Available online at www.sciencedirect.com
ScienceDirect
Journal of Business Venturing 22 (2007) 262–282
JOURNAL of BUSINESS VENTURING

Venture capital investing by information technology companies: Did it pay?

Stephen A. Allen *, Kathleen T. Hevert

Babson College, Olin Hall 317, Babson Park, Wellesley, MA 02457, United States

Received 1 December 2004; received in revised form 1 January 2006; accepted 1 January 2006

Abstract

While corporate venture capital programs offer prospects for direct financial returns and strategic benefits, there is little evidence regarding whether they deliver economically significant value to sponsoring firms. We take an initial step in addressing this question by evaluating direct returns of programs of U.S. information technology companies during 1990–2002. Direct gains (losses) were widely dispersed and bimodally distributed, based on IRR and net cash flow metrics. Timing of initiation within the venture capital cycle; program scale; and annual investment, write-down, and harvest behavior were associated with differences in returns. We also explore how program characteristics may relate to their attractiveness as platforms from which to pursue strategic benefits.

Keywords: Corporate venture capital programs; Venture capital cycles

1. Executive summary

While corporate venture capital (CVC) investments grew dramatically during the past decade, there is little evidence regarding whether they delivered attractive direct financial returns or valuable strategic benefits for their parent companies. To begin to shed light on this question, we examined investment activity and direct returns of CVC programs of 90 U.S. information technology companies during 1990–2002. Performance metrics were

* Corresponding author. Tel.: +1 781 239 4413; fax: +1 781 239 5916.
E-mail address: allen@babson.edu (S.A. Allen).

0883-9026/$ - see front matter
doi:10.1016/j.jbusvent.2006.01.001

internal rate of return (IRR), cumulative net cash flow over program duration, and cumulative program net cash flow÷cumulative parent EBITDA. Programs were diverse with respect to scale (cumulative investment of $2 million to $4.5 billion, median $95 million), duration of activity (2–13 years), and timing of investments.

Thirty-nine percent of programs had IRRs exceeding their parents' cost of capital. Distribution of returns was wide and bimodal, with 30% of programs achieving IRRs greater than 40% and an equal proportion with returns of −20% or worse. For 44% of programs, these returns reflected cumulative net cash flows which were economically significant to their parents and enhanced or depressed cumulative parent EBITDA during program life by 2% or more.

Direct gains (losses) experienced by larger (more than $95 million of investment) programs were generally substantial. Thirty-six percent of these programs generated cumulative net cash flows greater than $100 million and appeared to offer the most attractive platforms from which to pursue strategic benefits. An equal proportion realized losses of $100 million or more. While these direct value destroyers may have provided strategic benefits, the value of those benefits would have to be very large to compensate for direct losses of this magnitude.

Most smaller programs generated cash flows between $25 million and −$25 million, indicating limited economic significance to their parents. However, 31% of smaller programs had IRRs greater than 45% and were noteworthy for their longer duration, low write-downs, and disciplined exposure management.

We identified three factors which distinguished direct value destroying programs from the rest of our sample: initiation late in the venture capital cycle, large spikes in annual investment activity, and less active harvesting of holdings. We interpret negative effects of these factors as variously reflecting late-cycle herding behavior, program inexperience, and strains on program capabilities engendered by spikes in investment activity.

Beyond providing broad benchmarks for direct return prospects of CVC investing, our findings have several implications for companies deciding to initiate CVC programs and executives responsible for managing and monitoring them. First, program initiation and monitoring should be informed by explicit guidelines for appropriate scale and annual exposures, reflecting company size, strategy, desired risk-return profile, and realities of venture capital cycles. This is similar in intent to more elaborate value-at-risk disciplines employed by financial institutions. Decisions on program scale–large or small–can take a company down two very different paths. We found that some small programs generated attractive IRRs, and they may have provided targeted benefits to new business development objectives. However, small programs may prove vulnerable in sustaining credibility internally (insignificant impact on parent results) and externally (deal flow). If the decision is to go for substantial scale, our data suggest that $100–500 million of investments over several years is likely to be required to deliver economically significant direct returns and to generate sufficient variety of holdings from which to pursue a necessarily smaller set of in-the-money strategic options. Sponsoring executives should also be aware of possibilities for large annual gains and losses across a venture capital cycle.

Second, we contend that programs with material exposures require active management for direct returns, even if they are motivated mainly by strategic objectives. Our data

indicate that probability that direct losses can be large enough to swamp strategic benefits is too great to relegate financial objectives to secondary considerations. Some observers argue that active financial management may sacrifice strategic benefits. The alternative is a long-term, buy-and-hold approach. We are not persuaded of superiority of this approach because it can sacrifice substantial direct gains and fail to limit losses across volatile venture capital cycles. Sale of holdings need not preclude continuing alliance activity with former portfolio companies or terminate organizational learning which may have been set in motion by initial investment.

Finally, we found that programs with large increases in annual investment activity after the venture capital cycle had progressed several years nearly always experienced large losses. Roughly one-third of younger and older programs fell into this trap, with annual investment often rising above $300 million for multiple years. While this can be put down to late-cycle herding behavior, a broader and more practical inference is that aggressive scaling of a program seldom pays because it compromises investing and harvesting disciplines. Our data cannot provide robust guidelines for what constitutes over-aggressive scaling because they deal with streams of activity rather portfolio composition, staffing, and organization of programs. What we can say is that dialogue between senior executives and program managers aimed at ensuring a credible match between aspirations and program investing, monitoring, and harvesting capacities is a vital discipline for successful CVC activity which can be too readily relaxed in hot markets.

2. Introduction

Corporate venturing and new business development activity of large firms can take a number of forms, including internally developed ventures, acquisitions, joint ventures, venture capital programs, and licensing agreements. We focus on one of these strategic investment modes: corporate venture capital (CVC) programs, which take minority positions in companies that are legally independent of the investor. These programs offer their parent companies prospects for both direct financial gains (losses) and wider strategic benefits.

CVC activity grew dramatically during the past decade; and it has attracted increased attention from researchers in the fields of strategy, innovation, and entrepreneurship. A central theme of many recent studies has been potential benefits of CVC programs in providing exposure and access to emerging technologies and markets and in developing networks of collaborators (Birkinshaw et al., 2002; Chesbrough, 2002). This theme relates to wider research interests in sources and processes of organizational learning and renewal (Cohen and Levinthal, 1990; Dess et al., 2003; March, 1991) and in creation and exercise of real options (Folta, 1998; McGrath, 1997).

Less attention has been devoted to evaluating returns and economic significance of CVC activity at the level of individual firms. In fact, there is little evidence regarding whether CVC programs ultimately create economic value for their sponsoring companies. This stems in part from difficulties in isolating and valuing returns from particular strategic benefits and their potential interactions with one another. While evaluation of direct

financial returns is a more tractable undertaking, evidence is limited to field studies of three programs.

