT, Materials, and Alternate Energy)	Literature
Chevron, Chevron VC	Petroleum Products (Ventures in Materials, IT, and Petroleum products)	Interview
Siemens, Siemens Venture Capital 1983 – present	Conglomerate – Telecommunications emphasis	Interview and provided literature
Lucent Technologies, Lucent New Ventures 1997 – present	Telecommunication Hardware	Literature and Interview
Cisco Systems, Inc., M&A and Strategic Investments	Telecommunication (IT) Hardware	Literature and Interview
Xerox, Xerox New Enterprises 1990 – present	Information Products	Literature
Thermo Electron Corp 1954 – present	Energy and Biomedical Products	Literature and Interview from another source

Exhibit 6.1 Comparison of Field and Literature Research on Firms Studied

Source: Author

The industries studied have a common high-tech thread running through them, and there is expectation among all these firms that a technology revolution is occurring both inside and outside of their firms. Some of these corporations invest more heavily in R&D; others choose to exploit corporate venture capital and acquisition strategies to uphold their innovation-based growth.

In this chapter, a "case-let" approach to the firm-by-firm comparisons will be provided. Each sponsoring firm is described, the venturing organization business model and

portfolio management is presented where applicable, its influence on corporate innovation is discussed, and finally a lessons learned is provided for each firm.

BECTON DICKINSON

General Information

Becton Dickinson (B-D) is located in Franklin Lakes, New Jersey, and is the leading maker of hypodermic needles and syringes in the U.S. Its diabetic syringes own almost 90% of the market share. B-D has attempted to change from a slow-growth firm in a mature market to a rapid-growth corporation by deploying new products and an aggressive acquisition strategy on a global scale. For instance, in the 18 months preceding November 1998, four major acquisitions were made totaling over $650M with expected annual revenues of $330M, and another major deal was in the works. In 1998, B-D's total revenues topped $3.1B with operating income of $341M. The firm had one-year growth of 10.9% sales and 21.2% net income. Analysts' projections estimate that B-D can grow at nearly 13-15% annually, with 3-5% of that growth stemming purely from its acquisition and venturing strategy. Hence the company is well on its way to doubling its size in five years.

Business Model and Portfolio Management

Becton-Dickinson Ventures, LLC (BDV) was formed in October 1998 for the purpose of establishing a corporate venture capital fund for strategic investments that offer future business opportunities for their core businesses in medical products. The fund is valued at $40M and derives only from internal cash with no external venture capital interests. BDV is looking to make 10-15 investments over the next three years, with investments ranging from $250K to $2M. They are looking for opportunities that have high potential market capitalization in 3-5 years in line with a 5 to 10 times return on initial investment. Residual funds will be allocated to the successful later-stage ventures that remain in the portfolio.

BDV plans to manage its portfolio from a two-level strategic perspective; first, to "not cost the company any money [zero NPV]"; and second, to gain a "window on external technologies." The BDV fund manager expects his portfolio to produce the expected 5 to 10 times return on capital in 5 to 7 years, suggesting an IRR of about 35%.

The fund is self-contained under the business development function of B-D with its General Manager reporting to the Senior Vice President of Business Development, Technology and Strategy.

BDV's mission is to "act like a VC fund" and to secure investments in startups and emerging external ventures that are strategically aligned with the company's core businesses and growth strategies. Specifically, BDV pursues the following key strategic elements:

1. BDV will only invest in businesses that are aligned with their core businesses;
2. Their IP position in the investment will depend on their strategic interests;
3. They will own strategically determined levels of equity in the ventures;
4. Look for investments that can be leveraged in the future for B-D businesses.

They will invest in venture portfolios with other investors, with either a lead or follower placement, depending on the strategic nature of the opportunity for BD. As B-D has been in an aggressive acquisition mode, these acquisitions are made to grow the firm in both aligned and new core areas. These acquisitions are considered to be "late stage" investments with established firms, specific products and established cultures. In retrospect, BDV's venture capital investments are also strategically aligned to grow within the core areas of the business. However, BDV is also looking for opportunities in non-core areas, "the white space".

As BDV is still young, and no investments had been made as of the date of the interview (1/99). What is envisioned, however, is a process that works as follows:

- BDV will receive and evaluate 20 to 30 venture opportunities a month
- Of these, 5 will receive serious consideration
  - 1 or 2 will be down-selected and presented to an internal B-D Venture Board
  - The board will grade the potential investment
  - A grade of "B or better" will be pursued
- Intensive due diligence will be performed by B-D's internal organization.
- In 60-90 days, BDV will make a final decision to pursue the investment
- For valuation of the specific BDV investment in the portfolio, a final step would be to determine the percentage value to the BDV fund, as defined by the percentage of equity owned in the new venture.
- Returns and portfolio management criteria were still being developed as of the date of the interview, however some indications of criteria are described in the business model discussion.

Regarding valuation, BDV will use a process similar to that used as standard practice in valuing existing firms for strategic reasons, such as M&A. This is a review of the financial statements of the company along with some projections of profitability and growth. Then an NPV calculation using appropriate risk adjusted discount rates is made using both the projected growth period and a terminal valuation beyond that period added together. A similar process for new start-ups is used with additional risk and market potential adjustments.

Corporate Venturing Influence on Innovation at B-D

BDV does not directly influence the innovation organization inside of B-D. The research organizations in B-D are an incubator for the organization and scout the external field for technological breakthroughs worthy of potential fund investment. The medical devices industry is driven by about a 3-year product cycle. Because of the product obsolescence cycle present in this industry, "We don't discover things in B-D, we only make what we have better" in order to quickly put new or improved products on the market. Coupled with the intricacies of the device approval cycle mandated by government agencies, B-D tends to favor incrementalism in its innovations in the medical devices arena.

In contrast to an internal corporate venturing function, B-D forms new core businesses from within by identifying key managers to run new product units for the firm. Two recent examples of new businesses that emerged from internally sponsored innovations are B-D gene and B-D id. These businesses are lead by high-profile managers who came up through the organization's development ranks.

Lessons Learned at BDV

Since no specific experience has yet been developed at BDV, few lessons learned could be provided in the interview. However, those I interviewed felt that investments should be aligned with the core businesses of the firm and, in the long run, these investments would be strategic windows on external technologies.

EXXON

General Information

When Exxon was developing its corporate venturing program, the petroleum industry was facing a crisis in terms of future growth and profitability. There were challenges from oil prices and the impending turmoil of the energy crisis of the early 1970s after the formation of OPEC. Exxon chose to develop a venturing strategy that gave it opportunities to explore new businesses and new products.

Business Model and Portfolio Management

Exxon Enterprises was launched in 1970 and functioned through 1980. During this period, a total of 37 investments were made, 19 of which were internal ventures. Of the 18 venture-funded companies, Exxon eventually acquired six of the most promising firms. The Exxon Enterprises mix of investments is shown in Exhibit 6.2.

Strategically, Exxon Enterprises' plan was to make exploratory investments in new ventures operating in emerging markets. The firm followed the two fundamental strategies of corporate venturing: internal corporate venturing and corporate venture capital funds. Of the internal ventures, including those acquired by the venture capital portfolio, none were described as providing Exxon with major new business diversification.

Venture Type	Investment Area	37 Venture Investments
19 Internal Ventures	Advanced Materials, components, and systems	7
	Energy conversion, and storage systems	5
	Information systems and system components	7
18 Venture Capital Investments	Air pollution control	1
	Health care	1
	Advanced materials	2
	Energy conversion and storage systems	3
	Information systems	11

Exhibit 6.2 Exxon Enterprises Corporate Venturing Breakdown
Source: Sykes, Hollister B., "Lesson's from a New Ventures Program", Harvard Business Review, May-June 1986, pp. 69-74.

Lessons Learned

Hollister Sykes makes several useful comments in his *Harvard Business Review* article entitled "Lessons from a New Ventures Program."[i] Here he describes his experiences and lessons he considers useful to other corporations considering a new ventures program. He offers the following three major changes he would have made to provide a more successful platform for the venturing organizations:

1. Acquire companies that expose the firm to new business areas;
2. Start fewer R&D-oriented ventures, as their high-risk bias decreased the overall portfolio return and stretched out time staging. He suggests making investments in later stage start-up opportunities that have gone past the R&D intensity stage of the development cycle. With a bias toward new technology development, it was difficult to justify the use of high-powered marketing initiatives to move the technology into the intended markets.
3. Venture capital investments provide a source of technology and market probing for related businesses to the firm. Use the independence and top management talent of these firms to exploit there intensity to succeed. Provided the venture-backed firm is driven to high growth, the minority investments made by the firm's corporate venture capital fund can yield benefits to established corporations.

Sykes provides the following lessons learned from his experiences in running Exxon Enterprises:

1. If internal venturing is to work it must be an important mainstream operation. The corporation should commit its funds in areas where it has or intends to build, in the long-run, relevant operating experience and management capability. The internal venturing approach can be a quick and effective way to develop new products and markets.
2. Large, multiproduct, environments do not provide a favorable environment for entrepreneurism. The problems relate to incentive compensation (equity stakes), product compatibility and coordination, and corporate liability (legal) for what ventures do. Success or not, venture staff will likely return to the parent organization and this needs to be consistently managed.

3. "Politically and strategically, longer term R&D projects are more appropriate to support an established business than to initiate a portfolio of diversified businesses." Thus, incumbent managers will not likely be tolerant of the high-risk nature and long-term unprofitability that preceded commercialization of a new product or business venture.
4. Product focus is critical to a successful venture. "Successful mature companies must learn to manage the complexities of multiple products, new product introductions that make older products obsolete, and product compatibility."
5. Venture success is directly linked to management experience in the relevant industry.
6. Ample financing does not encourage resourcefulness of the entrepreneurial venture.

