DISTINGUISHING SUCCESSFUL FROM UNSUCCESSFUL VENTURE CAPITAL INVESTMENTS IN TECHNOLOGY-BASED NEW VENTURES: HOW INVESTMENT DECISION CRITERIA RELATE TO DEAL PERFORMANCE

By

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Author's declaration for electronic submission of a thesis

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

This study investigates variability in the importance of investment decision criteria used by venture capitalists in assessing new technology-based ventures and relates the criteria to the subsequent performance of the investment in the new venture.

Variability was measured using interval and ordinal scale approaches for both criteria ratings and rankings. The analyses found that the criteria used by venture capitalists form a general hierarchy that is consistently ranked across ventures. However, there are some criteria that do not form part of this hierarchy and whose importance varies depending on the specific venture being evaluated. The criteria that are consistently considered important by venture capitalists can be thought of as necessary conditions for investment.

The hypotheses concerning the relationship between the criteria and subsequent deal performance are that:

- deal performance can be assessed by venture capitalists earlier for Internet-related ventures than for other-technology based ventures (H_1);
- Internet-related ventures have more extreme levels of deal performance (H_2);
- a small number of criteria will distinguish between successful and unsuccessful deal performance (H_3);
- criteria that do distinguish have above average variability (H_4); and
- criteria related to first-mover advantage distinguish between successful and unsuccessful deals (H_5).

The study was conducted in two parts. The original study (n=100) conducted by Bachher (2000) gathered information about the importance of the investment criteria using a web-based survey. The follow-up study (n=40) gathered information about the success of the investments by surveying the original participants and gathering information from the Internet.

Limitations of the study include a nonrandom sample, a small sample size for the follow-up survey and the very small number (n=5) of unsuccessful investments identified.

Evidence for hypotheses H_1 and H_2 was in the predicted direction but failed to achieve statistical significance. The evidence is supportive of H_3. Evidence for H_4 and H_5 was not found.

Additional analysis of the results suggests that venture capitalists whose investments were ultimately unsuccessful placed less importance on technology-related criteria than did venture capitalists investing in the other ventures. This finding implies that venture capitalists need to perform detailed assessments of the technology of new ventures.

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1 Introduction

During the period from 1996 to 2000, the venture capital industry underwent significant change. Two key elements of this change were the dramatic growth in overall investment levels and the rise of Internet-related investments.

Between the first quarter of 1996 and the second quarter of 2000 venture capital investment in the United States rose tenfold from $1.692 billion to $19.575 billion (PricewaterhouseCoopers, 2000). The rise in investment in Internet-related businesses is even more dramatic. Internet-related businesses began in the early 1990s with the introduction of the World Wide Web (Cailliau, 1995). By the second quarter of 2000, venture capital investments in Internet-related companies totaled $11.667 billion (PricewaterhouseCoopers, 2000). This represents 60% of total venture capital investments.

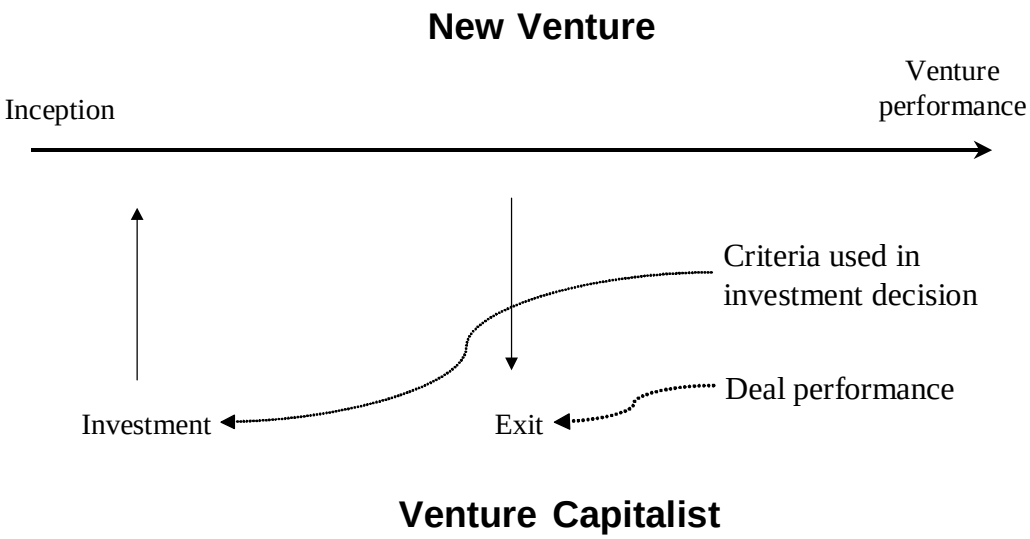
A significant amount of research has focussed on the investment decision-making process of venture capitalists (see, for example, Mason & Harrison 1999 and section 2.1, Criteria used in the investment decision). “Yet research on the efficacy of specific venture success criterion indicates a mixed set of results with few consistent findings” (Gartner, Starr & Bhat, 1998, p. 218).

This study investigates variability in the importance of investment decision criteria used by venture capitalists. It also relates the investment decision criteria to the subsequent performance of the investment in the new venture.

1.1 The venture capital investment environment

Figure 1 illustrates certain features of the venture capital investment environment that are important to this study.

Figure 1 **Venture capital investment environment**



The new venture is "an enterprise of a business nature in which there is considerable risk of loss as well as chance of gain" (*Oxford English Dictionary*, 1989, Vol. XIX, p. 520). This study focuses on technology-based new ventures. Technology-based new ventures are companies intending to commercialize a technology-based product or service for the first time and thereby expecting to derive a significant source of competitive advantage from the technology (Bachher & Guild, 1996). Examples include software, communications and Internet companies.

From its inception, the new venture progresses through its life cycle. The new venture's performance will vary throughout this life cycle depending on such factors as market conditions and competitive forces.

Often new ventures require investments from outside sources in order to finance their operations. Venture capitalists are one source of financing for new ventures. Venture capitalists invest in new ventures in various stages of the new venture's business life cycle. This study focuses on early stage financing including seed, start-up, and first-stage financing. Seed-stage financing is capital required to prove a concept and is used for developing a

prototype. Start-up financing is capital provided for product development and test marketing. First-stage financing is capital required when the company has started to sell its product or service, but requires additional funds to undertake full commercial production and sales.

In making the decision to invest, the venture capitalist may use various criteria to assess the new venture.

Ultimately, the venture capitalist exits the investment by disposing of their investment in the new venture. Exit may occur in a number of ways including:

- buyback of the investment by the new venture;
- sale of the investment to others (e.g., in an acquisition of the new venture by another company); or
- sale of the investment in the public markets after the new venture has made an initial public offering of its shares.

The time from initial investment to exit may vary considerably from investment to investment. For example, Robinson (1987) found the term of investment typically varied from one to twelve years.

Deal performance is the measure of the financial return to the venture capitalist on their investment from the date of investment to the date of exit.

1.2 Research questions

This study involves two primary areas of investigation. The first area of investigation considers the question of whether venture capitalists use a consistent set of criteria in their investment decision-making or whether the importance placed on individual criteria varies from investment to investment with little consistency between venture capitalists or between investments. This question is explored by examining the variability in the importance attributed to the investment decision criteria by different venture capitalists.

The second area of investigation considers the efficacy of specific investment decision criteria in distinguishing between successful and unsuccessful investments. This question is explored by relating the investment decision criteria to deal performance. It has been hypothesized that ventures that enter a market early tend to perform better than later entrants. Therefore, specific attention is directed to the efficacy of criteria related to first-mover advantage.

2 Literature Review

This chapter describes academic literature related to:

- criteria used in the investment decision;
- deal performance;
- relating investment criteria to deal performance; and
- first-mover advantage.

2.1 Criteria used in the investment decision

A significant amount of research has focussed on the investment decision-making process of venture capitalists. Table 1 summarizes a selection of this literature and is organized on the basis of the methods used to examine the criteria used in the investment decision.

The differing approaches to understanding the criteria used by venture capitalists in making venture capital decisions can be categorized on the basis of certain characteristics. Some research considers the criteria used by the venture capitalist in making all of their investment decisions (general). That is, this research assumes that venture capitalists use the same criteria and place the same level of importance on each of the criteria regardless of the specific investment they are evaluating. Other research considers the criteria used by the venture capitalist in making a specific investment decision (specific).

The literature can also be distinguished between research on the criteria that venture capitalists report they use when evaluating investments (espoused) and research into venture capitalists' actual decision-making behavior (in use). Research by "social judgment theorists suggest[s] that 'espoused' decision-making processes may be a less than accurate reflection of 'in use' decision-making processes" (Shepherd, 1999, p. 76).

Table 1 Methods used to examine the criteria used in the investment decision

Studies	*General vs. situation specific criteria*	*Espoused vs. in use decision-making behavior*	*Method of identification*	*Research technique used*
MacMillan et al. (1985)	General	Espoused	Personally recognized	Questionnaire
Tyebjee & Bruno (1984) study 2; MacMillan et al. (1987); Bachher (2000)	Specific	Espoused	Personally recognized	Questionnaire
Hall & Hofer (1993)	Specific	Espoused	Personally recalled	Interviews, verbal protocol analysis
Muzyka et al. (1996); Zacharakis & Meyer (1998); Shepherd (1999)	Specific	In use	Inference	Experiments, conjoint analysis

The methods used to study investment criteria include prompting venture capitalists for the criteria they use with lists of criteria (personally recognized), extracting criteria from venture capitalists' descriptions of how they make investment decisions (personally recalled), and inferring the criteria used from investment decisions made (inference).

The specific techniques used to gather information include questionnaires, interviews analyzed using verbal protocol analysis, and conjoint analysis of experimental situations using hypothetical investment opportunities.

Zopounidis (1994) analyzed various studies of evaluation criteria and reached two overall conclusions: "the first is that the criterion of the management team is considered predominant in all the studies concerning decisions in venture investment; and the second is the great

diversity of evaluation criteria and their relative importance (ranking of criteria) from one study to the other" (p. 63).

As illustrated by the papers cited in Table 1, the trend in research into investment criteria used by venture capitalists in recent years has been towards "in use" decision policies and away from "espoused" decision policies (i.e., the trend is towards the bottom of Table 1).

The study described in this thesis is based on data relating to investment criteria gathered by Bachher (2000) and is positioned towards the middle of the continuum illustrated in Table 1. This positioning has the drawback of basing the study on "espoused" rather than "in use" criteria. However, this positioning has several benefits. The research into "in use" criteria uses experiments involving fictional scenarios in order to derive the "in use" criteria. These fictional scenarios do not provide a strong basis for measuring deal performance and, consequently, are not useful for relating investment criteria to deal performance. In addition, the use of questionnaires by Bachher results in a relatively large sample size compared to the samples sizes that are practicable using interview techniques. External events occurring between the time of investment and exit can affect deal performance and mask the relationship, if any, between investment criteria and deal performance. Consequently, larger sample sizes are important to improve the power of the tests of the relationship.

This is not to suggest that research into "in use" criteria should be ignored. There are a number of findings from the research into "in use" criteria that are important to this study. Shepherd (1999) found that "venture capitalists have a tendency to overstate the least important criteria and understate the most important criteria" (p. 83) though the rank ordering of the "espoused" and "in use" criteria were similar. Zacharakis & Meyer (1998) found a "strong rank order correleation between actual and stated decision policies" (p. 69) though this correlation decreased as the amount of information provided to the venture capitalist increased. These findings suggest that care be taken when considering the stated importance of criteria by venture capitalists. In particular, absolute measures of importance may be

overstated for less important criteria and understated for more important criteria while the rank ordering of criteria may be a more stable measure of importance.