Our study examines CVC activity of 90 U.S. information technology firms during 1990–2002 and direct financial returns experienced by these investors. Data were derived from analysis of 10-K disclosures. Comparison of activity of this sectoral sample with census data from the National Venture Capital Association (2004) indicated that it accounted for a substantial part of all CVC investment by U.S. firms during our observation period.

We address four issues. First, how many CVC programs produced direct returns greater than their parents' cost of capital? Second, how many programs had direct gains (losses) which were economically significant relative to parent earnings? Third, we identify several aspects of program activity associated with differences in direct returns. Finally, we explore how a program's activity may relate to its attractiveness as a platform from which to pursue strategic benefits. While our research design cannot capture total value which may have been created or destroyed by a CVC program, it represents a first step in unraveling this issue.

3. Prior research

3.1. Venture capital cycles and corporate activity

Venture capital activity is subject to boom-and-bust cycles, as indicated by trends in annual investment and returns. Gompers (2002) identified three such cycles—1965–1974, 1979–1987, and 1994–2002. While non-financial corporations have participated in each cycle, prior to 1994 the population of CVC programs appears to have been less than 85 in any year (Bygrave and Timmons, 1992; Rind, 1981); and total investment by U.S. programs during the 1970s and 1980s was an estimated $1.8 billion (Dushnitsky and Lenox, 2004).[1] In contrast, during the most recent cycle the worldwide population of CVC programs was estimated at between 303 and 447 (Asset Alternatives, 2002; Birkinshaw et al., 2002). Total investment by U.S. programs during 1994–2002 was an estimated $36 billion, rising from $107 million in 1994 to a peak of $17 billion in 2000, and falling to a still substantial $2 billion in 2002 (National Venture Capital Association, 2004).

Sectoral composition of investors changed over the three cycles. In the most recent cycle, firms in the information technology sector accounted for 62% of U.S. programs (Kann, 2000) and more than 75% of investment (Dushnitsky and Lenox, 2004). In earlier cycles, metals and chemical firms accounted for roughly half of investment, while information technology firms represented one-third (Dushnitsky and Lenox, 2004).

[1] Estimates of U.S. CVC investment are derived from analyses of the Thomson Venture Economics database. Venture Economics employs a narrower definition of CVC activity than our study. We discuss these differences in subsequent sections.

3.2. Program scale and duration

A changing population of CVC programs has been diverse with respect to scale and duration of activity, and this diversity appears to have been greater during the past decade. While there is recognition that these factors may influence internal and external credibility of programs, their performance, and their potential for promoting organizational learning (Gompers, 2002), researchers have not yet pursued this line of inquiry.

Prior to 1995, most programs appear to have achieved modest scale, and many were terminated after only a few years (Gompers and Lerner, 1998; Rind, 1981). Sykes' (1990) survey reported median activity of 4 years, 5 investments, and annual investment rates of $3.6 million. Gompers and Lerners' (1998) study of 1983–1994 activity found that corporate investors made an average of 4.4 investments over an average of 4.5 years, compared to an average 43.5 investments over an average 7.1 years for venture capital funds.

The most recent venture capital cycle produced a group of CVC programs with substantial scale. Gompers (2002) identified 15 large programs with capital under management in 2000 of $210 million to $1.5 billion. While these programs could provide a broad base from which to pursue financial and strategic benefits, their direct results could also be large enough to influence volatility of parent company earnings, with potential impact on share valuation. The business press has cited direct gains (losses) from larger programs as a quality of earnings issue for their parents (Dorsey, 2000; Williams, 2000).

The past decade's CVC program population was characterized by short activity duration, reflecting initiation of many programs late in the cycle and numerous terminations. Programs registered with the Corporate Venturing Directory rose from 49 in 1996 to 303 in 2001, then fell to 214 in 2002 (Asset Alternatives, 2002). Of 477 programs identified by Birkinshaw et al. (2002), 31% were closed or inactive by 2002. Of 95 active programs surveyed by these researchers, 46% had been initiated during 2000 and 2001.

3.3. Program objectives

Corporate executives generally cite both financial and strategic motives for initiating CVC programs. However, how to balance these interrelated motives in setting program objectives and evaluating performance has been a contentious issue.

Several surveys provide a view of strategic objectives and their relative importance for different CVC programs (Birkinshaw et al., 2002; Corporate Strategy Board, 2000; Kann, 2000; Siegel et al., 1988). Their findings converge around three clusters of objectives:

1. Exposure and access to emerging technologies, both complementary and disruptive, are highest ranked strategic objectives in all surveys.
2. Exposure to new markets and access to resources and relationships which can accelerate an investing firm's ability to enter new markets.
3. Enhancing demand for products or services. One version of this objective is ecosystem investing in the information technology sector, in which CVC is aimed at establishing or strengthening a network of suppliers, complementors, customers, and investors

which can help create or defend de facto technology standards for the investing firm (Chesbrough, 2003).

Two surveys provide rankings of strategic and financial objectives (Birkinshaw et al., 2002; Siegel et al., 1988). In both studies, financial return was the highest ranked objective, followed closely by exposure to and development of new technologies and markets. Both also reported substantial differences among companies in relative weights placed on these objectives. These differences are mirrored by public statements of prominent CVC investors. Here are three examples:

1. Cisco Systems (Volpi, 2000): "While we make 'strategic' investments, we don't want to make stupid financial decisions. At the end of the day, if we make a strategic investment and the company fails, then there is no strategy around it anymore."
2. Microsoft (Nehru, 2000): "If an investment in a company can support and benefit our customers and strategic partners, as well as provide market traction for our products or technologies, we consider it a successful venture. Although financial gain is important to us, we view it as a byproduct of a successful relationship, not the primary goal of investing."
3. Intel (2004): "Intel Capital reviews market conditions for opportunities to sell all or part of its investments. It decreases investments in some companies to recoup capital for use in new investments. Intel is a strategic investor, and our decision to invest in a company must satisfy that goal. However, selling is done as part of prudent management of a large portfolio; and strategic activities may continue with companies following stock sales."

While researchers are divided on weight financial and strategic objectives should receive in managing and evaluating CVC programs, they have a modest base of evidence on program performance to substantiate their views. Those advocating importance of financial objectives offer three arguments. First, the corporate finance literature provides an empirical basis for skepticism regarding investments justified mainly on unmeasured strategic benefits (Jensen, 1993). Second, unless a CVC program can demonstrate tangible results within a few years, it is likely to be hard pressed to justify ongoing funding and senior management support (Hardymon et al., 1983; Siegel et al., 1988). Finally, capturing value from potential strategic benefits is often contingent on receptivity and complementary resource commitments by managers not associated with the CVC program; and some observers are skeptical of companies' ability to orchestrate these linkages (Hardymon et al., 1983; Hellmann, 1998; Hurry et al., 1992).