CHEVRON

General Information

Chevron is one of the world's largest oil companies. The San Francisco-based enterprise is also one of the U.S.'s largest oil refiners and leading marketers of refined products, including gasoline, diesel, and lubricants; it operates about 7,800 service stations in the U.S. and 200 in Canada. It manufactures and markets chemicals (including ethylene, benzene, and styrene) in more than 80 countries and mines coal in the U.S. Chevron is a 50% owner of Caltex, which markets refined petroleum products in 60 countries (mainly in Asia), and holds a 28% stake in Dynegy (formerly NGC Corporation), which acquired Chevron's natural gas business.

Chevron's investments in non-U.S. projects have helped boost its reserves of oil (4.4B barrels). Its foreign reserves include a stake in the Tengiz oil field in Kazakhstan, as well as oil fields in China and the Gulf of Mexico.

Like many of its peers, Chevron has had to slim down its organization to stay competitive. 1998 revenue of over $30B and net income of over $1.9B correspond to a one-year decrease of 12.7% in revenue and 39.3% in net income, largely driven by the substantial decrease in the per barrel price of oil.

Business Model and Portfolio Management

Chevron New Ventures group was formed in late 1998 as part of a broad restructuring of its technology investments and organization. Chevron's approach to its corporate venture capital business model is quite simple: they are interested in establishing technology relationships with startup ventures by taking an equity stake in these enterprises and offering itself as a "lighthouse" investor. Their venture fund is expected to reach $80M over seven years with annualized investments in the range of $15M. They expect to enter into syndicated investments with related venture firms in the early stage periods and are not interested in seed stage funding. Their financial models suggest potential returns of 38% (IRR) over the seven-year period provided they can establish a portfolio of investments that meet the expected range of successful ventures. Ultimately, they want to invest in a

technology company that earns back the investment and offers strategic technological content for Chevron's enterprise.

Chevron New Ventures will focus on the core areas of Information Technology, Materials, and Biotechnology, suggesting that these are business areas that are strongly believed to influence the future of the petroleum business. They desire to establish themselves in the venture capital business through venture partnerships with already established VC firms in their interest areas.

CV Influence on Innovation

Chevron's downstream R&D operations were scaled back in 1998/99 as part of a broad restructuring of their technology organization and to provide additional cost controls in a very tight-margin industry. Additionally, the industry margins were taking an even greater hit in 1998/99 as a result of extremely low oil price, which dropped to only $10 per barrel in early 1999. Chevron's expectations are to use CVC as a way to outsource their technological needs and leverage their venture position as a way to gain a window on related external technologies. Additionally, this window will provide a capability to monitor technology threats and opportunities. Having the option of creating an equity position in these technology companies will allow Chevron to acquire the potential in these firms without committing huge resources to perform core strategic research in these areas.

Chevron's innovation organization is intended to provide "lighthouse" capabilities to invested ventures, offering the prospects of testing and building customer prototypes, providing facilities and complementary assets, and technological and management guidance to increase the likelihood of a successful venture.

Lessons Learned

Chevron intends to partner with experience and related VC firms to gain a "smart money" foothold on their corporate venturing initiatives and strategy. They also intend to use the experiences and lessons of other CVC enterprises. They suggest close attention to financial performance must be maintained to make successful ventures work.

SIEMENS

General Information

Siemens, headquartered in Munich, Germany, is a global electronics giant operating in communications systems and products, semiconductors and electronic components, power generation and transmission facilities and equipment, medical engineering, information technology, transportation systems and equipment, lighting, and industrial and building systems and automation. The company has offices in more than 190 countries.

Siemens continues to post profits despite the strong German mark and tight competition worldwide. The company is restructuring, including spinning off its semiconductor operations and selling its components business. Siemens entered into a joint venture with Robert Bosch for the manufacture of appliances. The company has backed away from a 1998 plan to sell its Siemens Nixdorf Informationssysteme (SNI) subsidiary, a maker of PCs, servers, and software, to Acer because of the Taiwanese company's financial difficulties.

In 1998, Siemen's revenues were in excess of $70B and net income of over $549M, with one-year growth of 16.2% revenues with declines of 62.9% net income.

Business Model and Portfolio Management

Originally, the venturing organization was formed in 1983 but was restructured in 1999 to modify and centralize its strategic function for Siemens. It was restructured as Siemens Venture Capital, GmbH (SVC), with both strategic and financial goals. Strategically, the organization wants to foster innovation at Siemens. Financially, it intends to provide economic success (ROE > 15%) for their innovation investments. The organization presently is organized under Siemens Corporate Finance and is considered a component of the central organization of Siemens. Its Managing Director reports directly to Siemens' CFO. SVC presently has an eight-person staff, including recent hires from venture capital firms as well as from within Siemens. They intend to grow as the learning curve matures and they develop greater experiences with corporate venturing.

SVC's primary role is to coordinate the selection of venture capital portfolio companies for Siemens. They will participate with external VC firm portfolio companies that are lead investors in ventures that are of strategic interest to Siemens. They do this in a

centralized strategic and financial perspective for the entire firm. SVC will support the "Siemens New Ventures Network" as a center of excellence, providing information and know-how to these units.

Independently, five of the fifteen business units of Siemens each have a Venture Unit that is responsible for fostering internal relations with potential startups; however, they can make only direct strategic investments in these companies. These venture units of the Siemens Groups are very likely the lead investors in some of these startups. SVC is presently in a "learning mode" for venturing and has taken the role as a follower investor and most likely will invest together with another Siemens Group.

As part of their global corporate growth model, SVC is establishing a corporate venturing presence in Silicon Valley (SVC, LLC) in order to broaden its operations and global innovation opportunities in these markets.

According to SVC, "we do only investments in the core business of Siemens. Our shareholders get maximum benefit from this strategy. Our shareholders don't desire us to venture outside of our core – they can accomplish this on their own." SVC intends to invest around $100M over the next three years in a spread of both internal (40%) and external ventures (60%) (syndicated and nonsyndicated) related to their core areas of Information and Communication, Medical Equipment, and Microelectronics. These funds will be spread in global sectors of Europe, US, and Israel, in both Seed and Early-stage areas.

SVC is able to make investment decisions on its own up to a certain level of funding, beyond which they must get approval from the Siemens Investment Board. This freedom is considered an important element of their success. Returns are expected within the customary 5-8 year timeframe, based on their historical database. SVC is driven by a minimum of 15% ROI (this includes all costs). A 25-30% ROI is required to consider an initial investment. These levels are consistent with the 10 year hurdle rate for Siemens.

CV's Influence on Corporate Innovation

CV at Siemens is intended to foster increased technology productivity and innovation in the organization. It places key people in strategic and technology-rich regions of the world, such as the Siemens units in Silicon Valley. As a strategic investor that meets or exceeds a certain equity level, SVC has access to intellectual information associated with

portfolio companies provided the deal flow and relationships are established in the proper manner. SVC and the Central Technology (CT) organization work closely together; for example, CT provides areas of technology interest and SVC scans for potential investment opportunities. SVC expects that they will have a reinforcing influence on the technology productivity and entrepreneurial output of the CT organization. SVC sees CT as a "very active" location for potential spinoffs from Siemens technology efforts, with as many as ten new efforts formed as potential spinoffs from as many as 50 generated proposals.

Siemens is interested in both external startups and internal ventures. SVC gives internal entrepreneurs an opportunity to form new businesses under Siemens' sponsorship in order to avoid losing these people to new startup companies. Typically, SVC takes a minority stake and the internal entrepreneur (or Siemens Group or external equity partners) takes a majority stake and leaves to form the new company if they choose. SVC provides management consulting and access to Siemens' complementary assets (distribution networks, technology expertise, management expertise, etc.). Management determines if the idea stays within Siemens or gets spun off.

Entrepreneurism is suspect, however, as there Siemens has an inherent cultural tendency toward risk aversion and a focus on incrementalism fostered by the very deep-rooted institutional and apprenticeship educational system in Germany.

Lessons Learned

Lessons learned from previous venturing experiences and the restructured organization:

- Top management support is critical. The first venture group formed in 1983 evolved at the suggestion of a Board member (Prof. Dr. Beckurtz) who was very active and enthusiastically supported venturing. Tragically, upon his assassination, the CV movement in Siemens declined in significance and focused mainly on foreign, hands-off, financially motivated investments that lacked critical strategic innovation emphasis for fueling growth. SVC now has renewed support from the senior management levels of the organization and it appears they are a good buffer against the short-term performance agenda of many managers.

- A resurgence of top management support reappeared in 1997 as the CFO of Siemens became interested in venturing for strategic purposes and the organization was restructured in 1999 with new vision and direction that was driven into the organization by the CFO.
- Proximity to the investment region is critical to acquire strategic gains from the investments. Siemens did not have a presence in the U.S. and could only measure its returns on financial performance. SVC, LLC (US) in Silicon Valley is intended to handle all U.S. market activities.
- It is importance to emphasize both internal and external ventures globally in order to gain the greatest advantage from CV.
- SVC provides both financial and strategic objectives for Siemens. While the financial goals can be measured through ROI and top-line growth contributions, Siemens is questioning how to measure the strategic contributions and benefits that the venturing efforts bring. How can these be quantified and value determined?

LUCENT

General Information

Lucent Technologies, with headquarters in New Jersey, was AT&T's equipment manufacturing organization until 1996 when it was established as a separate company as a result of AT&T's decision to spin off its hardware function. To date, both AT&T and Lucent have market capitalization in excess of $100B, which has more then doubled the economic value of the two firms since the breakup.