2.2 Deal performance

In this study, deal performance is defined as the financial return to the venture capitalist from their investment in the new venture. This definition is consistent with those used by the venture capital industry. For example, the performance measurement principles of the European Venture Capital Association state that:

> The most common measure of performance within the venture capital sector is the internal rate of return or IRR. Industry-wide venture capital performance studies in the US use IRR. Not only does this measure take the time value of money into account, as well as the ability to measure returns on groups of investments, but it also expresses the return as a simple percentage. Thus, the Valuation Committee has selected the internal rate of return as being the most appropriate performance benchmark. (European Venture Capital Association, n.d., p. 47)

The definition of deal performance excludes non-financial returns that might be realized from an investment in a venture. For example, association with a particularly successful venture might result in a venture capitalist developing a strong reputation that gives it greater access to capital and to potential new investments.

Deal performance is well-defined and easy to measure. This contrasts with the concept of new venture performance. New venture performance considers the performance of the new venture as a whole rather than just the return on an investment in the new venture. New venture performance is a much more complicated concept than deal performance. March & Sutton (1997) describe the difficulties associated with using organization performance as a dependent variable. Similarly, Cooper (1993) considers the challenges in measuring and predicting performance for new firms. Focussing on deal performance rather than new

venture performance avoids many of the problems associated with using venture performance as a dependent variable.

2.3 Relating investment criteria to deal performance

While there has been a significant amount of research on the criteria used by venture capitalists in making investment decisions, there has been relatively little research on whether these criteria are predictive of successful deal performance.

MacMillan, Zemann & Subbanarasimha (1987) explored the relationship between criteria and venture performance. Their study predates the emergence of Internet-related businesses which have come to dominate the venture capital investment field (see chapter 1). Their study involved retrospective reporting by venture capitalists and the results led the researchers to conclude that the ratings for successful ventures were biased upwards and the ratings for unsuccessful ventures were biased downwards. There are a number of key findings from their study that inform the current study. First, each class of successful ventures has a look-alike class of unsuccessful ventures that differ in only one characteristic. This suggests that distinguishing between successful and unsuccessful ventures is difficult and supports the use of techniques involving larger sample sizes in order to improve the ability to identify any differences that do exist (see section 2.1, Criteria used in the investment decision).

Second, their study also found that of the 25 criteria examined only two were predictors of venture success. The two predictors of success were:

- the extent to which the venture is initially insulated from competition; and
- the degree to which there is demonstrated market acceptance of the product.

This finding suggests that few criteria will distinguish between successful and unsuccessful investments (see section 4.2, Decision process related hypotheses).

2.4 First-mover advantage

It has been hypothesized that ventures that enter a market early tend to perform better than later entrants. Porter (1985) suggests that first-mover advantages are associated with:

- developing a reputation as the leader in the industry;
- preempting an attractive product or market position;
- creating switching costs for potential users of latecomers' products;
- accessing unique distribution channels;
- gaining learning curve benefits;
- gaining favorable access to facilities or other resources;
- defining industry standards;
- establishing barriers to imitation; and
- reaping high early profits.

However, Porter also describes the following potential first-mover disadvantages:

- incurring pioneering costs that followers may avoid;
- experiencing demand uncertainty;
- coping with changing buyer needs;
- making irreversible capital investments while the industry is experiencing rapid technological change;
- experiencing technological discontinuities; and
- coping with unexpected low-cost imitation.

Many studies have tested for the existence of first-mover advantage with mixed results (VanderWerf & Mahon, 1997). Lieberman & Montgomery (1998) reviewed the results of a number of studies and reached the following conclusions:

1. Entry order effects exist, especially with respect to market share, but they are better specified as interactions than as direct effects.
2. The magnitude of first-mover advantages varies greatly across product categories and geographic markets.

3. First-mover advantages dissipate over time but are enhanced by longer lead times before competitive entry.
4. Entry order effects, although significant and robust, are weaker than 'marketing mix' effects related to price and advertising. Later entrants can utilize this result to catch up to and surpass pioneers. (p. 1116)

Bantel (1998) found evidence that technology-based ventures in the earlier stages of development perform better by pursuing a first-to-market strategy as opposed to an efficiency strategy. Also, as described in section 2.3, one of only two criteria found by MacMillan, Zemann & Subbanarasimha (1987) to predict venture success was the extent to which the venture is initially insulated from competition (i.e., it is a first-mover).

These results suggest that investment performance may be affected by a first-mover advantage effect (see section 4.3, Subject matter related hypothesis – first-mover advantage).

2.5 Conclusion

The results of previous studies suggest a number of considerations that impact on the current research including that:

- absolute measures of importance may be overstated for less important criteria and understated for more important criteria while the rank ordering of criteria may be a more stable measure of importance;
- considering deal performance rather than new venture performance avoids many of the problems associated with using venture performance as a dependent variable;
- few criteria are likely to distinguish between successful and unsuccessful investments; and
- investment performance may be affected by a first-mover advantage effect.

3 Analysis of Investment Decision Criteria

This chapter extends the analysis of data in Bachher (2000) related to the investment decision criteria used by venture capitalists. In Stage # 4 of his study, Bachher gathered data on the importance of 114 criteria from 100 venture capitalists (see chapter 5 for further details on Bachher's study). Venture capitalists rated the importance of each criterion on a 7-point scale where 1 represented "Not Important" and 7 represented "Extremely Important." Bachher's analysis is extended in this chapter by considering the rankings of criteria in addition to their ratings and by considering the variability in ratings and rankings.

3.1 Highest rated criteria

In his analysis, Bachher identified important criteria on the basis of their mean ratings. Table 2 shows the ten highest rated of the 114 criteria.

Table 2 **Criteria rated most important**

Criteria	*Mean rating*
1. The management team's level of commitment to the success of the new venture	6.53
2. The management team's sense of urgency regarding the new venture	6.31
3. Venture offering is driven by market demand	6.23
4. Ability to create a superior product or service compared to that of the competition	6.19
5. Ability to follow through on a strategy	6.18
6. Ability to create value for future shareholders	6.16
7. Ability to place the new venture in a position of market leadership	6.11
8. Ability to focus on customers needs	6.11
9. Ability to recruit people for the new venture's team	6.00
10. The management team's leadership experience	6.00

Note. The data in this table is derived from results reported in Bachher (2000).

Most of these criteria relate to the abilities and characteristics of the management team. These results are consistent with earlier studies that found criteria related to the management team rated the most important (Zopounidis, 1994; Muzyka, Birley & Leleux, 1996). Baccher (2000) provides a more detailed analysis of the mean ratings of the criteria.

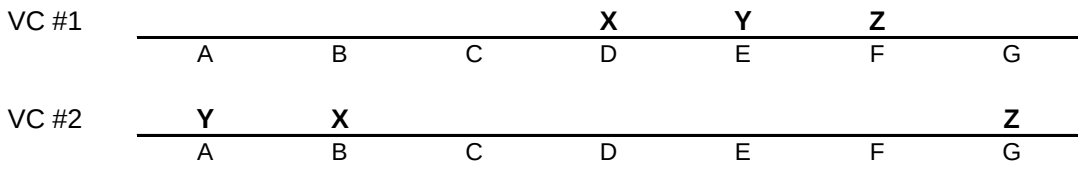
3.2 Rankings – an alternative method of analysis

An alternative analysis of the survey data involves examining the relative rankings of criteria by the venture capitalist rather than the values of the individual ratings. The survey directly gathered information about the importance attached to individual criteria. Since each criterion was evaluated using the same 7-point scale, the survey also contains information about the relative importance of an individual criterion compared to the other criteria. Deriving rankings for the criteria makes explicit the information about relative importance contained in the ratings.

The difference between ratings and rankings relates to the attribute that is being measured (i.e., they represent different perspectives on the importance assigned to the criteria). Ratings measure the *amount* of importance attached to a criterion. Rankings measure the *relative* importance of a criterion compared to the other criteria. Each approach is relevant but to slightly different questions.

The following example illustrates the derivation of rankings from the survey information. Figure 2 shows the results of a fictitious survey of two venture capitalists (VC #1 and VC #2) who have rated three criteria (X, Y and Z) on a 7-point scale. The ratings of the three criteria by each venture capitalist are overlaid on a single line in Figure 2 in order to simplify the Figure and to illustrate the information about relative importance contained in the ratings. The letters A to G are used in the scale rather than the numbers 1 to 7 to illustrate that there is no absolute meaning to the labels attached to the scale.

Figure 2 **Illustration of ratings vs. rankings**



Ratings can be determined directly in this example by assigning the numbers one to seven to the letters A to G respectively in the scale. Under this interpretation, VC #1 assigns a rating of importance of 4 to criterion X while VC #2 assigns a rating of 2 to criterion X.

Rankings can be derived from the same example by assigning numbers to the criteria based on their relative importance compared to other criteria. Thus, for VC #1, criteria Z is assigned a ranking of 1, criteria Y is assigned a ranking of 2 and criteria X is assigned a ranking of 3.

These two approaches lead to somewhat different interpretations. For example, VC #1 gives criteria X a greater amount of importance than VC #2 (rating of 4 vs. 2) but VC #2 considers criteria X more important than criteria Y (ranking of 2 vs. 3) while VC #1 considers criteria Y more important than criteria X.

3.3 Highest ranked criteria

Rankings for each criterion in Bachher's survey were calculated using the method described in section 3.2. Since each venture capitalist evaluated 114 criteria and there were only 7 points on the evaluation scale, a large number of ties occurred. Two methods of dealing with ties were considered. The first method is to assign the minimum ranking to all tied values. The second method is to assign the median ranking to all tied values in the group. For example, if five criteria were given ratings of 7, then under the first method all receive a ranking of 1 while under the second method all receive a ranking of 3. The analyses in this

chapter were performed using both methods and the results were similar. The results presented are calculated using the second method. This method was chosen as it produces more conservative rankings particularly when large numbers of ties occur.

Table 3 shows the ten criteria ranked most important based on their mean rankings.

Table 3 **Criteria ranked most important**

Criteria	*Mean ranking*	*Position in Table 2 (ratings)*
1. The management team's level of commitment to the success of the new venture	25.92	1
2. The management team's sense of urgency regarding the new venture	31.65	2
3. Ability to create a superior product or service compared to that of the competition	33.89	4
4. Venture offering is driven by market demand	34.20	3
5. Ability to create value for future shareholders	34.91	6
6. Ability to follow through on a strategy	36.00	5
7. Ability to focus on customers needs	36.30	8
8. Ability to place the new venture in a position of market leadership	36.53	7
9. Ability to recruit people for the new venture's team	40.44	9
10. Marketing skills	40.89	–

Comparing Tables 2 and 3 shows that ratings and rankings produce similar results in terms of identifying the most important criteria although the order of some criteria is shifted slightly and the last items in the tables differ.

3.4 Comparative strengths and weaknesses of ratings and rankings

Ratings are a more direct measure of importance than rankings. They are what the participants were asked to provide. Rankings are an indirect measure of importance inferred from the ratings.

Ratings assume that respondents are "identically calibrated instruments" (Kampen & Swyngedouw, 2000). That is, an importance of 4 means the same amount of importance to each respondent. Muzyka, Birley & Leleux (1996) raise this concern in connection with studies of venture capital investment decision stating:

> However, almost all have the inherent limitations of scaling in that there are inevitable differences in discrimination between what is considered important. So, for example, for some respondents, a 3 on a 5-point scale indicates a lower degree of importance, whereas for others, only a 1 truly indicates something of lesser importance. (p. 275)

There is evidence of this effect in Bachher's survey. Of the 100 participants, 58 used the entire 7-point scale. The remaining 42 participants used less than the full scale with 24 selecting only ratings greater than or equal to 3.

Rankings are less sensitive to concerns about scaling since they are based on relative rather than absolute scores. Rankings are also less sensitive to the effect identified by Shepherd (1999) that "venture capitalists have a tendency to overstate the least important criteria and understate the most important criteria" (p. 83).

However, in some ways, rankings are a weaker form of looking at the responses. Rankings can say a criterion is less important than another criterion but cannot say how much importance the criterion has (e.g., one criterion may be relatively more important than another but both may be unimportant to the overall decision).

Thus there are advantages and disadvantages to the use of ratings and rankings. Both ratings and rankings are considered in the analyses in this study.