Advocates of emphasis on strategic objectives offer arguments which are nearly a mirror image of those cited above. First, over-emphasis on financial returns may result in premature termination of programs (Rind, 1981). Second, giving primacy to financial objectives may lead to developing portfolios less likely to offer prospects for significant strategic spillovers (Chesbrough, 2002). Finally, firms which actively manage CVC investing as part of a wider technology strategy should be able to realize sufficient strategic benefits to compensate for low or negative direct returns (Dushnitsky and Lenox, 2004).

3.4. Evidence on program performance

Evidence on performance of individual CVC programs is limited to field studies of Exxon Enterprises (Sykes, 1986), Lucent's New Ventures Group (Chesbrough, 2003), and Xerox Technology Ventures (Gompers and Lerner, 1998). While these programs had different strategic objectives, they experienced similarly broad outcomes. Each realized positive financial returns, each was liquidated after a few years, and each was unable to document significant strategic benefits for its parent company.

Three studies provide indirect evidence on CVC program performance, employing samples of large numbers of transactions from the Venture Economics database. Since this database does not lend itself to identifying returns from the entire stream of activity of an individual program, these studies developed performance proxies for groups of investors. Gompers and Lerner (1998) used IPO rates to proxy performance, concluding that corporate investors fared as well as independent venture capital funds (IVCFs) and that corporate investors whose businesses were related to those of investees fared somewhat better than IVCFs. In a study of investments by Fortune Global 500 information and communication firms, Maula and Murray (2000) used IPO post-valuation as the performance proxy, concluding that companies co-financed by multiple corporate investors and by corporate investors and IVCFs had higher valuations than those funded only by IVCFs. A study of CVC programs of global telecommunications companies by Henderson and Leleux (2003) suggested interactions between strategic and financial benefits. They found that 56% of investees announced collaboration agreements with their corporate investors and that these investees had higher IPO rates than the rest of their sample. While these studies provide indirect evidence of positive performance within the population of CVC investors, they do not address returns actually achieved or the range of performance across programs.

With regard to pursuing potential strategic benefits, an interview study by Corporate Strategy Board (2000) found that a subset of best practice CVC programs had developed processes for screening and monitoring strategic relevance of investments and that some employed customized metrics for evaluating strategic benefits achieved. However, it reported that this appeared to be atypical of the population of CVC programs. It did not provide evidence on value captured from strategic spillovers.

4. Research design and methodology

We used data from a company's financial disclosures to establish its stream of CVC activity and to calculate directly measurable returns from that activity. We focused on U.S. firms because their reporting requirements provide sufficient detail to track activity. We drew our sample from the information technology sector because of its dominant role in U.S. CVC investment during the past decade.

4.1. Identifying CVC activity

CVC activity can be distinguished from other corporate investments based on disclosures regarding status of recipients, how investments were made, and holding

intent of investors. We defined CVC investment as an exchange of cash or services-in-kind by non-financial corporations for equity securities or rights to purchase equity securities in companies which were legally independent of the investor. Recipients are generally private companies. Investments may be made directly by business development units and venture capital arms managed by company personnel or indirectly through investments in IVCFs and dedicated funds managed by venture capitalists on behalf of a corporation. Holdings represent minority positions in recipient companies, and direct holdings are generally designated as available-for-sale under SFAS 115. Indirect holdings and direct holdings with restrictions on ability to sell are reported as long-term financial assets. Our definition excludes equity holdings designated as trading assets under SFAS 115 and holdings deemed to be joint ventures (in which two or more companies contribute cash and other assets to form a separate legal entity). Joint ventures can be distinguished from venture capital investments by their treatment as non-financial long-term assets and by absence of available-for-sale status. Secondary indicators used to determine joint venture status were election of the equity accounting method for 20–50% holdings (which presumes significant influence by the investor over operating and financial policies) or designation of less than 20% holdings as associates or affiliates of the investor.

Our definition of CVC activity is broader than that employed for NVCA census data (National Venture Capital Association, 2003: 99–100). First, our treatment includes all direct CVC activity, while NVCA coverage excludes direct investments by company units other than recognized venture capital arms unless they meet the following criteria: (a) clearly demonstrated to be a financial investment (vs. outsourced R&D or market development), (b) a co-investment in a qualifying venture capital round or follows a qualifying round, and (c) involves cash for equity. Second, our treatment includes indirect corporate investments in IVCFs, while NVCA census data do not. Third, our data include available-for-sale holdings in public companies because these holdings often reflect decisions by corporate investors to temporarily retain positions in private firms which have subsequently gone public or in equity securities obtained from acquisition of portfolio companies. While some of these holdings may also reflect initial investments in public companies, their available-for-sale status indicates an exit intent consistent with venture capital investing. Finally, NVCA census data exclude recipients not domiciled in the U.S. while our coverage does not.

4.2. Sample and data

We reviewed 10-K disclosures for 1988–2002 of 223 suppliers of information technology products and services for evidence of venture capital investments, as defined above. These firms represented all information technology companies listed in Stern Stewart 1000 annual rankings of largest market cap U.S. firms for any year during 1988–2002, including suppliers of semiconductors, other electronic components and systems, and semiconductor manufacturing equipment; producers of computer systems, peripherals, software, and networking equipment; systems integrators; and providers of data processing and information retrieval services (excluding telecommunications carriers). Venture capital activity was reported by 108 firms. Disclosures by six companies were inadequate for

tracking activity. We eliminated another 12 companies which were acquired prior to 2002 due to inability to fully determine results.[2] This resulted in a final sample of 90.

Based on analyses of financial statements, footnote disclosures, and management's discussion of non-operating income, we developed three annual time series for each firm's CVC activity: investments in equity securities (I), proceeds from sale of equity securities (P), and residual value of holdings (R). These data were derived from reporting formats as follows:

I = (year-end lower of cost or fair value of equity holdings$_t$ + impairment charges for other-than-temporary decline in value of holdings$_t$ + recovery of lower of cost or fair value of equity securities sold$_t$) − year-end lower of cost or fair value of equity holdings$_{t-1}$.

P = before tax realized gains (losses) from sale of equity securities$_t$ + recovery of lower of cost or fair value of equity securities sold$_t$.

R = year-end lower of cost or fair value of equity holdings retained$_t$ + year-end unrealized gains (losses) on publicly traded equity securities$_t$.

Realized gains (losses) in P reflect direct expenses for transactions involved—e.g., trading costs, management fees and carried interest for indirect holdings, and carried interest for direct holdings when this form of compensation is used.[3] They exclude indirect expenses for directly managed programs—e.g., salaries, bonuses, and other overheads.