Lucent is the leading U.S. manufacturer of telecommunications equipment and related software. Its product lines range from telephones to communication systems for business, including network configurations in wired and wireless technologies. It is also a leading manufacturer of digital signal processors, telecom power systems, and personal communication service supplier. Bell Labs Innovations appears boldly in their logo, indicating their propensity for technological innovation and the strong linkage of their business to this powerful R&D community.

Lucent's growth strategy includes new product additions, acquisition of complementary global companies, and an aggressive corporate venturing strategy. To exemplify its acquisition intensity, Lucent recently closed a deal to purchase Ascend Communications, a data networking company, for $20B. Lucent's 1998 revenues exceeded $30B with operating profit of over $2.3B and had 1-year growth of 14.4% sales and 79.3% net income.

Business Model and Portfolio Management

Lucent New Ventures (LNV) was formed in 1997 after a brief incubation period to validate its internal corporate venturing business case. The VP and COO of Lucent, President of Bell Labs, conceived the idea and drove the formation of LNV. This important endorsement by senior management of the LNV initiative gave it the necessary sustenance, commitment, and visibility.

Five key partners in the organization lead LNV. Three partners, including its president, specialize in venturing in the core business areas of Lucent, and the other two are focused on administrative financial and legal issues. Each partner controls an equity interest

focused on administrative financial and legal issues. Each partner controls an equity interest in LNV's venture portfolio in lieu of larger compensation shares of stock options from Lucent. This greater share of ownership in the portfolio favors individual commitment and sound decision and deal-making actions. LNV is purely an internal corporate venturing (ICV) operation, with their CVC operations held as a separately managed and controlled function.

Overall LNV has tremendous ICV leverage because of the depth of innovation talent within Lucent's Bell Labs, which offers them greater access and timeliness to innovation than the typical venture capitalist. Lucent has worked hard to capture and understand the business of venture capital and its associated risk and return. LNV strives to create one new venture per quarter and manages its portfolio accordingly. LNV's fund source is derived from the over $700M committed to research at Bell Labs, but no specific fund levels were provided during the field interview.

LNV is driven by three major strategic and goals or success criteria:

1. Identify "home run" opportunities for new businesses
2. Generate a portfolio return of 20% over 5 years
3. Nurture and create a new entrepreneurial spirit within Lucent

LNV works in particular areas of expertise related to Lucent (they do not stray too far from their mainstream). They look at sponsoring innovation business opportunities that simply need to be nurtured to develop a sound revenue projection or that fall beneath the revenue threshold standards at Lucent's other 10 SBUs.

There are two basic formats for a venture in LNV:

1. "Syndicated" in the first-stage funding. In this case they look for "smart money" from external VC partners who have knowledge and network maps in particular areas of technology and business leadership. For instance, Veridicom (personal electronic identification via fingerprints) was ventured with several primary external partners including AT&T Ventures, Allegro Capital, Lucent Venture Partners, and US Venture Partners. In this format, Lucent provides the technology and the key innovator from within; the venture partners assist with and help to build the management team to lead the company through its various growth stages. Each round will likely have increased participation and possibly dilute the interests (depending on deal structure).

2. "Go it alone" format in which LNV goes from idea conception through the first-stage funding solely within Lucent, driven by high market and technical familiarity. Lucent Digital Video is a non-syndicated venture.

The LNV business organization is quite interesting. In addition to the five partners who share a percentage of the equity stake in the fund, LNV has twenty-two staff who are entrepreneurial agents known as business development entrepreneurs (BDE). These are people with an R&D (technical) background that have "made the jump to a business development career." These people have a propensity and desire to build a business from scratch and make it succeed. Nearly 80% of the BDE staff comes from outside the Lucent organization, with a technical degree, some experience, and an MBA combined with consulting experience. They effectively mine the "core potential" of the Bell Labs organization, visiting the various departments in search of ideas that have not yet left the lab. In many cases, these people play a "cross-pollinating" function by bringing various ideas from one technical department together with another. The BDEs appear to play a pivotal role in mining ideas inside of Bell Labs.

In its first 12 months, LNV evaluated 110 opportunities. Of these 110, ten opportunities were seeded for further business evaluation and feasibility. Of these ten opportunities, four ventures were launched. To date, thirteen ventures have or will be launched and will continue at the rate of about one per quarter. Of the early ventures launched, each should meet their portfolio 20% IRR in two years instead of the target five years. In terms of portfolio return, this is an exceptionally well-performing "VC" portfolio.

One explanation for its early success is rationalized as pent-up technological innovations that LNV has extracted from Bell Labs. For instance Lucent Digital Video was based on investments that AT&T had made for many years into establishing a dominant technological position in High Definition TV (HDTV). By the 1996 divestiture, they had developed the MPEG2 standard and held a 70% patent position in the entire technological HDTV market (and, as they do with most patents, retained them, unlicensed, for internal strategic reasons).

A Lucent management and strategy team considers its own options to make the spin-in or spin-off decision. If Lucent's senior management decides to take a particular action,

LNV is prepared to support it either way. However, the IPO process is essentially the same for either an internal spin-in or external spin-off.

CV's Influence on Corporate Innovation

One of LNV's strategic goals is to create and nurture an innovation culture within Bell Labs' and Lucent's operations. As the successes of its operations become apparent to the technical community, their ability to attain this goal will increase.

For now, LNV is too young and small against too large an imbedded technical culture to change the innovation culture overnight. The Bell Labs scientific community still has a fairly high degree of skepticism regarding LNV that only positive and successful results will change. It is likely that a more subtle impact that will build as success from within the LNV organization occurs and is communicated and celebrated.

Lessons Learned

LNV has experienced several lessons learned in their short foray into internal corporate venturing, thus far. These are:

1. The requirement to educate senior management's mental model of the LNV organization. This includes the need to establish "patient money", P&L considerations, internal legal and financial policies, and incentive structuring;
2. The internal cultural aspects of dealing with the "independent" nature of the LNV organization;
3. Intellectual Property (IP) has become the biggest internal bureaucratic issue for LNV. They have had to "break down lots of old policies and knowledge" and then subsequently "rebuild the internal knowledge" to support the LNV business model. Lucent's internal organization began with a very tight position on IP and then began to gradually release it depending on the venturing position. Ventures require a more flexible IP position to allow them to develop (under a wholly owned subsidiary function) that then has the potential to develop into separately managed businesses.

The unique VC-like partner structure of the LNV organization has helped to effectively manage many of these issues.

CISCO SYSTEMS, INC.

General Information

Cisco Systems Inc., located in the Silicon Valley of California, is the number one supplier of networking products. Cisco controls two-thirds of the market for routers (which move data efficiently between networks) and is a key maker of LAN switches. Its other products include dial-up access servers and network management software. Cisco traditionally targets the high-end market, including service providers and large corporations, but it also sells to midsize and small businesses and is moving into the consumer market. The company has also expanded beyond its traditional data networking role to offer devices that accommodate voice and video traffic. The company gets a third of sales from phone companies.

Cisco products are at the heart of nearly every big network and the company has used acquisitions (nearly 30 since 1993) to broaden the company's product line so it can offer customers one-stop shopping for networking gear. Cisco has formed strategic relationships with the industry's major players, including Microsoft and Motorola. They use licensing to widen the influence of the company's Cisco Internetwork Operating System software (Cisco IOS) in hopes of making it a networking industry standard. Cisco's 1998 revenues exceeded $8.4B with a one-year growth of 31.3% and nearly $1.35B in net income, with one-year growth at 28.7%. Cisco's market capitalization has recently exceeded the $100B mark, making it a highly successful equity based company in a very short time span.

Business Model and Portfolio Management

Cisco's corporate venturing operations are managed inside of their Business Development, Mergers and Acquisitions/Strategic Investments group by an eight-member team. Functionally, the new venture operations reports up through the CTO and enjoys strong senior management endorsement. Their fundamental growth proposition hinges on a corporate venture capital (CVC) strategy which is intended to infuse technology and new products into Cisco's core businesses and fuel overall growth for the next five years. Their potential investments are tightly tied into Cisco's four main business units, and emphasize

Enterprise, Service Provider, Small-Medium Business, and Consumer lines of products. The new ventures operation acts as a centralized organization that goes beyond operating as a transaction engine for venture investments. They evaluate and execute investment opportunities from a strategic fit perspective for Cisco's entire operation. Strategic fit is defined by Cisco as establishing a clear linkage to Cisco business, having a shared market and product vision, and possessing the ability to quickly and significantly contribute to the strength and markets of the core operations.

Cisco typically takes minority equity positions and deal structure and strategy drive the size of the investments. Cisco made more than ten investments in 1998 and expects that the number of investment opportunities will continued to grow. Their investment opportunities are largely in late-stage ventures where first-generation product is close to being shipped and the venture offers liquidity potential in less than three years. Given the competitive intensity and technological velocity in their product market, they have also invested in earlier stage startups. Although good financial returns are a prerequisite to their investments, Cisco has strong focus on the strategic value of investments that are strongly endorsed and supported by the technology needs of the core business units. Their investments have performed well and offer significant returns, assumed to be greater than their cost of capital.

Critical to Cisco's venture investment effectiveness is the strong coupling and championing that they maintain with the business units. A business unit champion of a proposed investment venture is typically sought early in the evaluation stages in order to establish strong ownership and endorsement. Provided an investment is made, this assures that the venture will be given the proper nurturing and support by the business unit to make it a successful partner of Cisco. Cisco considers their investments as a business unit partnering opportunity to assure a venture's success and mutually beneficial growth, including bringing new ventures together with other Cisco venture investments and engaging in joint development and sales and marketing activities.