3.5 Variability in ratings and rankings

C.G. Jung (1957/1970) commenting on individual personalities states:

> The statistical method shows the facts in the light of the ideal average but does not give us a picture of their empirical reality. While reflecting an indisputable aspect of reality, it can falsify the actual truth in a most misleading way. … The distinctive thing about real facts, however, is their individuality. Not to put too fine a point on it, one could say that the real picture consists of nothing but exceptions to the rule, and that, in consequence, absolute reality has predominately the character of irregularity. (p. 250)

The preceding sections of this chapter examine the average ratings and rankings of criteria. Averages provide us with valuable information but, as indicated in the quotation by Jung, they also hide information about variability within the results. Considering the variability in assessments of criteria along with the average ratings and rankings may lead to valuable insights into the decision-making process.

There are two opposing views of the investment decision making process. One is that the decision process is formulaic with a consistent set of criteria used by all venture capitalists. The other view is that the decision process is an art that cannot be captured in a generalized process.

Muzyka, Birley & Leleux (1996) illustrate these two views in commenting on earlier studies. They state that the earlier studies "have assumed a single hierarchy of decision criteria in all cases and across all venture capitalists. We do not accept that this is valid" (p. 274).

Similarly, one of the venture capitalists who participated in the Bachher survey made the following comment related to assessing the importance of the criteria:

> These answers will vary wildly with the portfolio company, its products and markets, the development stage, people and financial needs and risks. The answers are by no means representative of a generalized process. (Bachher, 2000, p. 106)

These two views lead to two different interpretations of variability in the ratings and rankings. MacMillan, Siegel & Subbanarisimha (1985) consider the variability in ratings, as measured by the standard deviation of the ratings, as a measure of consensus. This is consistent with their objective of identifying the most common criteria used by venture capitalists.

An alternative interpretation of variability in the assessments of criteria is that the variability reflects a tailoring of the importance placed on individual criteria to the specific venture and the environment it faces. If tailoring is occurring, it will produce variability in the importance placed on individual criteria.

The question that is investigated in the following sections of this chapter is whether there is a single hierarchy of criteria that apply in all cases and across all venture capitalists. This question is investigated by examining the variability in the ratings and rankings assigned to the investment decision criteria.

3.6 Measuring variability – metric and ordinal approaches

Both ratings and rankings are ordinal scales of measurement. This raises the issue of how to measure variability. One approach is to treat the variables as interval scaled variables. This approach is often used though there is considerable controversy over whether such as approach is appropriate (Kampen & Swyngedouw, 2000). With this approach metric statistics such as standard deviations can be used to measure variability. An alternative

approach is to use measures of variation designed specifically for use with ordinal data. Blair & Lacy (2000) describe a class of such measures of ordinal variation. Both approaches are used in the analyses that follow.

3.7 Variability in the ratings

Figure 3 is a chart of the means and standard deviations of the ratings for each of the 114 criteria.

Figure 3 Chart of means and standard deviations of criteria ratings

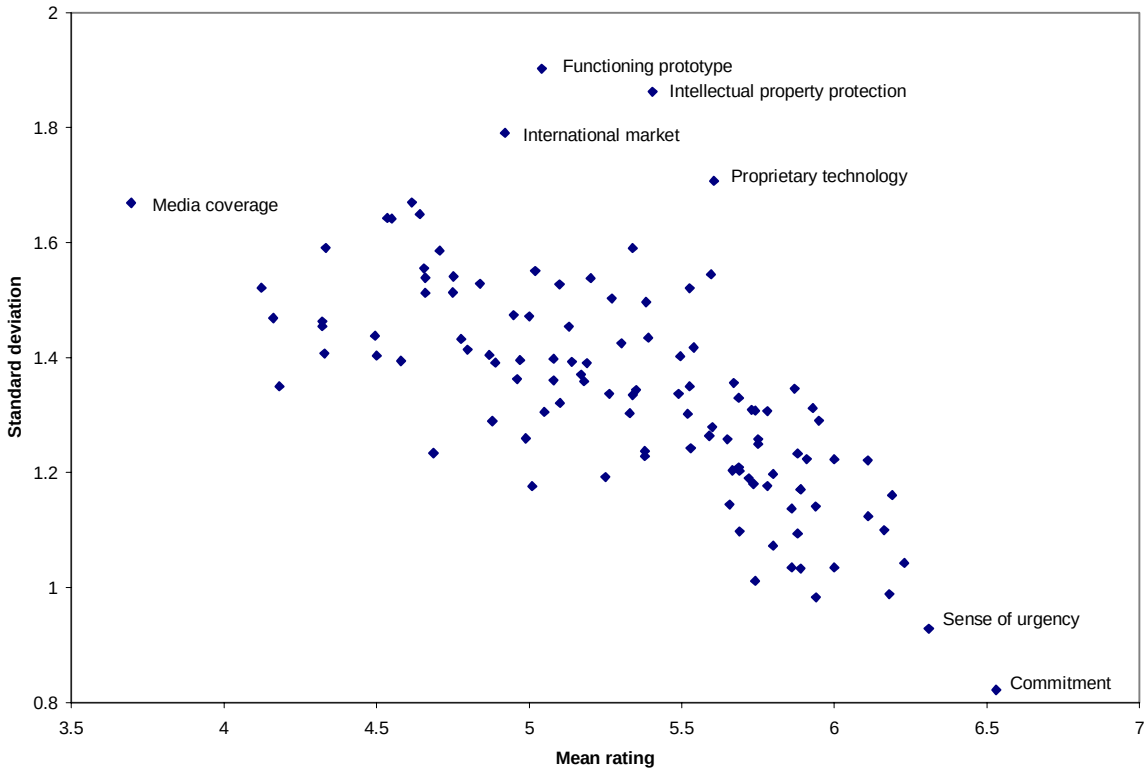
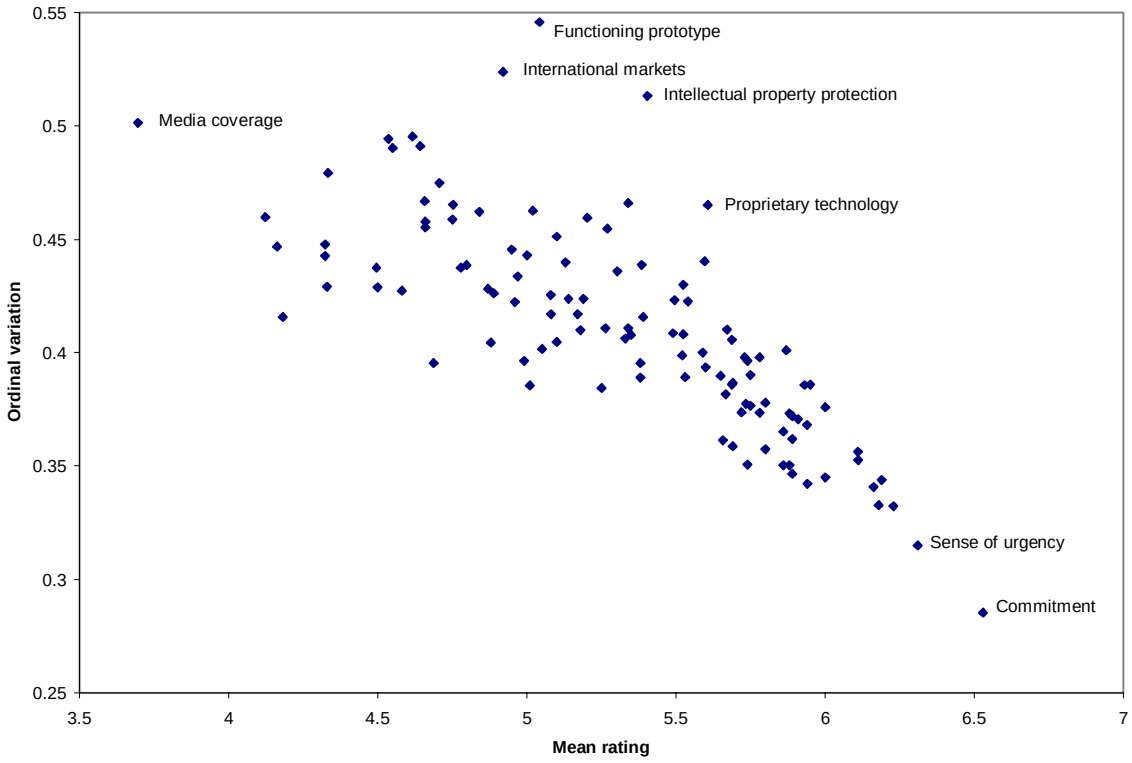


Figure 4 is a chart of the means and ordinal variations of the ratings for each of the 114 criteria. Ordinal variation is measured using Blair & Lacy's 1-*l* measure (see Appendix A).

Figure 4 Chart of means and ordinal variations of criteria ratings



Figures 3 and 4 show that the metric and ordinal approaches to measuring variability produce similar results for the survey data.

3.8 Variability in the rankings

Figure 5 is a chart of the means and standard deviations of the rankings for each of the 114 criteria.

Figure 5 Chart of means and standard deviations of criteria rankings

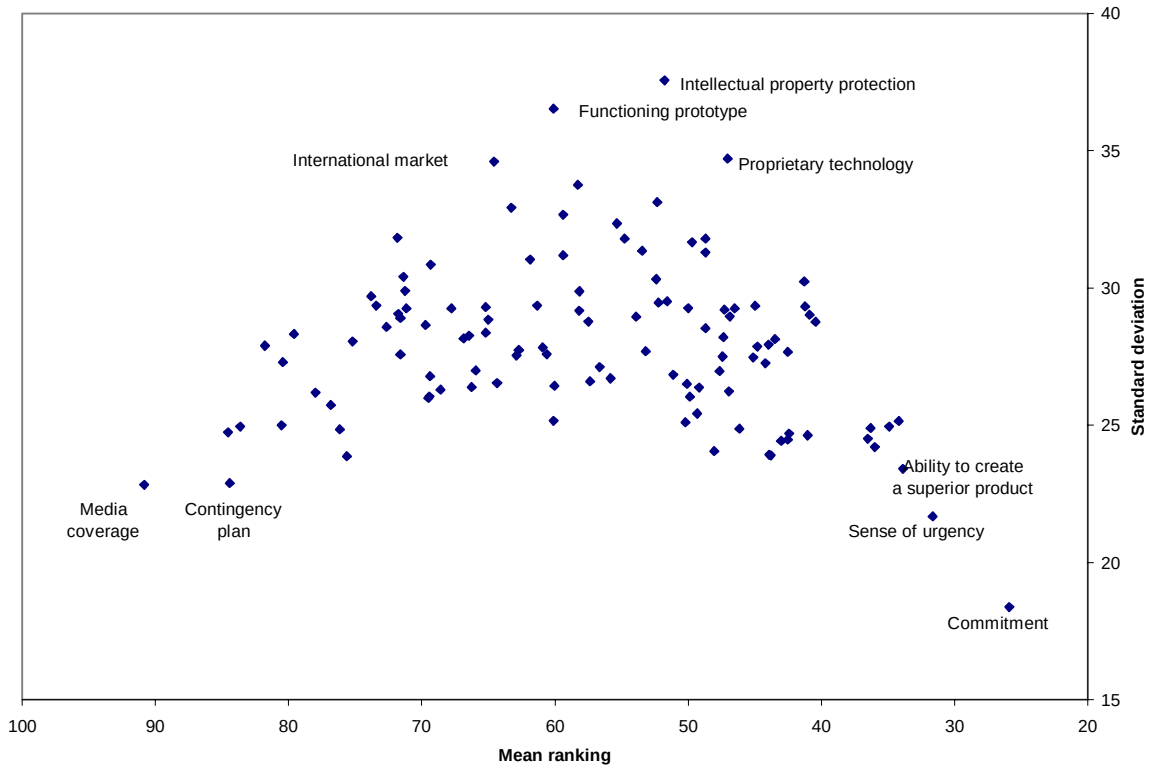
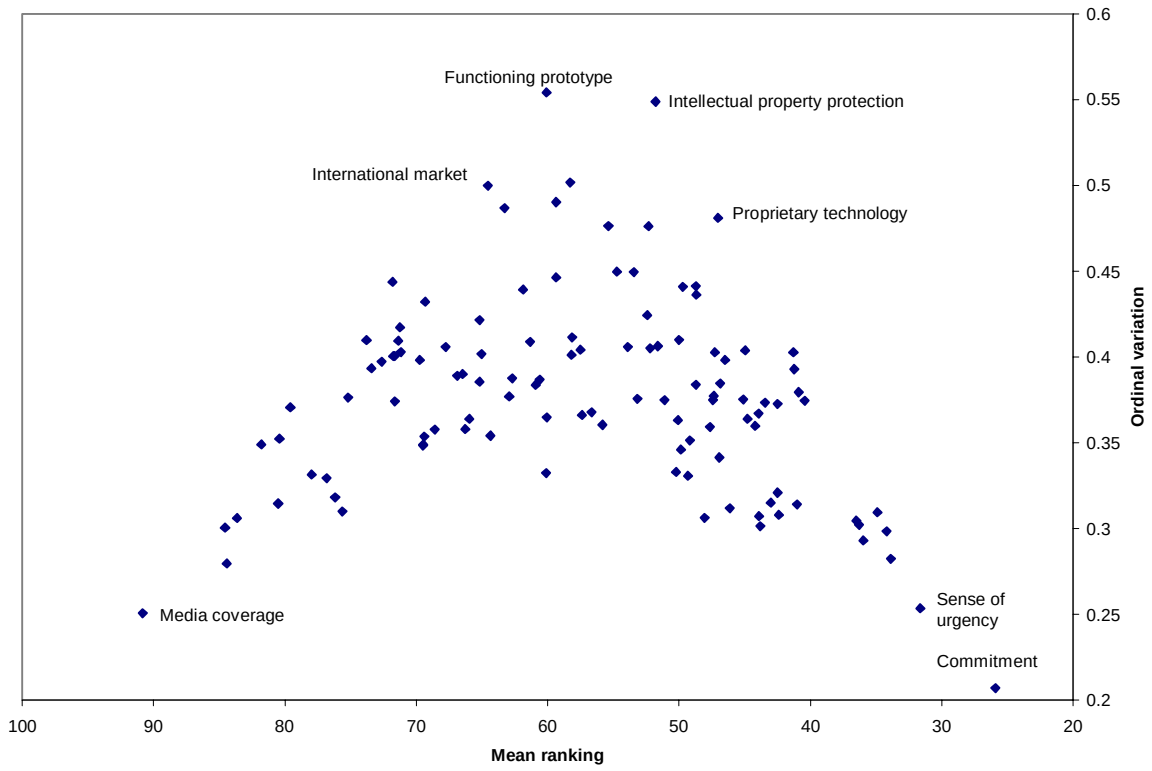