Since our data track annual activity rather than individual transactions, we could not establish controls for differences among programs with respect to related v. diversifying investments. Kann's (2000) analysis of 94 CVC programs of U.S. information technology companies found that 99% had missions to focus activity within that broad sector. Therefore, we believe that related vs. diversifying program activity was unlikely to have significantly influenced our findings.

4.3. Performance metrics

Three metrics were used to gauge directly measurable program performance. In line with venture capital industry practice, we adopted internal rate of return (IRR) as the primary figure of merit (Bygrave and Timmons, 1992; VentureXpert Methodology, 2003). We also developed two measures intended to reflect size and materiality of direct returns: (a) cumulative program net cash flow in undiscounted dollars[4] and (b) cumulative program net cash flow ÷ cumulative parent EBITDA (earnings before interest, taxes, depreciation, amortization). Cumulative parent EBITDA was matched to time span of CVC activity. Measurement periods for programs began with their first fiscal year of activity and extended through fiscal 2002 or last year in which any holdings remained.[5]

[2] This censored $285 million of investment activity. Mean activity per excluded firm was $23.8 million of cumulative investment and 3.3 years.

[3] An estimated 78% of U.S. CVC programs are directly managed (Kann, 2000), and carried interest appears to be relatively uncommon for this type of program (Birkinshaw et al., 2002).

[4] Operationalized as $(P_1 - I_1) + (P_2 - I_2) + \ldots (P_T - I_T + R_T) - I_0$.

[5] Only four companies had liquidated all holdings by the end of fiscal 2002.

IRR was operationalized as:

$$I_0 = \frac{P_1 - I_1}{1 + \text{IRR}} + \frac{P_2 - I_2}{(1 + \text{IRR})^2} + \ldots \frac{P_T - I_T + R_T}{(1 + \text{IRR})^T}$$

where I_t is investment in equity securities in year t, P_t is proceeds from sale of equity securities in year t, T is the time period through which returns are measured, and R_T is residual value of holdings in terminal year T. IRR is the discount rate that equates initial investment (I_0) with the present value of net cash flows over the measurement period.

IRR has merits and limitations as a performance measure, both technically and in interpretation (Kelleher and MacCormack, 2004). Its merits are that it recognizes time value of a stream of investment activity and permits inferences regarding whether direct returns of a program create or destroy value. Its technical limitations are that it can become undefinable with multiple changes in signs within a cash flow series and it assumes that interim gains can be reinvested at the calculated rate of return. Also, IRR does not provide a valid basis for ranking programs due to differences in scale, duration, and annual harvest activity. We recognize these limitations in presenting and interpreting our findings.

4.4. Sample analysis

Sample companies made $65 billion in CVC investments, $57 billion of which occurred after 1997. These figures substantially exceed National Venture Capital Association (2004) estimates of all CVC activity, which were $36 billion for 1994–2002. Our data reflect a broader definition of CVC investment and a longer observation period.[6]

Descriptive statistics in Table 1, Panel A, confirm that sample firms were generally large enterprises, as measured by market capitalization and revenues in 2002. Mean years as a public company was 17; however, somewhat more than 25% of sample firms had gone public during our observation period.

Data on CVC activity (Table 1, Panel B) show considerable diversity among programs. While 28% had eight or more years of activity, 41% had 4 years or less. Median and mean cumulative program investment were $95 million and $714 million, respectively. Distributions for all activity metrics were skewed to the right, indicating presence of a group of programs with substantial scale. Correlations between program duration and cumulative investment, average annual investment, write-downs, and residual value were not statistically significant. This suggests considerable differences among programs with respect to timing of activity.

IRR and cumulative program net cash flow were not significantly correlated, confirming importance of both time-valued return and size of cash flows in interpreting direct performance. Performance metrics reflect realized gains (losses) and residual value of holdings (R). While companies are required to take write-downs for other-than-temporary declines in value of these holdings, they have discretion regarding these decisions. While 25% of sample firms retained more than $72 million in holdings and

[6] NVCA has not reported census data for CVC activity prior to 1994. Dushnitsky and Lenox (2004) estimate that 1990–1993 activity averaged $100 million per annum.

Table 1
Descriptive statistics for sample firms, their venture capital activity, and direct return metrics

	Quartiles			
	Mean	25	Median	75
Panel A: Company size and age				
Market cap—year-end, 2002 ($ billion)	13.0	0.8	2.5	7.0
Revenues in fiscal 2002 ($ billion)	5.1	0.5	1.1	2.1
Years as public company in 2002	17	8	14	19
Panel B: Venture capital activity and direct return metrics				
1. Duration of activity (years)	6	4	5	8
2. Cumulative investment ($ million)	718	34	95	417
3. Average annual investment ($ million)	110	7	18	65
4. Cumulative write-downs ($ million)	349	8	32	187
5. Residual value, end fiscal 2002 ($ million)	240	5	19	72
6. Residual value ÷ cumulative investment	0.29	0.08	0.20	0.45
7. Cumulative program net cash flow ($ million)	13	−35	−2	67
8. IRR (%)	173.2	−28.2	2.4	50.9
9. Cumulative program NCF ÷ cumulative parent EBITDA (%)	9.4	−2.6	0.7	6.9

Correlations

	1.	2.	3.	4.	5.	6.	7.	8.
1.	1.00							
2.	0.16	1.00						
3.	0.10	0.99***	1.00					
4.	0.12	0.98***	0.98***	1.00				
5.	0.12	0.97***	0.96***	0.94***	1.00			
6.	0.01	0.06	0.05	−0.03	0.16	1.00		
7.	0.22*	−0.20	−0.27**	−0.31**	−0.19	0.01	1.00	
8.	0.05	−0.04	−0.04	−0.04	−0.03	−0.01	0.15	1.00
9.	0.08	−0.07	−0.08	−0.09	−0.04	0.08	0.23*	0.52***

* $p \leq 0.05$.
** $p \leq 0.01$.
*** $p \leq 0.001$.

holdings greater than 45% of cumulative investment at the end of fiscal 2002, neither measure of R was significantly correlated with IRR or cumulative net cash flow. Differences in company treatment of R do not appear to pose major issues in evaluating direct returns.[7]

[7] To further confirm this, we examined realized return ratios for programs. In line with venture capital industry practice, this ratio was calculated as capital multiple excluding R ÷ capital multiple including R, where capital multiple is cumulative net cash flow ÷ cumulative investment. First quartile and median values were 0.78 and 0.89, respectively. This compares to an historic realized return ratio of 0.72 for all U.S. venture capital activity (National Venture Capital Association, 2003: 84).