CV Influence on Innovation

From the perspective of innovation, Cisco maintains a strong anti "not-invented-here" culture. One of Cisco's core values is to "avoid internal technology religion," which

encourages the innovation organization to always be on the lookout for external technology and opportunities. Many of Cisco's venture investments, when coupled together with the internal business units form new ideas that were not initially envisioned at their outset. Thus, the innovation influence by bringing external technology and innovation into Cisco is quite high. Cisco sees the investments as a "tool to motivate a new market or product" and is critical to their innovation output and overall growth as a corporation.

Competitively and from an innovation perspective, Cisco considers the following three elements critical to the success of their venturing investment strategy:

1. Enabling Technology – Invest in complementary technology that can enhance current products
2. Market Demand – Invest in areas that generates demand for Cisco products and creates sustainable competitive advantage
3. Technology Learning – Build a knowledge base of future technologies

Lessons Learned

Cisco has developed an effective corporate venturing strategy focused on strategic selection criteria. As mentioned in the previous discussion, the key elements of Cisco's investment strategy are its fundamental role in their strategic corporate development growth strategy, the strong linkage to the business units, and their commitment to assuring investment success. Cisco maintains that strong senior management support of the organization and its continued successful investment strategies have increased its role and impact in the organization. Finally, critical to this organization is the successful infusion of an innovation culture that is capable of acquiring, managing, leveraging and maximizing ideas from external innovators.

Cisco's venturing strategy does not presently include an internal corporate venturing component, contrary to key competitors such as Lucent and Siemens. With a strong 15,000 member organization sharing in the growth of Cisco's business, it seems likely that Cisco can motivate internal entrepreneurship and idea generation that would help to increase the prospects for growth by internally motivated technological innovation. Cisco should explore the prospects of IVC in greater detail for its strategic corporate development function.

XEROX

General Information

Xerox Corporation, headquartered in Stamford, Connecticut, is best known as a copier company, but they are trying to increase their image as a digital company. The company operates globally through Xerox Limited (formerly Rank Xerox) and through Fuji Xerox, co-owned by Japan's Fuji Photo Film. Digital products, such as color copiers, are pushing growth, although Xerox has been slow to build its digital copier market, and analog devices still account for more than half of sales. The company's early digital offerings were specialized and costly, but Xerox has positioned its latest line of products to replace more than three decades of standard office copiers. Related activities include document imaging services that convert paper documents into a digital format, document outsourcing, and copier supply sales. Xerox is also fostering marketing relationships in developing economies, including China, India, and Russia and is moving more aggressively into direct sales channels.

The company's innovation engine, its Palo Alto Research Center has a reputation for producing great technologies (laser printer, computer mouse, PC remote networking, and PC screen-interface icons), but is slow on product implementation, which is consistent with the IRI findings presented in Chapter 3. Instead of giving away technology, Xerox is spinning it into new businesses through its internal venturing organization. Xerox had 1998 revenues of greater then $19B and net income of $395M, with corresponding one-year growth of 17.1% revenues with a decrease of 72.8% net income.

Business Model and Portfolio Management

Xerox New Enterprises (XNE) is an internal corporate venturing organization. They use their corporate R&D labs as a primary source for new ideas and innovations. They also provide "entrepreneurial operating principles" to existing core businesses of Xerox for entry into new target markets. According to Colin O'Brien, CEO of XNE, "We look at any assets that are underutilized or that you can define as lost within the corporation, anything that Xerox has spent money on that is under-performing, and move them into the group."

Two companies have been taken to IPO: Document Sciences (DOCX) and Documentum (DCTM). Presently, nine companies are part of Xerox's portfolio ranging from new software paradigms to innovative document hardware.[ii] Some of these companies are Chrystal Software, Document Sciences, Documentum, dpiX, InConcert Inc., and XESystems inc. Chrystal's revenues, for instance, will not top $15M in 1998. Stating the importance of being an isolated venture business, Steven Kiser, Chrystal's President suggests: "We're not even a blip on Xerox's radar screen. If we were still part of Xerox, we'd be killed off." XNE is planning to take Chrystal public in 1999. XNE is targeting themselves as a billion dollars of new value creation by the end of the decade.

XNE nurtures the companies that it invests in by providing them with access to cash and services. Each company, however, has its own board and establishes its own strategic direction. The basic venture model is similar to Lucent, except that Xerox holds a majority of stock (>50%). Additionally, new ventures can also return 1% of sales to XNE which gives them access to Xerox's complementary services. Employees of Xerox who join a venture company lose all ESOPs, profit sharing, retirement, and medical benefits in exchange for stock options and a corresponding benefits package that is affiliated with the new venture.

Lessons Learned

Perhaps Xerox's greatest lesson learned about corporate venturing can be traced to the realignment and strategic reorganization of their first venturing organization. Xerox Technology Ventures (XTV), created in 1989, was the initial corporate venture arm of Xerox. While XTV more closely adhered to a strict venture capital model, XNE moves beyond providing capital to also building a strategy, management team and corporate support for a technology to develop into a successful business. XTV's failing was to not take advantage of the very corporate bureaucracy that, in retrospect, provides a fundamental advantage to new firms vying for position in a competitive field. XNE altered their model to include this access – providing the venture firms with connection to Xerox's HR, public relations, and assistance with international marketing, to name a few, all for the price of 1% of sales revenues.

THERMO ELECTRON CORP.

General Information

Thermo Electron Corp., based in Massachusetts, is the parent or grandparent of a number of publicly traded, technology-related subsidiaries. Through these subsidiaries, the company is a leading manufacturer of environmental monitoring and analysis instruments, paper-recycling equipment, implantable heart pumps, mammography systems, alternative energy systems, and many other products aimed at improving environmental quality, health, and safety.

Thermo Electron's main business is to generate new businesses and the company is not content to simply produce innovative products and service. It incubates a product or division before launching it as a business, complete with an entrepreneurial team to help it succeed. Thermo Electron's publicly listed subsidiaries include Thermo Instrument Systems (maker of analytical, environmental monitoring, and process-control instruments), Thermo TerraTech (environmental services and soil and waste-fluids recycling), Thermo Cardiosystems (heart-assist devices), Thermedics, and Thermo Fibertek. The company also has a number of privately held subsidiaries, including ThermoLyte (propane-fueled lighting products). In 1998, the company had revenues in excess of $3.5B with pretax profit of nearly $437M with one-year growth of 8.7% sales with a decrease of 24% in net income. Nearly 85% of Thermo Electrons 1998 revenues were derived from the ventured operations.[iii]

Business Model

Thermo Electron's business model is to create new businesses from within and spin them out as separate but equity-held operations. In terms of ICV, Thermo Electron has formed the basic model for which other corporate venturing organizations benchmark. Thermo Electron also invests a certain amount of its portfolio in external investments, but primarily for financial reasons. Thermo Electron's business model combines the benefits of a large company (access to the equity markets, investment banking support, investor relations, PR, accounting, etc.) with the benefits of a small entrepreneurial company (a sense of urgency, equity ownership, a sense of building something from scratch, etc.).[iv]

A new venture begins as a division of the company, which does central research with about 100 potential opportunities active at any one time.[v] If this division can show growth potential of 30% CAGR, a strong management team able to run a public entity, and a solid business plan to use Thermo Electrons funds, it will be spun out. Thermo Electron holds a majority equity position in the venture with new management getting between 7-10% and all employees getting a stake with an employee purchase plan. Thermo Electron will nurture these new ventures with new management and strategic approaches, funding key acquisitions to support their individual growth.

Unlike their large corporate research lab relatives, Thermo Electron expects almost 70% of their research initiatives to fail. Although failure is tolerated, mismanagement is not, and this is essential to sponsor effective entrepreneurs. Culture also plays a role in Thermo Electron's ability to impart a sense of urgency in its entrepreneurs and inventors. At Thermo, the common ambition is to create another company like their peer predecessors of the organization. To create urgency, ambitions must be aligned with business goals. It is not uncommon for Thermo to be approached by researchers from other companies to commercialize a particular invention. This sense of urgency combined with the stable, solvent, parent company creates an environment in which IPOs are issued for their ventures up to three years earlier than for standard venture capital arrangements.[vi]

Another way Thermo has stimulated the sale of equity in spinouts is by selling call options and a price guarantee to stockholders.[vii] However, if this price exceeds a certain level for a number of days the guarantee is voided. This approach increased the market cap of a particular spin out from $10 million to $100 million.[viii] Thermo Electron raised $2 billion in equity in 1998.

Lessons Learned

Thermo Electron has established itself as an organization that sustains through corporate innovation. Specifically, this has been established through internal corporate venturing from the inspired technologists inside the core firm. Thermo Electron has learned, over time, to shape its venturing strategy into an efficient producer of new businesses. Its biggest challenge is with developing the management to run its spinout ventures.

> "Entrepreneurs and technical people don't necessarily make good CEOs and business managers. So the challenge for us is to decide which ones can and cannot make the transition. Then the second challenge is, for the one we don't think can make the transition, to persuade them that being an entrepreneur or scientist is equally important to being GM or CEO. That takes a lot of persuading, and sometimes egos get a little bruised, but we have not lost a key employee in 12 years."[ix]

Despite their challenges for selection of leadership for its ventures, Thermo Electron has managed to find a formula that works. Given their long-term success of over 40 years, the firm has learned the value of effective venture selection and management criteria, sustained and committed senior leadership, the use of internal communication to substantiate and motivate the technologists of the organization, and a consistent application and celebration of its venturing missions. The 5C's of corporate venturing appear to be entrenched and well-established practices of Thermo Electron that have been honed over time.