Figure 6 is a chart of the means and ordinal variations of the rankings for each of the 114 criteria. Ordinal variation is again measured using Blair & Lacy's 1-*l* measure (see Appendix A). In calculating ordinal variation, the rankings were grouped into ten categories. The first category consisted of rankings from 1 to 11, the second category consisted of rankings from 12 to 23, etc.

Figure 6 Chart of means and ordinal variations of criteria rankings



Again, the metric and ordinal approaches to measuring variability produce similar results for the survey data.

3.9 Comparison of variability in ratings and rankings

While there are similarities in the charts of ratings and rankings, there are also differences. The most significant difference relates to the area on the left-hand side of the graphs where the criteria show high variability in ratings but low variability in rankings. The differences are illustrated by examining the criterion related to media coverage. Table 4 shows the number of respondents who rated this criterion at each of the seven levels on the ratings scale.

Table 4 **Ratings for media coverage criterion**

Rating	*Number of respondents*
7	1
6	14
5	18
4	21
3	11
2	15
1	12

Table 5 shows the number of respondents who ranked this criterion in each of the ten groups of rankings.

These Tables show that there is significant variability in the amount of importance placed on the criterion (i.e., the rating) but there is consistency in the relative unimportance of the criterion (i.e., the ranking). This further supports the finding in section 3.4, Comparative strengths and weaknesses of ratings and rankings, that different venture capitalists are using different parts of the 7-point scale to indicate that a criteria is unimportant.

Table 5 **Rankings for media coverage criterion**

Rankings	*Number of respondents*
1-11	0
12-23	1
24-34	1
35-46	3
47-57	4
58-68	7
69-80	7
81-91	13
92-103	16
104-114	40

3.10 Interpretation

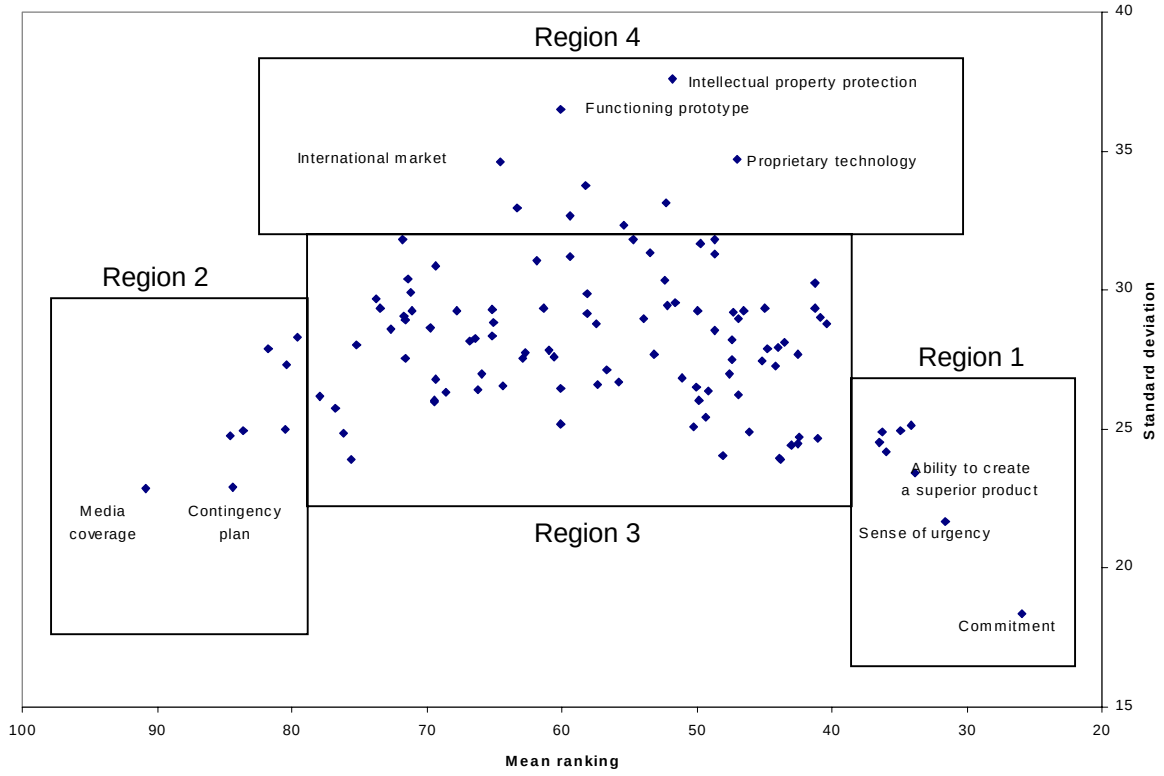
There are a number of regions of interest in the charts of variability. Figure 7 shows these regions on a graph of the means and standard deviations of the rankings for each of the 114 criteria.

Region 1 contains those criteria that are ranked as highly important and are consistently ranked highly. Examples of these criteria include:

- the management team's level of commitment to the success of the new venture;
- the management team's sense of urgency regarding the new venture;
- ability to create a superior product or service compared to that of the competition;
- venture offering is driven by market demand; and
- ability to create value for future shareholders.

As these criteria are consistently rated as very important, they can be thought of as necessary conditions for investment. A new venture that lacks these characteristics is unlikely to receive funding.

Figure 7 Regions of interest in chart of means and standard deviations of rankings



Region 2 contains those criteria that are ranked as unimportant and are consistently ranked lowly. Examples of these criteria include:

- received positive media coverage;
- strategy to contend with changes in macro-economic factors affecting the new venture;
- contingency plan developed by the new venture;
- the management team's recognition of chances of failure; and
- the management team's educational background.

As these criteria are consistently rated as unimportant, they generally are not a significant factor in the decision to invest though, if a new venture was significantly lacking in one of these characteristics, it might lead to the venture capitalist rejecting the investment.

Criteria in the middle regions have moderate importance to venture capitalists. These criteria fall into two regions. Region 3 contains those criteria that are consistently ranked as moderately important. Examples of these criteria include:

- project management skills;
- ability to focus the new venture on building "core competencies" that may yield a competitive advantage;
- ability to anticipate problems early on in the new venture;
- strategy of the new venture to respond to possible attack from competitors; and
- level of market analysis in the business plan.

Region 4 contains those criteria that are inconsistently ranked. Examples of these criteria include:

- venture offering has or can protect its intellectual property;
- venture offering has been developed as a functioning prototype;
- venture offering is designed using proprietary core technology owned by the new venture;
- venture offering has the potential to be sold in international markets; and
- presence of detailed biographies of the management team.

The criteria in Region 4 are qualitatively different than those in Region 3. The high variability of criteria in Region 4 is a result of the criteria being ranked very highly in some instances and being considered unimportant in other cases. Thus Region 4 contains criteria that are as important as the highest ranking criteria in some individual cases though they are relatively unimportant in other cases.

3.11 Conclusions

The evidence from considering the variability in criteria suggests a number of conclusions particularly as they relate to the question of whether there is a hierarchy of criteria.

The area in Figure 7 that includes Regions 1, 2 and 3 contains those criteria with lesser variability. These criteria do reflect a hierarchy with some criteria being consistently ranked highly important and others consistently being ranked less important. While there is evidence of a hierarchy, the fact that some variability does exist suggests that it is not a rigid hierarchy where a specific criterion is always considered more important than another specific criteria. Rather is it a more general hierarchy with some variability between specific investments and venture capitalists.

Region 4 includes criteria with higher variability and these criteria do not form part of the hierarchy. These criteria are as important as the highest ranked criteria in some individual cases but are considered unimportant in other circumstances.

Thus, the analysis of the criteria suggests that the answer to the question of whether there is a single hierarchy of criteria that apply in all cases and across all venture capitalists is yes and no. Some of the criteria used by venture capitalists do form a general hierarchy that is consistently ranked across ventures. However, there are other criteria that do not form part of this hierarchy and whose importance varies depending on the specific venture being evaluated.

The second conclusion that is suggested by the analysis is that there are a number of criteria that are consistently considered very important by venture capitalists and these criteria can be thought of as necessary conditions for investment. New ventures that do not score well on these criteria are unlikely to receive funding from venture capitalists.

4 Hypotheses

This section sets out hypotheses related to the relationship between the criteria used in the investment decision and deal performance. The hypotheses relate to deal performance for Internet-related ventures, the importance placed on criteria in the decision process and the subject matter of the criteria, specifically first-mover advantage.

4.1 Deal performance for Internet-related ventures

Chapter 1 described the dramatic rise in investment in Internet-related businesses by venture capitalists. Internet-related ventures accounted for 60% of total venture capital investments in the second quarter of 2000 (PricewaterhouseCoopers, 2000). One possible explanation for the appeal of Internet-related ventures is the speed at which Internet-related ventures mature (see, for example, the quotation in section 4.3, Subject matter related hypothesis – first-mover advantage). This speed may allow venture capitalists to realize a return on their investments in Internet-related ventures more quickly than for investments in other technology-related ventures.

A second possible explanation for the appeal of Internet-related ventures to venture capitalists is the very large potential returns that may result. Internet-related ventures can access a worldwide market often with little financial capital invested in physical assets. Thus, when they succeed, Internet-related ventures may offer extremely large returns to their investors. Conversely, since they often have few physical assets, when these ventures fail, investors may recover little or none of their original investment.