5. Findings

5.1. Directly measurable program returns

Pooled IRR for the total sample, which treats it as a single entity without regard to differences in returns of individual programs, was a modest 2.1%. This contrasts with 10-year pooled IRR through 2002 for all U.S. venture capital activity of 26.0% (National Venture Capital Association, 2003: 81). Since CVC programs have both strategic and financial objectives, we do not view venture capital industry benchmarks as the best standard against which to evaluate direct returns. Instead, we employ a minimal and readily available standard of whether direct returns equal or exceed parent company cost of capital. Based on estimates by Stern Stewart (2004), mean weighted average cost of capital (WACC) for sample companies in 2000 was 12.6% (standard deviation 1.8%).[8]

While CVC programs as an investor class were direct value destroyers, this was not the typical case across programs. Distribution of IRRs was wide and bimodal (Table 2, Panel A). Sixty-one percent of programs had returns below parent WACC (51% with negative IRRs).[9] Among programs with returns above parent WACC, 77% had IRRs greater than 40%.

Viewed from the perspective of cumulative net cash flow (Table 2, Panel B), 71% of larger programs (cumulative investment >$95 million) had gains or losses of more than $100 million. For smaller programs, 69% had more modest gains or losses of less than $26 million. Gains (losses) relative to cumulative parent EBITDA (Table 2, Panel C) were bimodal for both larger and smaller programs.

We used the three performance metrics to discriminate value creation and destruction among larger and smaller (cumulative investment ≤$95 million) programs which was likely to be viewed as economically significant by their parent companies. Our criteria were IRR above or below parent WACC, cumulative net cash flow positive or negative by more than $100 million for larger and $50 million for smaller programs, and positive or negative impact on cumulative parent EBITDA of more than 2%. By this reckoning, 44% of programs had economically significant impacts on their parents. Among larger programs, 33% had economically significant positive impacts and 36% negative. Among smaller programs, 16% had economically significant positive impacts and 4% negative.

5.2. Program activity and IRR

We examined relationships among three aspects of program activity and IRR: year of initiation (vintage year cohort); program scale as measured by cumulative investment; and annual investment, write-down, and harvest behavior. Table 3 reports IRRs by vintage year

[8] While WACC for a single year is not a perfect standard, we confirmed that mean WACCs for sample companies varied by no more than +1% or −1% from 2000 estimates for any year during 1990–2002 and that standard deviations did not exceed 2%.

[9] Program IRRs are before taxes. To discriminate direct value destroyers, we first identified programs with IRRs less than parent WACC. Highest IRR among these programs was 11.3%. Lowest IRR among programs which exceeded parent WACC was 16.6%. Three programs with IRRs greater than 16.6% fell below parent WACC when results were adjusted for an assumed 20% tax on capital gains.

Table 2
Direct returns for individual programs

Panel A: IRR

	< −40%	−21% to −40%	−11% to −20%	−1% to −10%	1% to 10%	11% to 20%	21% to 40%	>40%	Total
Number of programs	19	7	9	7	8	5	5	26	86
IRR ≤ 11.3% and < parent WACC									55
IRR ≥ 16.6% and parent WACC									35
All programs									90

Panel B: Cumulative program net cash flow ($ million)

	< −400	−201 to −400	−101 to −200	−51 to −100	−50 to −26	−25 to −1	0 to 25	26 to 50	51 to 100	101 to 200	201 to 400	>400	Total
Lower cumulative investment programs (≤ $95 million)	0	0	0	2	3	17	14	4	1	3	0	1	45
Higher cumulative investment programs (> $95 million)	8	4	4	2	2	4	3	1	1	6	5	5	45
All programs	8	4	4	4	5	31	7	5	2	9	5	6	90

Panel C: Cumulative program net cash flow ÷ cumulative parent EBITDA (%)

	< −4.0	−2.1 to −4.0	−1.1 to −2.0	−1.0 to −0.1	0 to 1.0	1.1 to 2.0	2.1 to 4.0	>4.0	Total
Lower cumulative investment programs (≤ $95 million)	4	8	1	2	6	3	3	9	36
Higher cumulative investment programs (≥ $95 million)	9	3	3	5	8	0	0	13	41
All programs	13	11	4	7	14	3	3	22	77

Reduced observations in Panel A reflect undefined IRRs for four programs, each of which had negative cumulative net cash flows. Thirteen observations with negative cumulative parent EBITDA are excluded in Panel C. CVC programs of these companies had a mean IRR of −43.4% (median −58.0%). Their mean cumulative net cash flow was −$81 million (median −$28 million).

Table 3
Returns (IRR %) by vintage year cohort

Vintage year	*n*	Quartiles		
		25	Median	75
1990	1	–	64	–
1991	1	–	6	–
1992	1	–	89	–
1993	5	−16	20	28
1994	5	7	18	23
1995	12	−13	5	98
1996	11	−4	37	55
1997	6	−38	75	236
1998	9	−2	22	178
1999	22	−58	−17	18
2000	9	−75	−70	−27
2001	4	−71	−46	−25
	86			

Median IRRs treating 1990–1998 and 1999–2001 vintage year cohorts as sub-samples are 21.5% and −27.5%, respectively. $p < 0.0001$ (Wilcoxon rank sums test).

cohort, which captures both program duration and timing of initiation within the venture capital cycle.

Forty-one percent of companies initiated activity during 1999–2001, and 83% of these programs had IRRs which were lower than parent WACC (74% with negative IRRs). All programs initiated in 2000 and 2001 had substantially negative IRRs. Most programs initiated prior to 1999 began activity after 1992. While there was a dispersion of returns within most of these vintage year cohorts, 57% of programs initiated prior to 1999 had IRRs exceeding parent WACC and 40% had IRRs greater than 40%.

Program scale was associated with differences in IRRs for older programs (Table 4). Median IRR for largest programs (cumulative investment >$417 million) in 1990–1998 vintage cohorts was negative and statistically significant compared with other programs in these cohorts. This may reflect diminishing returns to scale with respect to search, selection, and monitoring activity. Alternatively, it may reflect strains in capacity of program management teams during peak activity periods.

Table 4
Median returns (IRR %) by program scale and vintage year cohort sub-samples

Program scale ($ million cumulative investment)	Vintage year cohorts		
	1990–1998 ($n=51$)	1999–2001 ($n=35$)	All cohorts ($n=86$)
≤95 ($n=42$)	73 ($n=21$)	−29 ($n=21$)	5
96–417 ($n=23$)	45 ($n=14$)	−17 ($n=9$)	4
>417 ($n=21$)	−1 ($n=16$)	−28 ($n=5$)	−2

Break points for program scale categories are median and third quartile values for cumulative investment. Wilcoxon rank sums test was applied to IRR for programs of ≤$95 million and >$417 million compared to IRR for all other programs in each column. For 1990–1998 vintage cohort sub-sample $p < 0.003$ for programs with >$417 million of cumulative investment. For all other column comparisons, $p \geq 0.248$. Within 1990–1998 sub-sample differences in year of initiation were not statistically significant for programs with cumulative investment >$417 million and others ($\chi^2 = 0.63$, $p \geq 0.70$).