6.2 SUMMARY OF FIRM STUDIES

Comparison to Corporate Venturing Models

Exhibit 6.3 presents a comparison of several firms to the key set of corporate venturing fundamentals that were established in Chapter 5 (note that several firms presented in the previous section are left out for lack of clear and currently available information). This includes an evaluation against Block & MacMillan's screening criteria, the 5C's of corporate venturing, and a comparison against the overall strategic corporate development programs (covered in further detail in Chapter 7).

	BDV	Siemens	Lucent NV	Cisco Systems	Xerox	Thermo Electron
Corporate Venturing Strategy	CVC	ICV and CVC	ICV and CVC	CVC	ICV	ICV and CVC
Strategic Fit	✓	✓	✓+	✓+	✓	✓+
Potential Size	✓-	✗	✓	✓+	✓	✓+
Market Pos.	✓-	✗	✓	✓+	✓	✓+
Invest. Limits	✓	✓+	✓	✓	✓	✓+
Fin. Perform.	✓-	✓	✓	✓-	✓	✓+
Time Horizon	✓-	✓	✓	✓+	✓	✓+
Risk Levels	✗	✗	✓	✓	✓	✓+
Soc. Response & Corporate Value	✓+	✓	✓+	✓+	✓	✓+
Feasibility	✓	✓	✓	✓	✓	✓+
Impact	✓	✓	✓	✓+	✓	✓+
Criteria	Moderate	Moderate	Moderate	Strong	Weak	Strong
Commitment	Weak	Strong	Strong	Strong	Strong	Strong
Consistency	Weak	Moderate	Moderate	Strong	Weak	Strong
Communication	Weak	Moderate	Strong	Strong	Moderate	Strong
Celebration	Weak	Weak	Moderate	Weak	Moderate	Strong
Incremental Innovation	Moderate	Strong	Strong	Weak	Strong	Weak
M&A Ingredient	Strong	Strong	Strong	Strong	Moderate	Moderate
Corporate Venturing	Moderate	Moderate	Strong	Strong	Strong	Strong

✓+ = Strongly developed experience ✓ = Defined but needs experience and refinement ✓- = weakly defined, needs development
✗ = Not defined during discussion/review

Exhibit 6.3 Qualitative Strategic Level Comparisons of Firms Studied Presently Pursuing a CV Initiative Source: Author

Best Practices

Exhibit 6.4 provides an overall summary of the best practices extracted from each of the firms studied, the aggregate of which provides a solid comparison to the academic perspectives and research studied in the earlier sections of this thesis.

Firm	CV Strategy	Best Practices
B-D Ventures	CVC	Committed financial funds and strong growth supported by company Use of the Business Development function to execute deals Mainstream strategic focus on strategic alignment with core businesses
Chevron	CVC	CVC "light-house" strategy for external start-ups Planning syndicated relationships with experienced VC firms Championing an "outsourced" R&D function with this strategy
Siemens Venture Capital	ICV and CVC	Committed senior management Significant VC experience Tight coupling with R&D organization (Central Technology) Global presence and operations
Lucent New Venture	ICV	Committed senior management Organized as a separate P&L center Tight coupling and leveraging of past investments with strong R&D organization Use of Business Development Entrepreneurs to "mine" new businesses from Bell Labs and become their entrepreneurial leaders Formation of partnership led organization to provide strong incentive structure and VC-like autonomy LNV Partners own equity stake in portfolio investments LNV Partners include internal administrators to facilitate these functions
Cisco Systems	CVC	Strong coupling to their business units Highly successful venture relationships and experiences help to increase credibility Business unit partnerships with ventures Anti-NIH culture present in their innovation organization
Xerox	ICV	Committed senior management Significant organizational learning and shaping of new venture organization Tight coupling with R&D organization Alignment with mainstream operations
Thermo Electron Corp.	ICV and CVC	Business is to generate new businesses Nurturing and development practices Developed criteria and culture of venturing processes and the apparent adoption of the 5C's to manage its CV business proposition.

Exhibit 6.4 Suggested Best Practices from Firms Studied Presently Pursuing a CV Initiative
Source: Author

Industry Comparisons

An industry comparison evolved during the course of this thesis that involves the telecommunications industry, particularly in the areas of voice/digital data transmission and related hardware and software components. In particular, Lucent, Siemens, and Cisco were evaluated based on their corporate venturing strategies. Exhibit 6.5 compares their venturing operational organizations.

Firm	Strategic Focus	Key Factors
Lucent	ICV focus (Lucent has separate CVC focus organization)	1. Aligned as a business development function, have a separate an independent CVC function 2. Strategy aligned with core businesses 3. Strong venturing experienced management team 4. Organizationally aligned with central technology organization 5. Use of partners and BDE's to effectively manage and "mine" the technology organization for potential innovations 6. Global views restricted by organizational design
Siemens	ICV and CVC focus	1. Management team aligned under the Financial Organization, both ICV and CVC functions supported. 2. Sound business and financial strategy aligned with core business 3. High experience and established long term VC relationships 4. Functionally aligned with central technology organization and core businesses 5. Small staff responsible for working with central units and business operations 6. Establishing a global venturing operation (US, Europe, Israel)
Cisco	CVC focused	1. Aligned as a business development function, no ICV function 2. Considerable attention to strategic fit over financial performance 3. Functionally experienced team looking to grow 4. Considerable linkage with business unit operations and developing effective championing 5. Small staff responsible for working the strategic fit functions for entire operation 6. Anti-NIH culture assure smooth transition and support of ventures within Cisco's innovation operations

Exhibit 6.5 Telecom Industry Level Comparison of Key Factors in CV Programs
Source: Author

[i] Sykes, Hollister B., "Lesson's from a New Ventures Program", *Harvard Business Review*, May-June 1986, p. 74.
[ii] "Xerox New Enterprises: Transforming the Corporate Investment Model" and FAQs, Xerox WWW site, About XNE pointer.
[iii] Stevens, Tim, "Divide and Conquer (companies dividing new businesses based on odd venture-capital model)., Industry Week, Vol. 247, pp. 28(1). p. 5
[iv] Hastopholous, George, Notes from personal interview notes from Craig Jarchow and German Cura (SF '99) at Thermo-Electron Corp., January 22, 1999, p. 1
[v] Ibid
[vi] Hastopholous, George, p. 2
[vii] Hastopholous, George, p.2
[viii] Hastopholous, George, p. 2
[ix] Stevens, Tim, pp. 5-6

CHAPTER SEVEN

Best Practices for Corporate Venturing

7.1 WHY VENTURE?

Among other incentives, methods for fueling growth and future streams of revenues are critical elements to providing total shareholder returns. As is often the case, firms are driven by the desire to look for short-term boosts to expectations that drive up stock price and increase total market capitalization. In the meantime, these firms are comfortable churning out products that meet customer expectations and challenge the innovation culture to prescribe incremental improvements. These improvements may sustain or move the landscape of the industries' competitive playing field by "natural selection", where the fittest firms survive and the unfit succumb to market pressures.

In this vein, the companies that practice incremental process and product improvements will be the antithesis of Porter's key force to sustain favorable positioning in the industry through a low-cost or highly differentiated product. In the short term, these firms have won the battle but not the war. As is often the case, a field of new entrants exists, some of which were spawned by the unpursued ideas of incumbent organization, and they may ultimately threaten the long-term prospects of a firm. When the shareholders hear such a message, market capitalization will decrease and the once-prosperous times of the firm may succumb to market pressures.

Companies venture primarily to grow and respond to competitive pressures. In a study by Block and Subbarasimba of U.S. and Japanese firms, over 70% of U.S. firms cited reasons for venturing as (1) meeting strategic goals and (2) the economic maturing of base businesses that the firm had entered. Exhibit 7.1 quantifies for both U.S. and Japanese firms the reasons for venturing:

Reasons for Venturing	U.S. Companies (%)	Japanese Companies (%)
Maturity of the base businesses	70	57
To meet strategic goals	76	73
To provide challenges to managers	46	15
To develop future managers	30	17
To survive	35	28
To provide employment	3	24

Exhibit 7.1 Reasons for Venturing by U.S. and Japanese Firms
Source: Block and MacMillan, 1993

Quite simply, with the dynamic environment that has emerged in the late 20th century, firms can no longer expect to develop their futures and growth from within. The flurry of mergers and acquisitions is one example of just that recognition, as well as the rebirth of venturing organizations inside major corporations. With pending changes to generally accepted accounting practices and federal regulatory guidelines, M&As may be tempered or slowed. Thus, at a minimum, the use of corporate venturing gives firms the ability to tap into external agents that at one extreme may give the firm access to technology and knowledge but at the other extreme could become a potential competitor of the firm in its later stages.

Strategic implications are the reasons most often cited by firms. Likewise, as a firm's business stagnates, it becomes increasingly important to develop new outlets that may rejuvenate a business or grow a new one. An organization's survival depends on constant growth and defense against competition. From a defensive standpoint, long-run competitiveness cannot be maintained without innovation and the generation of new ventures.[i] For sustainable growth, organizations must consider the critical dependencies on products and markets, both in old and new sectors. Corporate development strategy must therefore be woven into these perspectives in order to provide the basis for growth. Exhibit 7.2 provides a summary of growth paths.

		MARKETS	
		OLD	NEW
PRODUCTS	OLD	Greater Penetration, Increased Share	Develop New Markets
	NEW	Develop New Products	Diversification

Exhibit 7.2 Product – Market Matrix for Corporate Development Strategies
Source: Block and MacMillan, 1993

In adapting this table to specifically address the issues of strategic corporate development, Exhibit 7.3 represents this adaptation.