This analysis leads to the following hypotheses:

H_1: Deal performance can be assessed by venture capitalists earlier for Internet-related ventures than for other-technology based ventures.

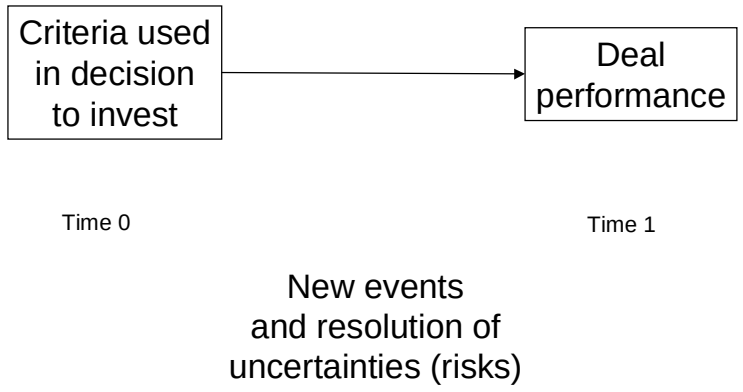
H_2: Investments in Internet-related ventures have more extreme levels of deal performance, both positive and negative, than investments in other technology-related ventures.

4.2 Decision process related hypotheses

The basic relationship of interest in this study is that between the venture capitalists' assessment of the importance of criteria at the time of investment and the subsequent deal performance.

The new venture is affected by new events and the resolution of uncertainties between the time of investment by the venture capitalist and the realization of that investment by the venture capitalist. These factors could have a significant effect on the deal performance that cannot be attributed to the factors assessed by the venture capitalist at the time of investment. These relationships are illustrated in the Figure 8.

Figure 8 **Conceptual model**



The criteria used in the decision to invest reflect conditions that can be assessed by the venture capitalist at the time of investment. The importance placed on the criteria is specific to the new venture being evaluated and the time the decision is made and may change between ventures and over time.

New events (e.g., the emergence of a competing technology, or a change in legislation affecting the venture) will affect deal performance and may obscure the relationship between the criteria used in the decision to invest and deal performance. Alternatively, these new events may amplify the differences between successful and unsuccessful ventures by reinforcing small differences between ventures (i.e., creating a positive feedback loop).

Deal performance may also be affected by the resolution of uncertainties that existed at the time of investment. The assessment of the new venture at the time of the investment can be thought of as assessing a distribution of risk/return possibilities for the new venture. Over time the distribution "collapses" to a specific return as the uncertainties are resolved. This may result in a venture with a favorable distribution at the time of investment turning out to be an unsuccessful investment. This may occur not because of an error in assessing the venture at the time of investment but rather because uncertainties that existed at that time happened to turn out unfavorably to the new venture.

These factors suggest that deal performance may be significantly affected by events subsequent to the date of investment. Still, it is expected that there will be some relationship between the criteria used in the decision to invest and deal performance. Therefore, it is expected that some criteria will distinguish between successful and unsuccessful deal performance. If there is a relationship between the criteria used to make the investment decision and deal performance, the findings of MacMillan, Zemann & Subbanarasimha (1987) suggest that few criteria will predict success. Consequently, the first hypothesis related to the decision making process is:

> H_3: A small number of criteria will distinguish between successful and unsuccessful deal performance.

The analysis in chapter 3 concludes that criteria that are consistently assessed as important can be considered necessary conditions for investment. These criteria will be considered important in the investment decision for all new ventures and, therefore, are unlikely to distinguish between successful and unsuccessful deals. The analysis in chapter 3

also found that some criteria are inconsistently assessed (i.e., the importance placed on the criteria varies from deal to deal). These criteria may distinguish between successful and unsuccessful deals. This analysis results in the following hypothesis:

> H_4: Criteria that do distinguish between successful and unsuccessful deals have above average variability.

4.3 Subject matter related hypothesis – first-mover advantage

The hypotheses discussed above do not consider the subject matter of specific criteria. Section 2.4, First-mover advantage, describes the advantages and disadvantages associated with being a first-mover. First-mover advantage is often considered an important attribute of new ventures, particularly those associated with the Internet as illustrated by the following comment:

> Four months: That's the narrow window of opportunity that a would-be Internet entrepreneur has to transform an idea into an actual product that's available on the Web, insists J. Neil Weintraut, a general partner at 21st Century Internet Venture Partner, in San Francisco. "Time to market is the only advantage of being a start-up," he explains. "Put simply, it's four months—or game over. If you have an idea that you want to ponder for half a year, you might as well forget about it. On the Internet, if you can, then you must. Because if you don't someone else will." (Mieszkowski, 2000, p. 148)

This leads to the following hypothesis:

> H_5: Criteria related to first-mover advantage distinguish between successful and unsuccessful deals.

5 Methods

The study was conducted in two parts. The original study conducted by Bachher (2000) gathered information about the importance of the criteria used in the investment decision. The follow-up study gathered information about deal performance.

5.1 Sample

The population of interest for this study is venture capitalists involved in early stage financing for technology-based new ventures. The unit of analysis is the individual venture capitalist.

Bachher developed a network of venture capitalist contacts and identified a target group of 200 venture capitalists for his survey. The criteria used in identifying this target group included venture capitalists that:

- were actively investing at the time of the survey;
- invest in early-stage, technology-based ventures;
- have two or more funds (a sign of success as a venture capitalist).

The development of this network is described further in Bachher (2000).

One hundred of these venture capitalists participated in the original survey. Thirty-two percent of the venture capitalists were from Canada, 26% from California, 16% from Massachusetts, 23% from other States, 2% from Asia and 1% from Europe. Fifty percent of the venture capitalists had one to five years of experience as a venture capitalist while the others had six or more years of experience.

Because of the methods used to develop the network including the fact that many of the individual participants were recommended by other participants, the original survey is not a

random sample. Consequently, the generalizability of the findings is an issue. While not a random sample, the sample was intended to include a significant proportion of the venture capital firms that provide early stage financing to technology-based new ventures. *The MoneyTree Survey* of venture capital activity for the second quarter of 2000 (MoneyTree, 2000) includes a listing of the 75 most active U.S. venture capital firms in that period. The firms listed include those involved in all types of venture capital financing and thus represent a larger population than the subject of this study (venture capitalists engaged in early stage financing of technology-based new ventures). Nonetheless, individual venture capitalists from 15 (20%) of these 75 firms participated in the survey.

The follow-up survey included only the 100 venture capitalists who participated in the original survey.

5.2 Measures

5.2.1 Investment decision-making criteria

Bachher developed the 114 investment decision-making criteria through:

- a review of the criteria used in previous studies;
- a case study; and
- interviews with venture capitalists.

The resulting criteria were reviewed by three Canadian venture capitalists for validation and their suggestions were incorporated into the design of the survey (Bachher, 2000).

5.2.2 Deal performance

The dependent variable for this study is deal performance. Ideally, deal performance is measured as the annualized rate of return on the investment in the new venture. However, this measure is not feasible for the following reasons:

- venture capitalists generally do not make information about the rates of return on specific investments publicly available;
- this measure is only determinable on disposition of the investment in the new venture. Disposition of an investment may not occur for five to ten years after the date of investment.

Consequently, alternative measures of deal performance need to be considered. Robinson (1998), Bantel (1998) and Brush & Chaganti (1998) suggest that multiple performance measures are appropriate when studying venture capital investments. Bantel (1998) and Brush & Chaganti (1998) also suggest that subjective measures may be appropriate. Further, Bantel (1998) suggests that "creativity in the assessment of performance is necessary in research of this nature" (p. 224).

Smart (1999) measured deal performance by asking the venture capitalist to rate deal performance on a 5-point scale as (5) mega-winner (4) winner (3) neutral (walking dead) (2) loser or (1) mega-loser. The current study uses this measure of deal performance. This measure has the advantage of dealing directly with deal performance but has the disadvantage of being subjective.

Deal performance can also be measured indirectly by looking at changes in the new venture since the date of investment. Events such as initial public offerings ("IPOs"), acquisitions, mergers and subsequent financings may be important signals of the performance of the new venture and, indirectly, of deal performance. These events involve a detailed assessment of the business by a potential investor (e.g., underwriter, acquirer or venture capitalist) at a date subsequent to the original investment and, therefore, may indicate the performance of the venture. The Canadian Venture Capital Association has collected statistics related to the performance of venture capital investments based on the mechanism used to exit the investment. Performance was measured by the ratio of the value realized on exiting the investment to the amount of the investment in the venture. For 1998, these statistics show that investments in ventures that went public had an average return of 3.77

times the investment in the venture and investments in ventures that were acquired had an average return of 2.37 times the investment (Macdonald, 1999). Similarly, a new venture may no longer be in operation (i.e., it may have failed since the date of investment). If the new venture has failed, it can be inferred that the deal was unsuccessful. Thus, information about changes in the new venture can be used to infer deal performance. This measure has the advantage of being based on objective evidence about events related to the new venture. It has the disadvantage of being an indirect measure of deal performance.

Thus two measures of deal performance are used in this study. One is a subjective measure obtained by questionnaire from the venture capitalists and the other is an indirect objective measure obtained from information about events related to the new venture since the date of investment.

5.3 Design

The study design involves two phases. The original survey gathered information about importance of various decision-making criteria. In responding to the survey, the venture capitalists were asked to keep in mind a specific investment they made in a new venture within the last 12 months.

The follow-on survey took place approximately one year after the original survey and gathered information about deal performance. Thus deal performance was assessed by the venture capitalists approximately 12 to 24 months after the date of the investment.

Conducting the survey in two phases helps ensure that the results are not biased by retrospection by the venture capitalists. MacMillan, Zemann, & Subbanarasimha (1987) measured both the criteria and performance at the same date and found evidence of significant retrospection in the results.

An important issue in the design of a follow-up survey is timing. Following up early has the benefits of capturing performance on a timely basis relative to the decision to invest. However, in some cases, it may be too early to accurately assess deal performance. In addition, their may be a "honeymoon period" where problems in the new venture are beginning to surface but the venture capitalist fails to recognize them having only recently made the decision that the venture was a good investment. Delaying the measurement of performance has the benefit of allowing more time to assess performance. However, delaying the measurement makes it more difficult to contact the venture capitalists, who may no longer be with the firms they were with at the time of the investment, and thus may reduce the sample size. In addition, the longer the period between the investment and the measurement of deal performance, the greater the likelihood that events and circumstances arising after the decision to invest will affect deal performance. This effect could mask the relationship between the decision-making criteria and deal performance (see section 4.2, Decision process related hypotheses).

The industry in which the new venture operates may also impact the optimal timing for measuring performance. Many of the new ventures in the survey are Internet ventures where success or failure may be determinable in a very short period of time. Other new ventures in the survey are life sciences companies where results may take much longer to materialize.

Taking these considerations into account it was decided that measuring performance 12 to 24 months after the date of the original investment was reasonable.

An application for ethics review of research involving human participants was submitted to the Office of Research Ethics at the University of Waterloo. Notification of full ethics clearance was received in July 2000.

5.4 Procedures

The original survey was conducted using a web-based instrument. The follow-on survey gathered information about the success of the investments by:

- surveying the original participants for their view on the success of the investment; and
- gathering publicly available information about the new venture using the Internet.

5.4.1 Original web-based survey procedures

Venture capitalists who had agreed to participate in the survey were directed to the Internet site and completed the questionnaire on-line. After reading the instructions, participants were requested to complete the survey keeping in mind a specific investment made within the last 12 months in a technology-based new venture in its early stages of financing.

The 114 criteria in the survey were grouped into the following six categories:

- characteristics of the new venture's management team;
- characteristics of the new venture's target market;
- characteristics of the new venture's offering (product or service);
- characteristics of the new venture's positioning within its competitive environment;
- characteristics of the new venture's capital payback projections;
- characteristics of the new venture's business plan.

Participants were asked initially to indicate the degree of importance they place on the six categories of criteria when deciding to make the investment in the new venture using a scale from "Consider it first" to "Consider it last." The individual categories of criteria were then presented to the participants in the order of importance indicated by the participant. That is, the individual criteria related to the category rated "Consider it first" were presented first through to the individual criteria related to the category rated "Consider it last" which were presented last.