To develop more granular insights into relationships between program activity and returns, we compared annual investment, write-down, and harvest behavior of eight subgroups consisting of 1990–1998 and 1999–2001 vintage cohort sub-samples sorted by value creating or destroying IRRs and by larger or smaller program scale. Due to small numbers of observations involved, we report aggregate data for each group. Harvest behavior was gauged by dividing recovery of cost basis of equity securities sold by prior year cumulative cost basis of holdings. This was derived from our data as follows:

$$\frac{C_t}{\sum I_{t-1} - (\sum C_{t-1} + \sum W_{t-1})}$$

where C_t is recovery of lower of cost or fair value of equity securities sold during the observed year, $\sum I_{t-1}$ is cumulative investment through end of the prior year, $\sum C_{t-1}$ is cumulative recovery of lower of cost or fair value of equity securities sold through end of the prior year, and $\sum W_{t-1}$ is cumulative write-downs through end of the prior year.

Table 5, which reports data for 1999–2001 vintage cohort groups, indicates that among direct value destroying programs investment activity centered on 2000 and 2001 and that 51% of investment had been written off by the end of 2002. Residual value of smaller programs had been reduced to modest levels. While aggregate residual value of larger programs was $1.1 billion, median holdings were $44 million. Activity of these younger programs (41% of our sample) suggests herding behavior (Scharfstein and Stein, 1990) within what turned out to be the boom-to-bust phase of a venture capital cycle. The rapidity with which write-downs followed high investment activity suggests poor track records for target selection and in valuations paid.

Table 6, Panel A, indicates four differences between direct value creating and destroying larger programs in 1990–1998 vintage cohort groups. First, value destroyers invested aggressively late in the cycle. Despite large write-downs beginning in 2000, these

Table 5
Investment, write-down, and harvest behavior of four groups of programs within 1999–2001 vintage cohorts

Year of activity	IRR ≥ 16.6% and parent WACC					IRR ≤ 11.3% and < parent WACC				
	n	Investment ($ million)	Write-downs ($ million)	Residual value ($ million)	Harvest (%)	*n*	Investment ($ million)	Write-downs ($ million)	Residual value ($ million)	Harvest (%)
Panel A: Higher cumulative investment (>$95 million)										
1999	2	272	0	272	0.0	9	474	0	592	0.0
2000	2	0	0	272	4.0	11	3225	152	5466	21.5
2001	2	0	143	19	39.9	11	1222	1664	2586	13.0
2002	2	136	1	139	72.2	9	217	828	992	12.4
1999–2002		408	144				5138	2644		
Panel B: Lower cumulative investment (≤$95 million)										
1999	4	21	0	20	0.0	9	114	0	127	0.0
2000	4	11	7	87	52.4	16	310	21	441	17.5
2001	4	9	1	19	28.6	19	252	273	318	15.1
2002	3	3	12	10	6.3	19	110	145	230	14.5
1999–2002		44	20				786	439		

Aggregate data for firms in each group. *n* is number of firms in each group with activity in a given year.

Table 6
Investment, write-down, and harvest behavior of four groups of programs within 1990–1998 vintage cohorts

Year of activity	IRR ≥ 16.6% and parent WACC					IRR ≤ 11.3% and < parent WACC				
	n	Investment ($ million)	Write-downs ($ million)	Residual value ($ million)	Harvest (%)	*n*	Investment ($ million)	Write-downs ($ million)	Residual value ($ million)	Harvest (%)
Panel A: Higher cumulative investment (> $95 million)										
1990	1	27	0	27	0.0	0	0	0	0	0.0
1991	1	38	0	11	100.0	1	42	0	0	0.0
1992	1	0	0	0	40.7	1	23	0	0	0.0
1993	4	202	0	202	0.0	2	99	0	3	0.0
1994	7	869	0	1071	0.0	4	206	0	129	100.0
1995	9	144	0	1146	6.0	9	964	0	171	3.6
1996	13	813	0	1921	3.2	13	1018	0	3282	1.5
1997	14	382	0	2221	4.3	15	2622	2	5700	7.8
1998	14	1941	14	4075	3.3	18	2190	5	7814	3.1
1999	14	3015	37	6573	10.1	18	9038	107	21,415	17.0
2000	14	3424	402	8216	25.7	18	13,404	2590	27,324	10.9
2001	14	397	1908	4420	45.1	18	11,966	11,481	21,193	7.9
2002	14	188	1575	2542	12.6	18	11,226	9743	18,544	9.1
1990–2002		11,440	3936				52,798	23,928		
Panel B: Lower cumulative investment (≤ $95 million)										
1992	1	10	0	10	0.0	0	0	0	0	0.0
1993	1	0	0	10	0.0	1	22	0	23	0.0
1994	1	5	0	5	100.0	2	14	0	33	0.0
1995	4	30	0	25	66.7	4	16	0	44	11.1
1996	7	36	0	53	32.0	5	10	0	52	6.3
1997	10	76	0	106	43.4	6	44	0	96	10.9
1998	15	77	4	142	32.1	7	20	0	110	2.2
1999	15	74	0	132	83.2	7	23	7	116	18.0
2000	14	136	0	199	51.1	7	136	0	236	37.6
2001	14	90	54	165	34.7	7	91	128	164	12.9
2002	14	62	85	78	37.2	7	48	23	139	4.1
1992–2002		596	143				424	158		

Aggregate data for firms in each group. *n* is number of firms in each group with activity in a given year.

programs continued substantial investment through 2002. Second, value creators harvested more actively during 2000 and 2001 than did value destroyers. Third, write-downs for value destroyers were 45% of a much larger cumulative investment base, compared with 34% for value creators. Finally, value destroyers retained holdings valued at $18.5 billion at the end of 2002, offering prospects for future gains or losses. However, gains would have to be substantial to compensate for $22.1 billion of losses which these programs had already realized.

Direct value destruction by more than half of larger programs in pre-1999 vintage cohorts reflected, in part, decisions to take and retain large positions late in a venture cycle despite signals from rising write-downs that the cycle may have been entering a phase with growing downsize risk. While this is similar to herding behavior observed in younger cohorts, it additionally suggests escalation of commitments in the face of adverse results

(Staw and Ross, 1989). High levels of investment during 1999–2002 may also have compromised search and monitoring capacity of these programs.