		MARKETS	
		OLD	NEW
PRODUCTS	OLD	Product or Process Innovations of Existing Product Lines INCREMENTAL PROCESSES	Venturing with Internal or External Start-ups in New Markets VENTURE PROCESSES
	NEW	Venturing with Internal or External Start-ups in New Products VENTURE PROCESSES	Merger or Acquisition of Established or Late-stage Start-ups M&A PROCESSES

Exhibit 7.3 Revised Product – Market Matrix for Corporate Development Strategies Source: Author

Consider the three elements of strategic corporate development that have been developed here:

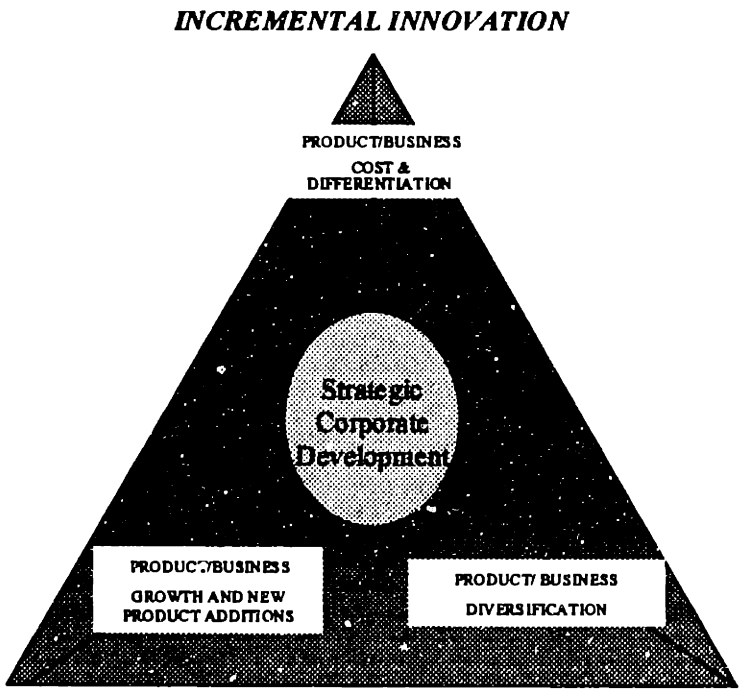
1. Investment in product and process improvements geared toward incremental improvements in existing products and markets;
2. An M&A strategy that makes large corporate investments (along with smaller level acquisitions) to diversify product lines into new areas and markets as well as to consolidate the industry;
3. Corporate venturing investments to establish new products in existing markets (core businesses) or new markets with existing products. Both are venturing related and sustain the notion that the organization is investing in areas aligned with its core businesses.

Let's consider Becton-Dickinson. Their present market share position in their hypodermic needle business for the diabetic market is roughly 90%. Given this large market share, growth opportunities must come through continued product innovation on an incremental scale while at the same time securing new, but related, businesses for top-line growth. B-D has, in the latter 1990s, satisfied its business diversification through the acquisition of mature firms. Additionally, B-D has incubated a number of new product and

process improvements, internally, to sustain its market share and continue its loyalties with customers with product innovation and cost containment. Finally, B-D is rounding out their business development strategy with a corporate venture capital fund. This fund will invest in seed and early-stage ventures to secure a strategic position on the start-ups technology which may eventually complement B-D's products. Thus, B-D recognizes the strategic role of the corporate venturing strategy as an ingredient in their overall growth formula.

Other firms studied, including Cisco, Lucent, Siemens and Xerox, and most recent Intel, have integrated a corporate venturing element into their strategic corporate development formula as well.

Thus, firms need to consider venturing as one of the critical elements of its Strategic Corporate Development delta strategy, as shown in Exhibit 7.4. The delta strategy suggests that it is important to consider a three-part strategy in strategic corporate development:



Source: Author

Exhibit 7.4 The Strategic Corporate Development Delta Strategy

- First, investment in the incremental innovation of existing products within core businesses;
- Second, the arranging strategic mergers and acquisitions for product and business diversification (and industry consolidation);
- Third, the use of corporate venturing provides the strategic ingredients of product and business long-run growth and the provision for adding complementary and potentially competing products into the core businesses of the firm.

7.2 WHAT GOES INTO SUCCESSFUL CORPORATE VENTURING?

In this thesis, both the established literature as well as field study efforts identified the following elements as critical to successful venturing programs:

1. Significant, top-level management support and validation of the claims of the corporate venturing initiative;
2. A secure corporate venturing vision and its alignment with the core elements of the established firm business;
3. A portfolio strategy with goal driven expectations and time phased results
4. Intense diligence and selection methods for venture selection
5. Leadership with intensity and incentive driven obligations to meet or exceed the goals of the core business.
6. It is important for inexperienced firms to partner with venture capital firms (or hire it explicitly) for engaging in a high risk but sound investment. Syndicated arrangements are often important to establish interests in the unfamiliar areas of new technology/ products or new markets.
7. It is critically important that corporate venturing organizations establish tight coupling with the corporations business units in order to secure a venture champion that will see to the success of the venture through nurturing and technical support and engagement.

In addition, the following are lessons learned from venturing organizations studied both in the literature and in the field:

1. Proximity and engagement of the portfolio company is critical to accessing strategic information and content;
2. Top leadership support and nurturing of longer-term implications of venturing are extremely important. Additionally, the importance of continuously educating and developing the top management's understanding of the issues and factors of venturing;
3. Industry is an important consideration; however, it should not negate the use of a venturing organization for top line growth. The "hot" industries create entrepreneurial motivation both within and outside of large firms. Firms need to explicitly evaluate whether these industries and their offerings are orthogonal to product offerings or whether, in fact, there may be implicit alignment and opportunity.
4. Whereas most firms venture invest for both strategic and financial motivations, it is important to not lose sight of the strategic investment metrics. It is easy to monitor the financial progress of a venture portfolio, following the experiences of venture capital firms. However, VC firms are not strategic partners and thus have no experience in establishing specific metrics for strategic returns. Corporate venturing operations therefore need to establish and maintain focus on the strategic initiatives that they undertake in parallel with their financial objectives.
5. There may be an initial rush of "pent-up" innovations from within a firm that may have evolved over years of corporate investment and patent protection. Firms must be leery of the initial rush of optimism in newly established internal corporate venturing. Sustaining innovation and entrepreneurial behavior is critical to long-term success.
6. Intellectual property and its associated influence of deal making have surprised some CV organizations as to their implications from within the corporation. In firms where tight appropriability is the norm, it is likely going to be an uphill battle to secure IP flexibility that is often a requirement for venturing.

7.3 CAN CV WORK FOR ALL CORPORATIONS?

The answer is a resounding yes. However, critical in its implementation are an integration of the 5C's into the venturing model (see Exhibit 4.11 and Exhibit 4.12): Criteria, Commitment, Consistency, Communication and Celebration. Without these fundamental elements, the venturing organization will likely fail in short time. These success criteria are entwined into the elements of the successful organizations highlighted above.

In some of the interview I conducted, questions of scale were often cited as a key reason for lack of interest in the venturing organization. Despite the apparent success rate of venturing, as determined by Porter, there still seems to be a predominant supposition that mergers and acquisitions provide better returns for top-line growth. In shareholder valuations for immediate profitability in the short term, this may be true, provided the success of the merger warrants true growth for the corporation. However, when one considers that nearly 54% of all mergers will result in failure because of the merging of clashing cultures or competing interests, the risk-adjusted gains may in fact be lower. Additionally, when one considers that nearly 56% of all ventures will succeed, there may, in fact be comparable results to top-line growth. Scale is an issue, and corporate venturing groups need to define their criteria in ways that select only those investments that will grow to be significant contributors to the economic value of the firm. Whether a $100M market capitalization, a $500M revenue stream by year 3, or a combined value and 45% IRR, it is critical to go after only those investments that fulfill both the short and long-term needs of the investors.

7.4 WHAT MODEL PROVIDES THE BEST IMPLICATIONS?

This is an empirical result and not supported by any success criteria, but the approach that seems to work best is as follows:

1. Establish an incentive-driven, corporate venturing organization that is motivated by the success of its portfolio companies whether internal corporate ventures or external ventures. The venture fund managers, or partners, need to be rewarded for their

successes and effectively penalized for inefficiencies and failures in their investment selections and organizations that support and nurture them;