For each criterion, the venture capitalist was next asked to assess the importance of the criterion on their decision to invest in the new venture and to assign a rating to the criterion on a scale from 1 to 7, where 1 represents “Not Important,” 7 represents “Extremely Important” and N/A represents “Not Applicable.”

At the conclusion of the survey, background information about the venture capitalist and the investment was gathered. This phase of the study was conducted between June 1999 and September 1999. Additional details on this phase of the study are contained in Bachher (2000).

5.4.2 Follow-on mail survey procedures

The follow-on survey was sent by mail in July 2000 to all of the participants in the original survey. Appendix B contains a copy of the survey instrument. The survey contained three questions and was designed to minimize the time required of the participants in order to maximize the response rate. The survey first reminded participants of the specific venture they selected in the original survey by including the short description of the new venture provided by the participant in the original survey.

Participants were then asked about specific changes that may have occurred in the venture since the time of investment. In addition to gathering information related to one of the measures of success, this question was expected to cause the participant to focus on the specific venture and how it has performed.

The second question asked the participants to assess the success of their investment in the venture using a 5-point scale where 1 represents “Dismal failure”, 3 represents “Break even” and 5 represents “Outstanding success.” Participants were also given the option to respond that it was “Too early to tell” about the success of the investment.

The third question asked for the annualized rate of return for the deal. It was anticipated that it was likely too early to gather this information but that it may be useful information in those cases where it was available.

In August 2000, second requests were sent to those who had not responded to the original request. Second requests were sent by e-mail and included a copy of the original request.

5.4.3 Internet information procedures

Information about the success of the investments was also gathered using public information about the new venture available on the Internet.

This procedure used the identity of the venture capitalist and the description of the new entity provided by the venture capitalist in the original survey to determine the identity of the new venture. The identity of the new venture was used to gather information about its success.

The first step in this procedure was to identify the venture capitalist's Internet site. This was done using an Internet search engine to search for the venture capital firm's name. Internet sites were found for most of the venture capital firms involved in the original survey.

Generally, venture capitalists' Internet sites contain a section describing their portfolio of investments. This information typically includes the names of the ventures in their portfolio, a short description of the ventures and links to the ventures' Internet sites. The description of the new venture provided by the venture capitalist in the original survey was compared to the short descriptions on the venture capitalist's Internet site in order to identify a match. In 70 cases, a definitive match was made. In eight cases, the description of the new venture provided by the venture capitalist in the original survey was too vague to make a positive match. In the remaining 22 cases, a match was not made either because the venture capitalist did not have an Internet site or because more than one investment in their portfolio had a

description that was similar to the one provided by the venture capitalist in the original survey.

Once the identity of the new venture was determined, information was gathered about events affecting the new venture since the date of the investment by the venture capitalist. This information was gathered by visiting the new venture's Internet site. The new venture's Internet site was located either by following a link from the venture capitalist's Internet site or by using an Internet search engine to search for the site. The new venture's Internet sites typically contained a section, often titled "About the company," that contained press releases issued by the new venture. These press releases include announcements of initial public offerings, acquisitions, mergers and additional financing arrangements. A review of the press releases was used to identify initial public offerings, acquisitions or additional financings that occurred after the date of investment by the venture capitalist. There may be some potential bias towards success with this step as it is based on information provided by the venture. This potential bias is reduced by comparing the information to information provided by the venture capitalists and to information available from other Internet sources (see following paragraph).

In addition to the above, a number of Internet sites provide information about venture capital investments. These sites include SiliconValley.com (http://wwdyn.mercurycenter.com/business/moneytree/index.cfm) and Internet VC Watch (http://www.internetvcwatch.com). These sites provide information about venture capital investments and therefore can help in identifying the new venture and in identifying subsequent investments in the new venture. Information from these sites was used to supplement the information gathered above.

Information from the Internet was gathered during the period April 2000 to August 2000.

5.4.4 Process to ensure confidentiality

The process described in the preceding section uses information about the identities of the venture capitalists and the descriptions of the new entities in ways not originally anticipated and not communicated to the survey participants at the time of the original survey. Accordingly, a process was developed to ensure that the confidentiality of the information provided by the venture capitalists is preserved.

The data elements from the original survey were separated into two databases to ensure that the criteria assessments made by the participants in the original survey could not be identified with specific ventures. The Identification database contains information about the identity of the venture capitalist and the description of the new venture. The Analysis database contains the assessments of the decision-making criteria.

Unique identification codes were assigned to each record in the Identification database (e.g., 1, 2, 3, etc.) and distinct analysis codes to each record in the Analysis database (e.g., A, B, C, etc.). A third party not otherwise associated with the research was the only person with access to the list matching identifiers in the two databases. However, this individual did not have access to either database.

Information about the identity of the venture capitalist and the new venture were replaced with the identification code whenever there was a move from the Identification database to the Analysis database (e.g., when the success of the venture was determined). The information was then given to the third party who replaced the identification code with the analysis code and returned the information to the researcher. The researcher entered the information about success into the Analysis database and analyzed the information without the ability to identify the specific venture capitalist or new venture to which the information related.

Table 6 shows the information available to the researcher at each step of the process (i.e., when identifying the ventures, when determining success and when analyzing the results).

Table 6 **Confidentiality process**

	Researcher 1	*Researcher 2*		
		Identify venture	*Determine success*	*Analyze*
Identification database:				
Identity of venture capitalist	x	x		
Description of new venture	x	x		
Identity of new venture		x	x[a]	
Analysis database:				
Assessments of decision-making criteria	x			x
Success of new venture			x	x

Note. Researcher 1 was the individual who conducted the original research. Researcher 1 did not have access to either the Identification or Analysis databases. Researcher 2 was the individual conducting the current research. "x" indicates the information required to perform the task (or in the case of Researcher 1, information already available to him).

[a] as described above, the identity of the new venture was removed from the information before it was entered into the Analysis database

6 Results

This chapter presents the results of the study. As described in section 5.1, Sample, the survey was not a random sample and thus does not meet the statistical requirement for a random selection from the population of interest. Nonetheless, statistical tests are used in a number of the analyses in this chapter not in order to reach a statistical conclusion but rather to help judge whether the differences are large enough to be considered important.

6.1 Summary of responses to the follow-up survey

Responses to the follow-up survey were received from 40 of the 100 participants in the original survey.

6.1.1 Venture capitalists' assessments of deal performance

Table 7 shows the venture capitalists' assessment of deal performance rated on a 5-point scale (Question 2 in the survey). The results are separated between Internet and other technology-based ventures based on the descriptions provided by the venture capitalists in the original survey.

The response rate was 37% for Internet ventures and 42% for other technology-based ventures. These results do not indicate any significant difference in the response rate resulting from the industry in which the new venture operates.

Hypothesis H_1 is that deal performance can be assessed by venture capitalists earlier for Internet-related ventures than for other-technology based ventures. Table 7 shows that only 13% of venture capitalists who invested in Internet ventures indicated that it was "too early to tell" about the performance of the investment while 28% of the venture capitalists who invested in other technology-based ventures selected this response. While this finding is

consistent with the hypothesis, the Fisher exact test for the 2x2 table (Internet vs. other technology-based, too early to tell vs. deal performance assessed) was not statistically significant (p = .44). Thus the evidence for hypothesis H_1 is in the predicted direction but is weak.

Table 7 **Assessment of deal performance**

Assessment of deal performance	*Internet ventures*	*Other technology-based ventures*	*Total*
1 - Dismal failure	2	1	3
2	0	2	2
3 - Break even	0	1	1
4	6	10	16
5 - Outstanding success	5	4	9
Too early to tell	2	7	9
Total responses	15	25	40
Non responses	26	34	60
Total	41	59	100

Hypothesis H_2 is that investments in Internet-related ventures have more extreme levels of deal performance, both positive and negative, than investments in other technology-related ventures. Table 7 shows that extreme levels of performance (i.e., ratings of 1 or 5) are dominated by Internet ventures while more moderate levels of performance (i.e., ratings of 2 to 4) are dominated by other technology-based ventures. When Internet investments are successful they are very successful and when they are unsuccessful they are very unsuccessful. While this finding is consistent with the hypothesis, the Fisher exact test for the 2x2 table (Internet vs. other technology-based, Extreme levels of performance vs. moderate levels of performance) was not statistically significant (p = .26). Thus the evidence for hypothesis H_2 is in the predicted direction but is weak.

The findings that investments in Internet ventures mature more quickly than other technology-based ventures and that investments in Internet ventures are more volatile than

investments in other technology-based ventures helps explain the attractiveness of Internet ventures to venture capitalists. Internet ventures offer the venture capitalist the potential of a large gain, though also the risk of a large loss, in a short period of time.

6.1.2 Subsequent events affecting the new ventures

Table 8 shows the subsequent events that occurred in the ventures subsequent to the date of the investment (Question 1 of the survey).

Table 8 Reported subsequent events affecting the new ventures

Reported subsequent events	*Internet ventures*	*Other technology-based ventures*	*Total*
Venture has ceased operations	1	1	2
Venture has been acquired	1	2	3
Venture has merged	0	1	1
Venture has received subsequent financing	10	19	29
Venture has gone public	3	3	6

Note. Participants were asked to indicate all events that applied. Consequently, the total events reported do not equal the number of responses received.

Subsequent financing is by far the most common event. Subsequent financing was reported in 73% of the responses. The finding that 3 of the 15 Internet ventures had gone public (20%) compared to 3 of the 25 other technology-based ventures (12%) is consistent with and provides some additional evidence for hypothesis H_1.

6.1.3 Annualized rates of return

The third question in the survey asked for the annualized rate of return for the deal. Table 9 summarizes the responses to this question.

Table 9 **Responses regarding annualized rates of return**

	Number of respondents
Annualized rate of return provided	10
Rate of return is not yet determinable	28
Unwilling to provide this information	2
Total responses	40

The finding that rates of return were provided in a relatively small proportion of cases (25%) is consistent with the expectation set out in section 5.2.2, Deal performance.

6.2 Analysis of the results of the follow-up survey

6.2.1 Consistency of measures of deal performance

Section 5.2.2, Deal performance, indicates that two measures of deal performance are considered in this study. One is a subjective measure obtained from the venture capitalists and the other is an indirect objective measure obtained from information about events occurring in the new venture since the date of investment.

As shown in Table 10, ten respondents provided information about annualized rates of return on their investment in the new venture. Table 10 relates the information about annualized rates of return to the subjective assessment of deal performance by the venture capitalist.

In all cases, the subjective assessments are consistent with the information provided about annualized rates of return. While the amount of data provided about annualized rates of return is limited, it does provide some support for the validity of using the subjective assessments as a measure of deal performance.

Table 10 **Comparison of subjective assessments of performance to annualized rates of return**

Subjective assessment of deal performance	*Annualized rates of return indicated*	*Number of respondents*
1 - Dismal failure	100% loss of investment	2
2	–	0
3 - Break even	0%	1
4	28 - 100%	3
5 - Outstanding success	100 - 2000%	4

As a test of the validity of using changes occurring in the venture since the time of investment as a measure of deal performance, changes identified by the venture capitalists are compared to the subjective assessments of deal performance. Table 11 contains this comparison.

This table shows that certain events, specifically ceasing operations and going public, are strong correlated with deal performance. However, these events occurred in only a relatively small number of ventures. The most commonly reported event was subsequent financing. Subsequent financing does not, however, correlate well with the subjective assessments of deal performance. Subsequent financing occurred in new ventures that failed as well as in those that succeeded and in those where it was too early to tell. Therefore, the evidence from this comparison indicates that subsequent financing events are not a valid measure of deal performance.