Differences in behavior of smaller direct value creating and destroying programs (Table 6, Panel B) were similar in many respects to those observed for their larger counterparts. Value creators harvested actively, had a remarkably lower write-down rate (24%), and had reduced holdings to modest levels by 2002. A noteworthy difference between smaller value creators and the other three groups in Table 6 was their high level of harvest activity throughout 1994–2002. Direct financial return may have been a higher priority for many of these programs. Alternatively, they may have focused on a small set of investments and actively monitored and harvested positions as benefits were either achieved or appeared unlikely.

5.3. Looking beyond direct returns

The case for strategic benefits of CVC investments rests on assumptions that they generate knowledge and relationships which parent companies profitably exploit by parallel or subsequent actions. The potential for strategic benefits has been likened to real options (Hurry et al., 1992; McGrath, 1997). Viewed from this perspective, CVC investments not only carry prospects for direct gains (losses) but also embed equivalents of call options (possibilities but not obligations) to create and exploit organizational learning within investing firms or to undertake alliance activities with investees. By extension, a CVC program can be viewed as a platform for generating multiple, interacting real options (Kogut and Kulatilaka, 1994). Yet, given substantial uncertainties surrounding prospects of investees, CVC programs need a sufficient number and variety of positions from which to exercise a smaller set of in-the-money real options (Luehrman, 1998; McGrath and Nerkar, 2001).

Consistent with option logics, we developed an index of a program's attractiveness as a platform from which to pursue strategic benefits based on its duration, scale, and write-down experience. The index reflects three assumptions. First, longer duration programs represent more attractive platforms because they provide wider windows within which to exercise real options. Second, higher cumulative investment proxies a larger number of positions, which provides more opportunities for identifying and exercising options. Finally, higher cumulative write-downs÷cumulative investment indicates reduced underlying value of program holdings and, therefore, lower option value of a platform. Programs were assigned scores of 1–3 on each attribute, and platform attractiveness was measured as an equally weighted index of these scores.[10] Index mean was 5.84 (standard deviation 1.60).

Table 7 reports median platform attractiveness scores for economically significant value creating and destroying programs identified earlier plus the rest of our sample. Among larger programs, direct value creators had higher platform attractiveness than value

[10] Correlation between duration and cumulative write-downs÷cumulative investment was − 0.32 ($p<0.001$). Other correlations were not statistically significant. Scores for program duration were 1=2–4, 2=5–7, and 3=8 or more years, respectively. Scores for other measures were based on location above 33rd and 67th fractiles for the sample.

Table 7
Median platform attractiveness scores by direct performance groups

Direct performance group	Cumulative program investment	
	>$95 million ($n=45$)	≤$95 million ($n=45$)
Economically significant value creators	7.0 ($n=15$)	6.0 ($n=7$)
Economically significant value destroyers	5.0 ($n=16$)	6.0 ($n=2$)
Rest of programs	6.0 ($n=14$)	5.0 ($n=36$)

Wilcoxon rank sums test was applied to differences among cells. For larger program value creators vs. destroyers $p<0.03$. For rest of smaller programs vs. larger program value creators and rest of larger programs $p<0.01$. All other comparisons were not statistically significant.

destroyers. Not surprisingly, smaller programs generally had lower platform attractiveness. While our index is an admittedly crude indicator of platform attractiveness, comparisons in Table 7 suggest that higher direct return programs did not have lower strategic platform attractiveness. If so, potential trade-offs between financial and strategic objectives of CVC programs may be less of an issue than some observers have posited.

6. Discussion and conclusion

We found considerable diversity in scale, duration, and timing of CVC activity of U.S. information technology companies during 1990–2002. Half of these firms had put more than $95 million in cumulative investment at risk, while 25% had more than $417 million in exposures. Fifty-five percent had more than 5 years of activity. For another 26% CVC activity appeared to be a modest, short-lived experiment initiated late in a venture capital cycle.

Our main objective was to generate evidence on direct financial gains (losses) which CVC programs can experience. Thirty-nine percent of programs had IRRs exceeding their parents' cost of capital. Distribution of returns was wide and bimodal, with 30% of programs achieving IRRs greater than 40% and an equal proportion with returns of −20% or worse. For 44% of programs these returns reflected cumulative net cash flows which were economically significant to their parents and enhanced or depressed cumulative parent EBITDA by 2% or more.

Dividing the sample into larger (investments greater than $95 million) and smaller programs provided additional insights. Among larger programs, 36% generated cumulative net cash flows greater than $100 million and appeared to offer the most attractive platforms from which to pursue strategic benefits. An equal proportion realized losses of more than $100 million. While these direct value-destroying programs may have produced strategic benefits, the value of those benefits would have to be very large to compensate for such large direct losses. The case for skepticism is further supported by the observation that many strategic spillovers are akin to real options, requiring additional investment to exercise and raising issues of differences in parent company capabilities for efficient exercise and abandonment (Adner and Levinthal, 2004; Copeland and Tufano, 2004).

Sixty-nine percent of smaller programs generated cumulative net cash flows between $25 million and − $25 million, suggesting limited economic significance to their

parents. However, 31% of smaller programs had IRRs greater than 45%, and most of these programs enhanced parent EBITDA by more than 2%. While smaller scale suggested more modest platforms from which to pursue strategic benefits, these programs may have served limited new business development objectives. These programs were noteworthy for their longer duration, low write-downs, and disciplined exposure management.

More detailed analysis found that direct value destroying programs tended to be initiated late in the venture capital cycle, to have large spikes in annual investment activity, and/or to less actively harvest positions. Our interpretation of this evidence centers on herding behavior and strains in search, selection, negotiation, and monitoring capabilities resulting from activity spikes. We suspect that in many cases these factors had independent and interactive effects. Late-cycle escalation of activity likely compromised investment disciplines at a time when quality of the pool of candidates may have been declining and valuations inflating. Also, program managers may have shifted efforts to investing at the expense of monitoring and search for attractive exit possibilities. These problems are not unique to CVC programs; they represent longstanding issues within the wider venture capital community (Bygrave and Timmons, 1992; Valentine, 2000).

Four limitations of our research design should be held in mind in drawing broader conclusions about merits of different CVC programs. First, while we identified broad characteristics of programs associated with their direct returns, we did not study goals, mindsets, and processes of programs and their sponsoring companies. Second, we focused on one economic sector because of its dominant role in U.S. CVC investment during the past decade. The information technology sector has characteristics and dynamics which may both predispose it to CVC activity and influence the patterns we observed. These include a high rate of technological progress, short product development and life cycles, and a high rate of new company formation. In other industries activity patterns, strategic intents, and success factors of CVC programs could be different. Third, we did not examine whether sample companies pursued or captured value from strategic spillovers. Finally, the level and pattern of CVC activity witnessed during the past decade may prove unique. However, issues of program timing, scale, and navigation across venture capital cycles are unlikely to be temporally unique.