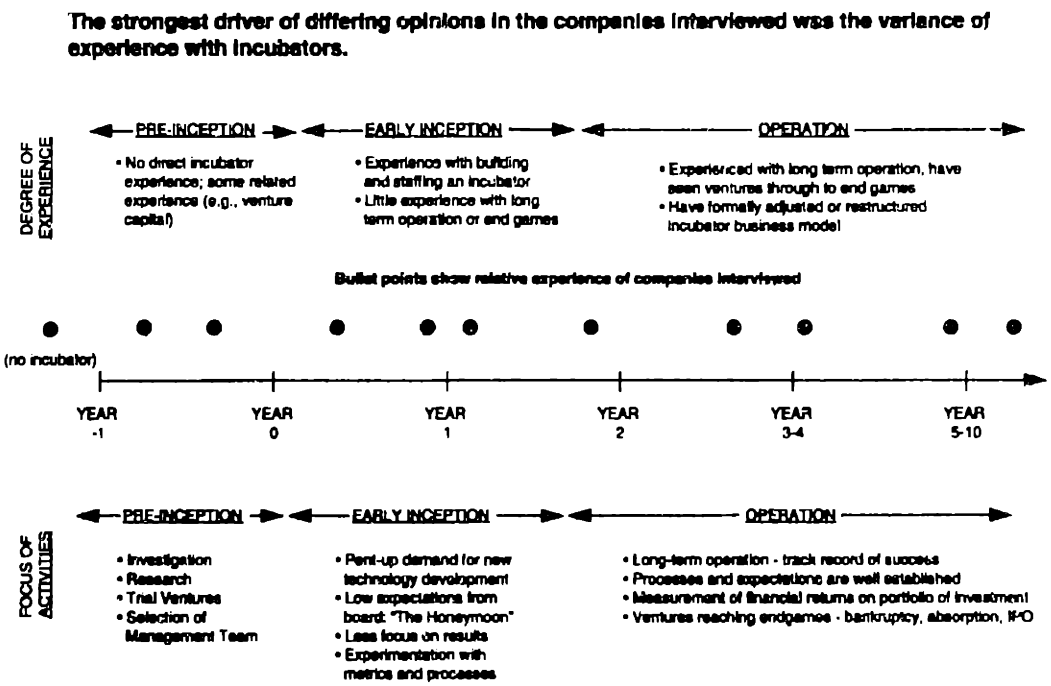
2. Establish both internal and external innovation champions. In this sense, internal refers to the individual closely tied to the technology and external may be a "visionary" agent who can see how to implement the technology into the market. In a successful model, the firm allows both motivated internal and external innovators to bring the technology towards a potential venture;
3. Support from senior management is critical. Establishment of a venture board that complements this is important. The venture board should review investment progress and critique investment opportunities. It should not make decisions on the investments themselves, unless they exceed the firm's criteria;
4. Keep the venturing organization and its ventures separate from the core businesses of the firm. In this sense, the organization has the incentive of a portfolio bias toward the core businesses of the firm while at the same time holding these operations at arms length from the daily morass of the business. By doing this, the ventures maintain their essential elements of entrepreneurial drive and aren't bogged down by the cultural and bureaucratic aura of the business;
5. Communication and network with venturing organizations is critical. Maintaining strong partnerships to venture capital firms is imperative. Forming syndicated fund partnerships, especially for early learning, is a methodology that works for both internal and external corporate ventures.

7.5 WHAT HAVE CORPORATIONS LEARNED FROM CV?

In an unpublished study that evaluated internal corporate venturing among eleven companies, it was concluded that *experience* was the strongest driver of internal venturing. There were three distinct experience phases of ICV that an incubating (ICV) organization typically goes through: Pre-inception, Early inception, and operation (see Exhibit 7.5). Each of these phases earns the ICV organization a degree of experience that allows the business

model to be modified and the operational experience to be evaluated. In terms of the research performed, their conclusions are validated as follows:

1. There appears to be an early phase of venturing development where structure takes the form of lengthy evaluations of corporate venture organizations, a portfolio trial selection, and a building of the staff groups that will run the CV operation. Additionally, these groups spend significant time pursuing potential venture capital partners to expose themselves to the practices and procedures of these institutions.
2. As the process matures, a "honeymoon" period evolves where the organization pursues internal ventures that are well into the early-stage phase of venturing and can make a quick and exciting proposition for the firm. Lucent's experience with their Lucent Digital Video subsidiary was undeniably this type as AT&T had invested countless resources to establish their strong patent and standard position on this industry.



Source: Easton Consultants, "Nurturing New Technologies", Research Summary, February, 1999

Exhibit 7.5 The Experience Effect of Corporate Venturing Source: Easton Consultants, 1999

3. The later phase venturing organizations, such as Xerox, have established a strong corporate learning process from the ICV organizations. In the case of Xerox, their first organization, Xerox Technology Ventures, had only limited success. According to Colin

O'Brien, CEO of Xerox New Enterprises, "in addition to being based on non-Xerox technology, the ventured companies wanted to get as far away from the Xerox structure and bureaucracy as possible. By doing that, the mainstream corporation just divorced itself from the venture group. So the intimate bond that you need to be able to understand what the opportunities are, just the access to everything, generally collapsed. So now we have to be sure what we are setting up is a sustainable business in the long run."[ii] XNE is now the replacement unit for XTV and the business model has been modified. XNE is fed candidate technology from the Xerox labs such as Palo Alto Research Center (PARC) and sister labs in Canada, England, France, Los Angeles, and New York. XNE looks for candidate technologies that have a potential for high growth, with a supportable business strategy and a balanced level of risk. Their sole purpose is to keep promising products from falling through the corporate cracks. Additionally, XNE helps existing companies enter new markets by providing them with entrepreneurial operating principles.

4. In its final, perhaps most extreme form, firms can sustain themselves entirely by new venture operations. Thermo Electron Corporation is probably the most well-known venturing firm in the corporate mix. Thermo Electron, which started as an energy company in 1956, has evolved into an internal corporate venturing business model for companies in a wide variety of industries. They feed the company's growth on the proceeds from the "spin-out" of successful technologies developed in their labs. According to John N. Hatsopoulos, the president of Thermo Electron, "Our core business has become generating new businesses."[iii] In 1997, nearly 85% of its $3.6B in revenues was generated from the "spun out" companies and since its first spinout, their revenues have grown at a compounded annual rate of 22.7%, which share price climbing at 25.2% per year – hardly an indication that the market disapproves of their strategy. Thermo Electron has clearly evolved their business strategy from a core strategy, with refinements and adjustments along the way. Today, Thermo Electron continues this approach.
5. Value creation, likely the largest source of corporate interest, ranges from the abysmal "no contribution" of Exxon Enterprises to the exceptional performance of Thermo Electrons impressive growth and value since its inception. Considering Xerox's target

for $1B in value creation by the end of this decade and Lucent's high growth in venture businesses in digital TV and radio, high value creation is not unlikely. In all, compared with the other arms of strategic corporate development, new ventures is almost as equally likely to create value creation as mergers and acquisition. What's needed is the establishment and institutionalization of the 5C's of corporate venturing and constancy towards the justifiable means to this end.

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[i] Block, Zenas and MacMillan, Ian C., *Corporate Venturing – Creating New Businesses Within the Firm*, Harvard Business School Press, 1993 p.20-21

[ii] Stevens, Tim, "Divide and Conquer (companies dividing new businesses based on odd venture-capital model)., Industry Week, Vol. 247, pp. 28(1).

[iii] Deutsch, Claudia H., "When a Big Company Hatches a Log of Little Ideas", New York Times, September 23, 1998, Entrepreneurs – Special Section, p. 4

CHAPTER EIGHT

Conclusions and Recommendations

One of the questions to be answered in this research was if a corporate venturing group will increase the technology productivity of a firm. To answer this explicitly and quantitatively, one needs to dig into the R&D measures of productivity from those expenditures for each organization. Since this is a daunting proposition in and of itself we will look at more qualitative perspectives. By asking questions and reviewing the literature, it seems conclusive that corporate venturing organizations do, in fact, increase technology productivity in the firm. As in the case of both Lucent and Cisco, the innovation organizations have favorably responded to the strategic purpose and growth opportunities offered by venturing. In the case of Lucent, internal venturing has created a number of new product and market opportunities that have been internally generated. In the case of Cisco, its external ventures have brought new ideas and technology into a firm that is largely influenced by an open-technology culture, and whose combined efforts often produce even further innovation then was originally envisioned. Asking the opposite question, these firms would not have created these innovations or market potential without having made the risky venture investments through the insights and efforts of their corporate venturing groups.

Despite Lucent New Venture's goal statement to nurture and create a new entrepreneurial spirit within Lucent, LNV felt that it was too soon to explicitly determine if the technical organization was influenced by their existence. In the same vein, they suggested that successful business launches would only help to promote the innovation climate and technology productivity growth that the organization desires. On the other hand, Becton Dickinson, much like Cisco, was not looking to promote this climate internally but was determined to find its new product innovations outside in the entrepreneurial markets associated with their industry. Xerox New Enterprises, like LNV, has the structure in place to mine their technology organization. Thus it is built on many of the same principles as

LNV. Exxon's mistake was failing to align its internal ventures with a core business proposition; thus its approach failed to drive internal resources towards the "right" areas for Exxon even though its innovation organization produced some tremendously important technologies for the electronics industry. Finally, the creator of new venture organizations, Thermo Electron, thrives on a generation of ideas from their innovation engine. Thus, Thermo Electron would most likely support the notion that innovation is driven by the alignment to their core business proposition – growth by new ventures.

It is fairly intuitive to suggest that by providing a venturing outlet to the entrepreneurial innovator the organization will benefit. However, it does provide both entrepreneurial and incremental innovators in the organization with options to pursue core technologies that are important to the firm. Risk-takers can find outlets in the entrepreneurial side; those who are risk-averse can sustain the rewards of incremental product and process innovation – each side can complement the other in their independent quests for value-driven success. To close one end of the innovation spectrum, which most corporate technology organizations do, would be to jeopardize technology identity, motivation and drive of the whole organization. As is the case in Cisco, external ventures complement the technology drive of organizations by providing a source of external, non-incremental, knowledge in the organization. Internal technologists likely feed the source of external opportunities in their analysis of technology opportunities for the core products of the corporation. By allowing them an outlet to pursue alignment with these ideas, the corporation stands to gain from their individually inspired initiatives and the entrepreneurial drive that can get the product quickly to market.

THE RENTSCHLER STORY REVISITED

Would Pratt and Whitney be the $6B revenue contributor to United Technologies Corporation today if Frederick Rentschler had access to a corporate venturing arm at Wright Aeronautical? Would UTC even be in existence today had Rentschler pursued his entrepreneurial drive under the implicit ownership of Wright? We can only speculate the answers to these questions, but I feel that the answer is an emphatic no! The corporate

landscape, as we know it, will change and modify as a result of new ventures and startup companies that threaten incumbents. This we know as the condition of Schumpter's Creative Destruction. However, can the landscape be modified and can we alter our corporate futures by adding the benefits of entrepreneurism inside of our incumbent firms? Again, the answer is yes.