Table 11 **Comparison of subsequent events reported to subjective assessments of deal performance**

Subjective assessment	*Subsequent events reported*					*Total*
	Ceased operations	*Acquired*	*Merged*	*Subsequent financing*	*Gone public*	
1 - Dismal failure	2	0	0	1	0	3
2	0	1	0	1	0	2
3 - Break even	0	0	0	1	1	2
4	0	1	1	12	1	15
5 - Outstanding Success	0	1	0	5	3	9
Too early to tell	0	0	0	9	1	10
Total	2	3	1	29	6	

Note. Totals for subjective assessments differ from those in Table 7 as some respondents reported two events affecting the venture while other respondents reported no events.

6.2.2 Comparison of survey responses and Internet data

Information about the success of the investments was also gathered using public information about the new venture available on the Internet. It was intended that this information provide an alternative source of information about deal performance that could supplement the survey data thus increasing the overall response rate.

Information was gathered about 70 investments using the Internet. The results included the identification of five ventures that had gone public, four acquisitions and 32 subsequent financings. This is similar information to that gathered from venture capitalists in the follow-up survey.

In order to test the reliability of the Internet information, the common information gathered by both procedures was compared. Of the 40 survey responses and 70 investments found on the Internet, there were 31 instances where information was available from both

sources for the same investment. The common information related to going public, acquisitions and subsequent financings. In 15 cases, the information from both the survey response and the Internet were identical. In 16 cases, there was a single difference. Table 12 shows the results of the analysis of these differences.

Table 12 Analysis of differences between survey responses and Internet data

Reason for difference	*Number of instances*
Event identified in survey response but not Internet data:	
• Venture's Internet site does not include information about financing activities – many of these ventures were not public and often their sites did not provide press release type information	8
• A financing was identified on the venture's Internet site but it could not be determined whether it was the initial investment or a subsequent one since it occurred during the original survey period	3
• Venture's Internet site does not report press releases prior to going public. The subsequent financing identified in the survey response likely occurred prior to this time	1
• A public offering was indicated by the venture capitalist but venture is not public according to the identified venture's Internet web site – most likely a misidentification of the new venture	1
Events identified in the Internet data but not the survey response:	
• Venture went public and received subsequent financing according to the venture's Internet site but the survey only indicated the venture going public – most likely an oversight on the respondent's part	2
• Venture was acquired according to Internet web site but no acquisition indicated in the survey response – venture capitalist's investment may not have been acquired resulting in the difference	1

The majority of these differences are the result of incomplete information being available on the Internet. There were only four cases where the information conflicted. This suggests that the information provided by venture capitalists in the survey responses is fairly reliable since it is consistent with information provided by the venture on the Internet. The results

also suggest that the information obtained from the Internet is often incomplete and thus the Internet information is not reliable.

Therefore, because of concerns about the validity of using subsequent financing events as a measure of deal performance (see section 6.2.1, Consistency of measures of deal performance) and concerns about the reliability of the Internet data, the Internet data are not used in the analyses that follow.

6.3 Decision-making criteria and deal performance

The relationship between the criteria used in the investment decision and deal performance is analyzed by examining differences in the mean ratings and rankings for different levels of deal performance.

Four categories of deal performance are considered in this analysis. The first category, successful deals (n=25), includes those survey responses where deal performance was rated 4 or 5. The second category, unsuccessful deals (n=5), includes those survey responses where deal performance was rated 1 or 2. The third category, too early to tell (n=10), includes those survey responses that indicated that it was too early to assess deal performance. The single response with a rating of 3, break even, for deal performance is also included in this category. The fourth category, nonresponses (n=60), includes the nonresponses to the survey.

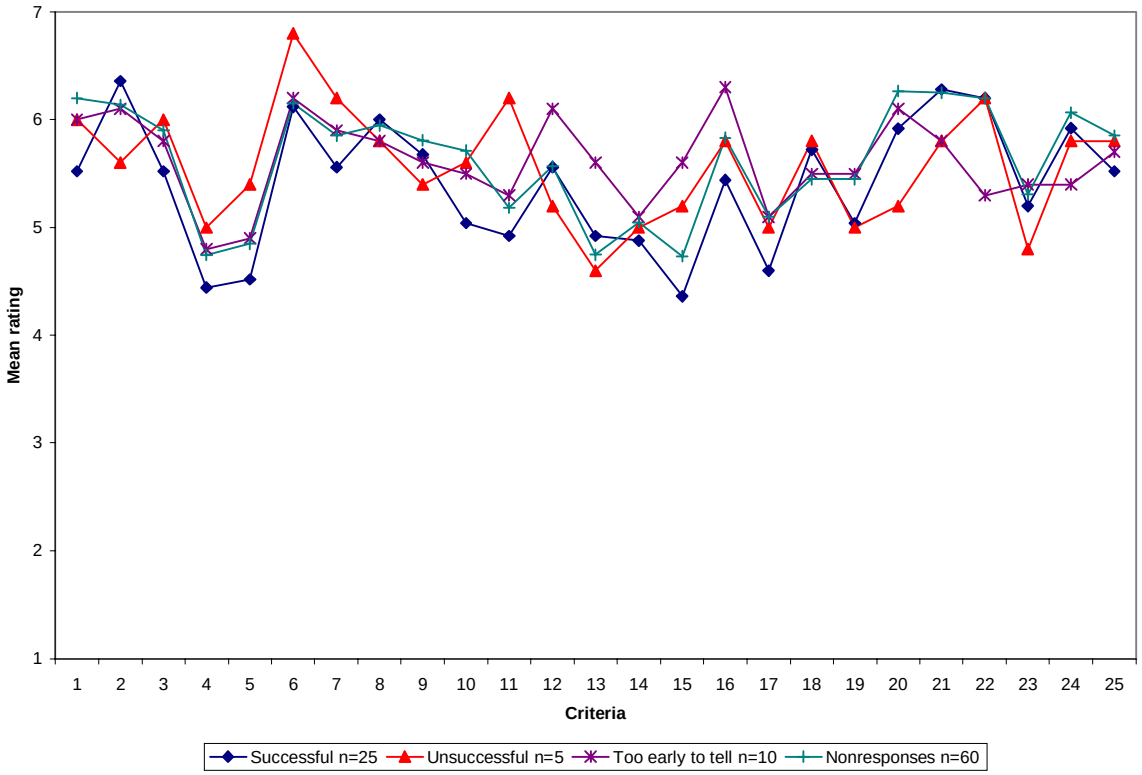
6.3.1 Mean ratings over all criteria

The mean ratings over all 114 criteria are 5.22 for successful deals, 5.20 for unsuccessful deals, 5.52 for the too early to tell category and 5.33 for the nonresponses. Comparison of the means suggests that nonresponses do not differ systematically from the other categories. The fact that the means for all four categories are similar suggests that differences between the four categories, if they exist, need to be investigated by considering individual criteria.

6.3.2 Charts of mean ratings for individual criteria

Figures 9, 10, 11 and 12 together show the mean ratings of each performance category for all 114 criteria.

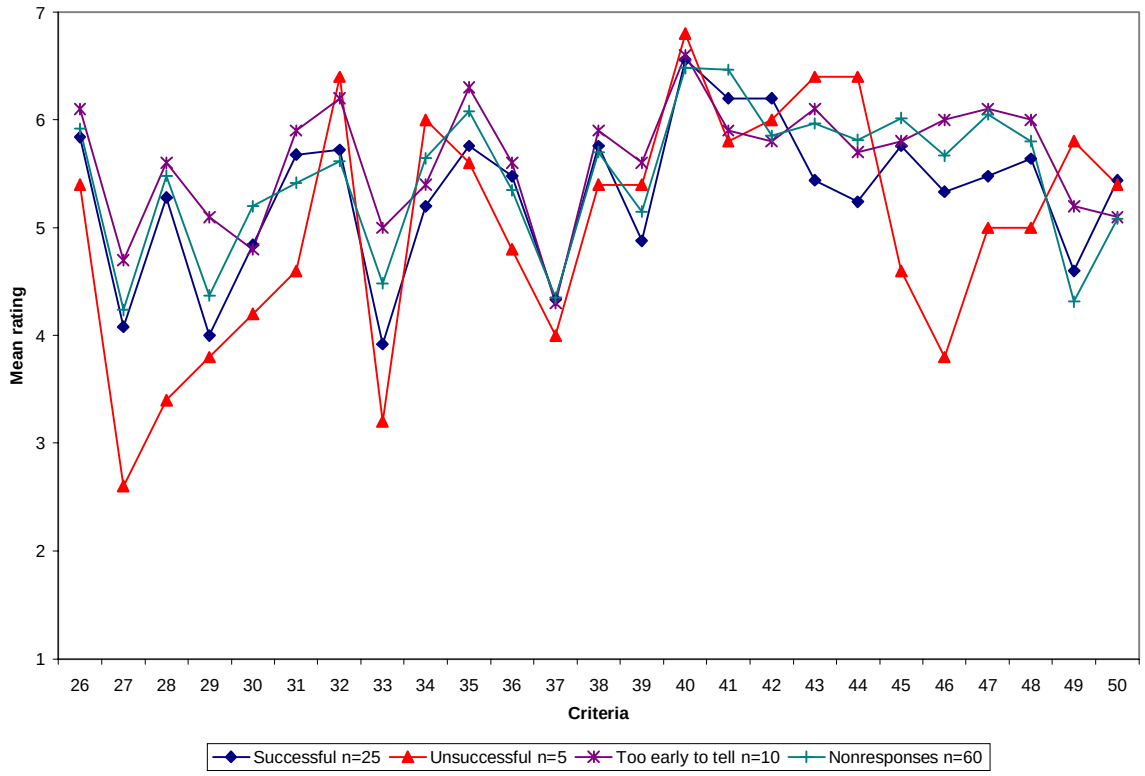
Figure 9 **Chart of mean ratings for criteria related to team ability**



Note. Descriptions corresponding to the criteria numbers are found in Appendix C.

Figure 9 shows the mean ratings for criteria related to abilities of the management team. The mean ratings for these criteria are relatively high consistent with the findings discussed in section 3.1, Highest rated criteria. In addition, there are no obvious large differences between the means of the four categories for these criteria.

Figure 10 Chart of mean ratings for criteria related to team skills and general

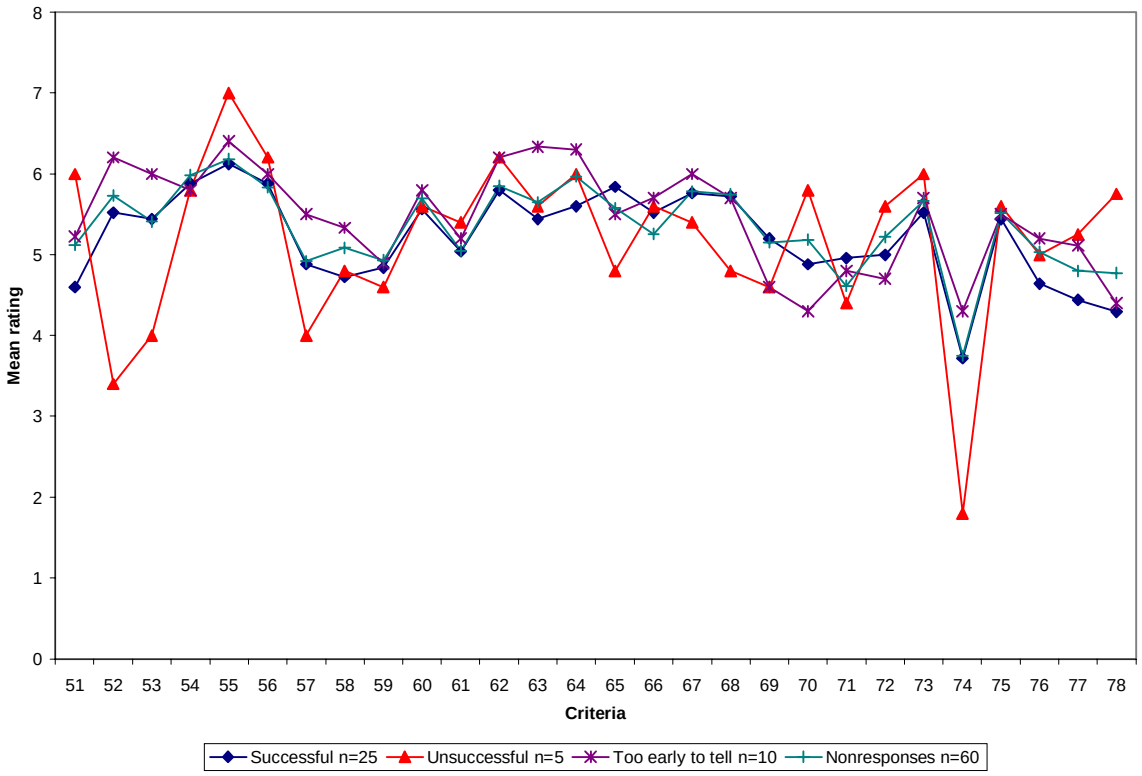


Note. Descriptions corresponding to the criteria numbers are found in Appendix C.