We see several fruitful avenues for future research on CVC programs. First, the issue of strategic spillovers begs for detailed study. How many companies actively pursue these wider benefits, and what processes do they use to do this? How do they gauge any value which is actually captured? How does this relate to broader themes of organizational learning? What lessons can be extracted regarding creation and exercise of real options? A related issue is how CVC programs may both complement other business venturing activities and compete with them for resources and top management support. A final broader line of inquiry is identification of factors which account for differences in initiation and strategic intent of CVC programs, both across and within industries. Our research suggests that future studies should recognize venture capital cycles, timing of program initiation, program scale, and direct return experience in drawing samples and interpreting findings. Our data indicate that measures of CVC activity and performance are unlikely to be normally distributed, and future research designs should be prepared to deal with this.

Acknowledgement

This project was funded in part by the Paul and Phyllis Fireman Charitable Foundation Chair held by Allen. We are grateful for helpful comments of William Bygrave, Shaker Zahra, Jesse Reyes, and anonymous reviewers.

References

Adner, R., Levinthal, D.A., 2004. What is not a real option: considering boundaries for the application of real options to business strategy. Academy of Management Review 29 (1), 74–85.

Asset Alternatives, 2002. Corporate Venturing Directory and Yearbook. Asset Alternatives, Wellesley, MA.

Birkinshaw, J., van Basten Batenburg, R., Murray, G., 2002. Corporate venturing: The state of the art and prospects for the future. London Business School.

Bygrave, W.D., Timmons, J.A., 1992. Venture Capital at the Crossroads. Harvard Business School Press, Boston, MA.

Chesbrough, H.W., 2002. Making sense of corporate venture capital. Harvard Business Review 80 (3), 90–97.

Chesbrough, H.W., 2003. Open Innovation. Harvard Business School Press, Boston, MA.

Cohen, W.M., Levinthal, D.A., 1990. Absorptive capacity; a new perspective on learning and innovation. Administrative Science Quarterly 35, 128–152.

Copeland, T., Tufano, P., 2004. A real-world way to manage real options. Harvard Business Review 82 (3), 90–99.

Corporate Strategy Board, 2000. Corporate venture capital: managing equity investments for strategic returns. Working paper 071-241-955.

Dess, G.G., Ireland, R.D., Zahra, S.A., Floyd, S.W., Janney, J.J., Lane, P.J., 2003. Emerging issues in corporate entrepreneurship. Journal of Management 29 (3), 351–378.

Dorsey, P., 2000. Is it a technology company or an investment firm? Red Herring, 444 (July).

Dushnitsky, G., Lenox, M.J., 2004. When does corporate venture capital create firm value? Working Paper, New York University and Duke University.

Folta, T.B., 1998. Governance and uncertainty: the trade-off between administrative control and commitment. Strategic Management Journal 19, 1007–1028.

Gompers, P.A., 2002. Corporations and the financing of innovation: the corporate venturing experience. Federal Reserve Bank of Atlanta Economic Review 87 (4), 1–18.

Gompers, P.A., Lerner, J., 1998. The determinants of corporate venture capital success: organizational structure, incentives, and complementarities. National Bureau of Economic Research. Working Paper 6725.

Hardymon, G.F., DeNinno, M.J., Salter, M.S., 1983. When corporate venture capital doesn't work. Harvard Business Review 61 (3), 114–120.

Hellmann, T., 1998. Some thoughts on the theory of corporate venture investing. Corporate Governance Today. Columbia University Law School, pp. 37–43. May.

Henderson, J., Leleux, B., 2003. Learning to effect resource combinations and transfer in corporate venture capital programs: an empirical appraisal. Working Paper, Babson College.

Hurry, D., Miller, A.T., Bowman, E.H., 1992. Calls on high technology: Japanese exploration of venture capital investments in the U.S.. Strategic Management Journal 13 (2), 85–104.

Intel, 2004. About Intel Capital. www.intel.com/capital.

Jensen, M.C., 1993. The modern industrial revolution, exit, and the failure of internal control systems. The Journal of Finance 48 (3), 831–880.

Kann, A., 2000. Strategic venture capital investing by corporations. Doctoral dissertation, Stanford University.

Kelleher, J.C., MacCormack, J.J., 2004. Internal rate of return: a cautionary tale. McKinsey on Finance. August.

Kogut, B., Kulatilaka, N., 1994. Options thinking and platform investments. California Management Review 36 (2), 52–71.

Luehrman, T.A., 1998. Strategy as a portfolio of real options. Harvard Business Review 75 (5), 89–100.

March, J.G., 1991. Exploration and exploitation in organizational learning. Organization Science 2, 71–87.

Maula, M., Murray, G., 2000. Corporate venture capital and the creation of U.S. public companies: the impact of venture capital on the performance of portfolio companies. In: Hitt, M.A., Amit, R., Lucier, C., Nixon, R.D. (Eds.), Creating Value: Winners in the New Business Environment. Blackwell Publishers, Oxford, pp. 164–187.

McGrath, R.G., 1997. A real options logic for initiating technology positioning investments. Academy of Management Review 22 (4), 974–996.

McGrath, R.G., Nerkar, A., 2001. Real options reasoning and a new look at R&D investment strategies of pharmaceutical firms. Paper presented at Strategic Management Society Meeting, San Francisco.

National Venture Capital Association, 2003, 2004. Yearbooks. Venture Economics Information Services, Newark, NJ.

Nehru, A., 2000. Understanding Microsoft's investment strategy. Company document.

Rind, K.W., 1981. The role of venture capital in corporate development. Strategic Management Journal 2, 169–180.

Scharfstein, D., Stein, J., 1990. Herd behavior and investment. American Economic Review 80 (3), 465–479.

Siegel, R., Siegel, E., MacMillan, I.C., 1988. Corporate venture capitalists: autonomy, obstacles, and performance. Journal of Business Venturing 3, 233–247.

Staw, B., Ross, J., 1989. Understanding behavior in escalation situations. Science 246, 216–220.

Stern Stewart, 2004. Stern Stewart 1000 database.

Sykes, H.B., 1986. Lessons from a new venture program. Harvard Business Review 64 (3), 69–74.

Sykes, H.B., 1990. Corporate venture capital: strategies for success. Journal of Business Venturing 5, 37–47.

Valentine, D., 2000. Sequoia capital. In: Gupta, U. (Ed.), Done Deals: Venture Capitalists Tell their Stories. Harvard Business School Press, Boston, MA, pp. 165–177.

VentureXpert Methodology, 2003. Venture Economics, Newark, NJ.

Volpi, M., 2000. Cisco Systems. In: Gupta, U. (Ed.), Done Deals: Venture Capitalists Tell their Stories. Harvard Business School Press, Boston, MA, pp. 29–37.

Williams, M., 2000. Glow fades from Intel's investments. Wall Street Journal 15, C-1 (December).