Corporate venturing is a must for today's corporate development groups, tapping both the external and internal markets of our industry to solicit and exploit the best they have to offer. Additionally, we cannot lose sight of our billion dollar corporate innovation generators that need to feed these engines. However, seeds of new growth and opportunity are sown every day inside our firms. Risk aversion and the incumbent dilemma cannot be dealt with ignorantly. Corporate venturing provides an outlet for corporations to look out their windows and see the emerging competitive landscape. It also taps into the innovation engine of our corporate intellectual capital.

Using our greatest resources to pursue only one purpose –incremental improvement of our product performance in our intended markets – will eventually run the well dry of its knowledge and foundation. We will lose people to our competitors and we'll lose them to their own ideas. And we will lose ideas that could not be pursued inside the walls of the organization because the organization was overly focused on incremental innovation. When this happens, our organization becomes threatened -- maybe not in the near term, but it will be threatened in the long run if these ideas get away. It took Wright Aeronautical 30 years to be competitively defeated by the innovations of Pratt & Whitney. Would the original shareholders of Wright have preferred to fuel growth in new markets?

Unfortunately, Wright went on developing the wrong products for their market, and the entrepreneurial energy of Pratt & Whitney, ironically initiated by Wright, transformed a venture-motivated machine tool company into a major aero engine provider. The market and product landscape was altered through the entrepreneurship and venturing drive of Rentschler and the venturing of Pratt & Whitney.

Corporate venturing is a strategic vehicle to grow new products, businesses, and markets by using the very asset capabilities and strengths possessed by a corporation. It is capable of feeding the innovation engine of the firm by increasing its capacity through entrepreneurship and access to external technologies that are inherently less incremental then

those inside the firm. It needs to be a fundamental component of a corporation's strategic development growth formula to fuel innovation that will sustain its competitive position. It is not industry specific, but it does benefit from the "hot" industries in a given industry cycle. Corporations that are determined to remain focused on their core businesses and long-term strategies can still use a corporate venturing function to find new, non-mature, opportunities that align with their mainstream businesses. Corporate venturing requires a level of commitment that will sustain its purpose in the organization and can use the experiences of its successes and failures to shape the effectiveness of the operations. Fundamentally, it requires a strict adherence to the 5C's of corporate venturing to assure its success.

If a firm has only the desire to change or to alter an existing product or process, it remains an incrementally focused evolutionary incumbent. Having the desire coupled with a source of fuel to change or alter the product and market landscape takes revolutionary commitment and corporate venturing.

See you in twenty years?

BIBLIOGRAPHY

Arrow, Kenneth J. Economic Welfare and the Allocation of Resources for Invention, The Rand Corporation, 1962, pp 609-626

Block, Zenas and MacMillan, Ian C., *Corporate Venturing – Creating New Businesses Within the Firm*, Harvard Business School Press, 1993.

Cable, Daniel M.; Shane, Scott, "A Prisoner's Dilemma Approach to Entrepreneur-Venture Capitalist Relationships", Academy of Management Review, Vol. 22, pp.142(35).

Christensen, Clayton M. and Bower, Joseph L., "Customer Power, Strategic Investment, and the Failure of Leading Firms", Strategic Management Journal, Vol. 17, 1996, 197-218.

Commercial Development Association, "Speeding Technology to Market is Key to Survival in Global Economy", Business Wire, 11/10/97.

David, Byron. L., "How Internal Venture Groups Innovate", Research/Technology Management, March-April 1994, pp. 38-43

Detz, Cliff, Personal interview on Chevron Long Range New Ventures (w/ Ed. B. Roberts), January, 1999.

Deutsch, Claudia H., "When a Big Company Hatches a Log of Little Ideas", New York Times, September 23, 1998, Entrepreneurs – Special Section, p. 4

Elter, John (Xerox Visiting Scholar at MIT/Sloan), Personal interview, January, 1999

Gee, Robert E., "Finding and Commercializing New Businesses", Research-Technology Management, January-February, 1994, pp. 49-56

Gunn, Eileen P., "Staying Smart/Managing Companies and Careers In : Venture Capital Is the New R&D. Tiny Investments by large corporations can have an outsized impact on the future of technology and on the bottom line." Fortune, 12/21/98, pp. 235.

Hastopholous, George, Notes from personal interviews w/ Craig Jarchow and German Cura (SF '99) at Thermo-Electron Corp., January 22, 1999

Henderson, Rebecca, "Underinvestment and incompetence as responses to radical innovation: evidence from the photolithographic alignment equipment industry", Rand Journal of Economics, Vol 24, No. 2, Summer 1993.

Henderson, Rebecca, "Managing Innovation in the Information Age", Harvard Business Review, Jan-Feb 1994.

Hunt, Brian (Harvard College Class of 1995) and Lerner, Josh, "Xerox Technology Ventures : March 1995", Harvard Business School Case 9-295-127, 11/97.

Kanter, Rosabeth Moss, "Swimming in Newstreams: Mastering Innovation Dilemmas", California Management Review, Summer 1989, pp. 139-163.

Kanter, Rosabeth Moss, When Giants Learn to Dance, Simon and Schuster, New York, 1989

Mack, George S., "Needle Maker Taps Strong Earnings Vein," MSN MoneyCentral OnLine, Posted 11/20/98.

Malone, Mike, "High Tech Giants Trying to Retain Entrepreneurs", The Dallas Morning News (author Special to the news), 5/18/85, pp.1g.

Markides, Constantinos, "Strategic Innovation in Established Companies", Sloan Management Review, Vol. 39, 03-22-1998, pp. 31(12).

Palepu, Bernard, and Healy, Introduction to Business Analysis and Valuation, South Western College Publishing, 1997

Pinchot, Gifford III, "Introducing the Intraprenuer", IEEE Spectrum, April, 1985, pp. 74-79.

Pratt & Whitney Corporation, "In the Company of Eagles", internal publication, 1990

Rabinow, Jacob, Writing in Chemtech, March 1980, p145. Excerpted from Roberts, Edward B., "Managing Invention and Innovation", Research Technology Management, Volume 31, No. 1, January-February 1988.

Reier, Sharon, "Beyond Start-ups: Venture Capital as Asset Building", Int'l Herald Tribune, 11/29/97.

Rich, Laura, "Lucent Sprouts In-House Ventures", The Industry Standard, August 24, 1998 (online), pp. 1-3.

Roberts, Edward B. and Frohman, Alan. L., "Internal Entrepreneurship: Strategy for Growth", The Business Quarterly, Spring 1972, pp.71-78.

Roberts, Edward B. and Yates, Ian C., "Large Company Efforts to Invest Successfully in Small Firms", unpublished paper, undated.

Roberts, Edward B. and Malone, Denis E., "Policies and Structures for Spinning Off New Companies from Research and Development Organizations", R&D Management, January 1996 17(15), Blackwell Publishers.

Roberts, Edward B., "New Ventures for Corporate Growth", Harvard Business Review, July-August 1980

Roberts, Edward B. and Berry, Charles A., Entering New Businesses: Selecting Strategies for Success", Sloan Management Review, Vol. 26, Number 3, Spring 1985

Roberts, Edward B., "Managing Invention and Innovation", Research-Technology Management, Volume 31, No. 1, January-February 1988, pp. 11-29.

Rosenberg, Ronald, "Seeing gold Siemens AG's expected purchase of start-up Redstone highlights scramble of big firms to catch tech wave," The Boston Globe, 03/18/99

Sahlman, William A. and Stevenson, Howard H., *The Entrepreneurial Venture – Selected Readings*, The Practice of Management Series, Harvard Business School

Schumpter, Joseph (London: George Allen and Unwin, 1943), second edition, Capitalism, Socialism, And Democracy, pp. 81-86.

Setright, L. J. K., The Power to Fly – The Development of the Piston Engine in Aviation, George Allen & Unwin Ltd., London, 1971

Smith, Herschel, Aircraft Piston Engines – From the Manly Baltzer to the Continental Tiara, McGraw-Hill Book Company, New York, 1981

Stevens, Tim, "Divide and Conquer (companies dividing new businesses based on odd venture-capital model)., Industry Week, Vol. 247, pp. 28(1).

Sykes, Hollister B., "Lesson's from a New Ventures Program", Harvard Business Review, May-June 1986, pp 69-74.

Taptich, Brian B. , "Bell on the Ball, Bell Labs technologies-in-progress range from the practical to the arcane.", Reb Herring On-Line, August 1998, 3 pages.

Teece, David J. (ed), The Competitive Challenge, (Cambridge, MA: Ballinger Publishing, 1987), pp. 185-219

Utterback, James M., *Mastering the Dynamics of Innovation*, Harvard Business School Press, 1994

Utterback, James M., "Developing Technologies: The Eastman Kodak Story", The McKinsey Quarterly, Number 1, 1995, pp. 131-144.

Vandendorpe, Laura, Basic Research White Paper, R&D Magazine, 1997 (Executive Summary On-line)

Xerox WWW site, "Xerox New Enterprises: Transforming the Corporate Investment Model" and FAQs,, About XNE pointer.

Zahra, Shaker A. et. al, "Transforming Technological Pioneering into Competitive Advantage", The Academy of Management Executive, Vol. 9, 2/1/95, pp. 17(15).

Zider, Bob, "How Venture Capital Works", Harvard Business Review, 11/1/98, pp. 106(10)