Figure 10 shows the mean ratings for criteria related to skills within the management team and the background, experience, and general characteristics of the management team. There are a few criteria in this chart where unsuccessful ventures are rated noticeably lower than the other categories. The largest differences are for:

- Criterion 27, the management team's recognition of chances of failure;
- Criterion 28, the management team's commitment to technical excellence;
- Criterion 45, technical skills; and
- Criterion 46, research and development skills.

Figure 11 Chart of mean ratings for criteria related to the offer and the market

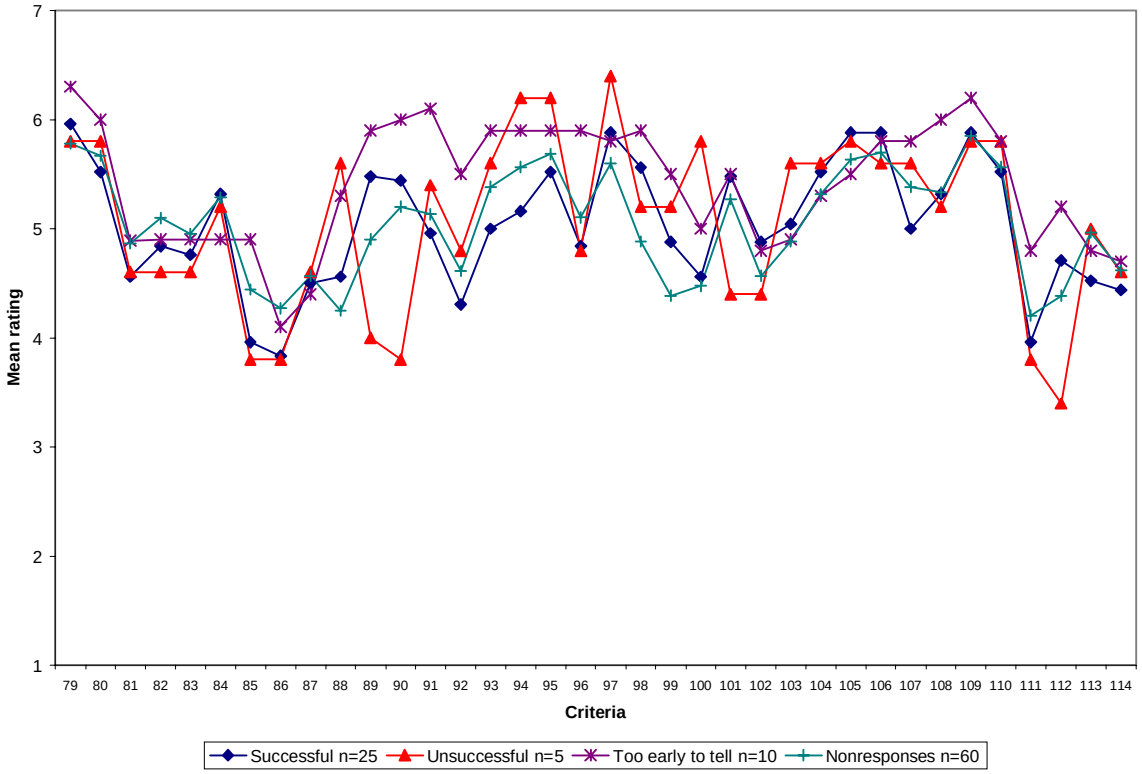


Note. Descriptions corresponding to the criteria numbers are found in Appendix C.

Figure 11 shows the mean ratings for criteria related to the characteristics of the new venture's offering (product or service) and the characteristics of the new venture's target market. Again, there are a few criteria in this chart where the ratings for unsuccessful differ noticeably from those of the other categories. The largest differences are for:

- Criterion 52, venture offering is designed using proprietary core technology owned by the new venture;
- Criterion 53, venture offering has or can protect its intellectual property; and
- Criterion 74, received positive media coverage.

Figure 12 **Chart of mean ratings for criteria related to the environment, business plan and capitalization**



Note. Descriptions corresponding to the criteria numbers are found in Appendix C.

Figure 12 shows the mean ratings for criteria related to the characteristics of the new venture's positioning within its competitive environment, the characteristics of the new venture's business plan and the characteristics of the new venture's capital payback projections. The criteria in this Figure show somewhat greater variability between all four categories than do the previous Figures.

Overall examination of Figures 9, 10, 11 and 12 indicates no consistent patterns except that the means for the unsuccessful deals are more extreme in a few cases. This is not unexpected given that there are only five items in the unsuccessful category. These extreme values are investigated further in the sections that follow.

Charts of the mean rankings show similar results to the above and are not reproduced here.

6.3.3 Statistical tests of differences between means

Analysis of variance (ANOVA) tests were performed to determine "whether the entire set of sample means suggests that the samples were drawn from the same general population" (Hair, Anderson, Tatham & Black, 1998, p. 332). ANOVA tests were run for each of the 114 criteria using the four categories described in section 6.3.

Table 13 reports the results of the ANOVA tests of the mean ratings for the eight criteria with significant *F* statistics. Post hoc tests showed significant differences ($p < .05$) between the unsuccessful category and the other categories in pairwise comparisons for the criteria related to technical excellence, research and development skills, product development skills and the use of proprietary core technology. Significant differences did not occur in the post hoc pairwise comparisons between categories for the other criteria.

While a number of significant differences appear in these tests, care must be taken in interpreting the results. The small sample size of the unsuccessful category (n=5) makes the results sensitive to individual unsuccessful deals which may not be representative of the category and also to how venture capitalists used the ratings scales for criteria (see section 3.4, Comparative strengths and weaknesses of ratings and rankings). The small size of the unsuccessful category also means that the test has low power and that the tests are therefore not sensitive to small effect sizes. In addition, since 114 tests are performed, it can reasonably be expected that there will be a few items that are significant at the 5% level simply by chance.

Table 13 **Summarized analysis of variance for mean ratings**

Criteria		*df*	*Mean square errors*	*F*
The management team's commitment to technical excellence	Between Groups	3	6.94	4.28**
	Within Groups	96	1.62	
	Total	99		
Research and development skills	Between Groups	3	6.41	3.82*
	Within Groups	95	1.68	
	Total	98		
Venture offering is designed using proprietary core technology owned by the new venture	Between Groups	3	9.65	3.57*
	Within Groups	95	2.70	
	Total	98		
Product development skills	Between Groups	3	3.35	3.35*
	Within Groups	96	1.00	
	Total	99		
The management team's educational background	Between Groups	3	5.50	2.94*
	Within Groups	96	1.87	
	Total	99		
Overall quality of the business plan	Between Groups	3	5.43	2.92*
	Within Groups	96	1.86	
	Total	99		
Clarity of the executive summary in the business plan	Between Groups	3	6.15	2.78*
	Within Groups	96	2.21	
	Total	99		
Received positive media coverage	Between Groups	3	7.26	2.76*
	Within Groups	88	2.63	
	Total	91		

Note. 106 of the 114 criteria did not have significant *F* statistics in this test and are not reported in this Table.

*$p < .05$. **$p < .01$.

6.3.4 Hypothesis H_3 – relationship between criteria and deal performance

Hypothesis H_3 is that a small number of criteria will distinguish between successful and unsuccessful deal performance.

The analysis of the charts of mean ratings for individual criteria (section 6.3.2) identified seven of the 114 criteria as having large differences between categories of success. The statistical analyses in section 6.3.3 identified eight criteria with significant differences. However, as cautioned earlier, care must be taken in assessing the evidence provided by these tests due to the large number of comparisons tested.

Consequently, the evidence is supportive of H_3. This finding is consistent with the findings of MacMillan, Zemann & Subbanarasimha (1987) (see section 2.3). This finding suggests that the investment decision criteria act primarily as filters to identify ventures worthy of investment rather than as predictors of ultimate deal success.

6.3.5 Hypothesis H_4 – consistently and inconsistently rated criteria

Hypothesis H_4 proposes that criteria that do distinguish between successful and unsuccessful deals have above average variability.

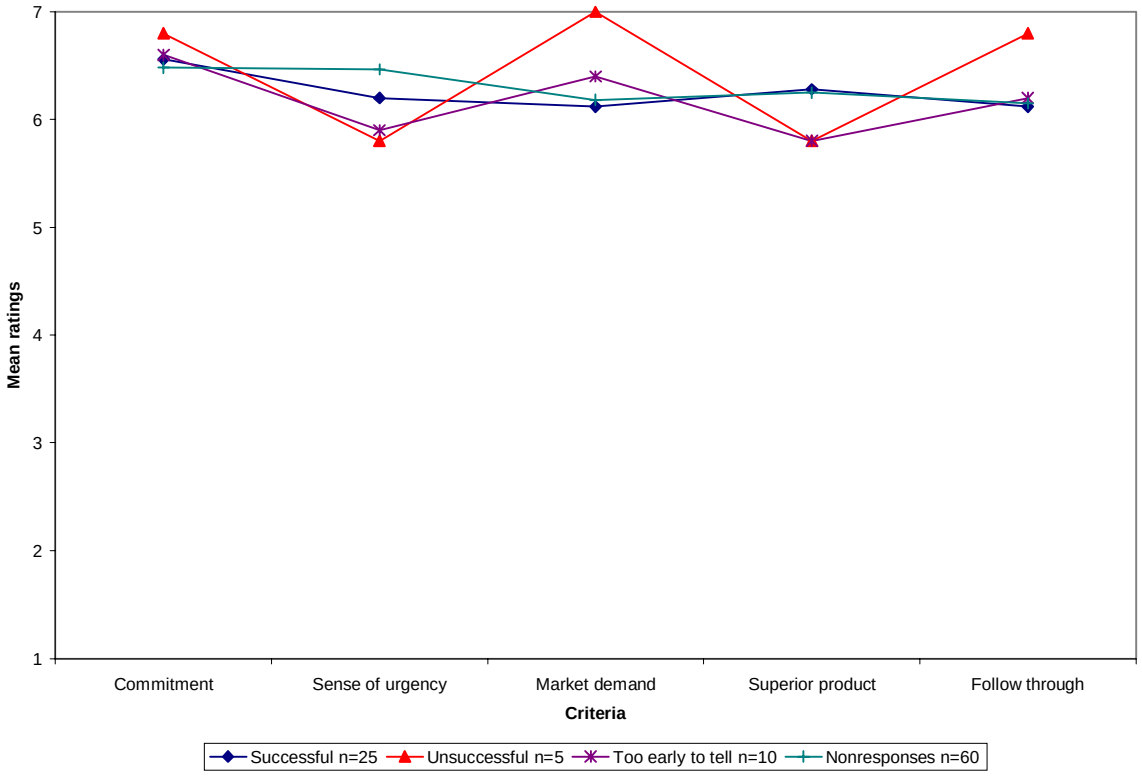
To test these hypotheses, the criteria with significant *F* values for the ANOVA tests (see section 6.3.3, Statistical tests of differences between means) are analyzed to determine whether they have above or below average variability. In addition, criteria with extreme variability are analyzed.

Of the eight criteria with significant *F* values for the ANOVA tests of mean ratings, five have standard deviations in ratings above the average standard deviations for all criteria and three have below average standard deviations in ratings. Standard deviations of the ratings are used as the measures of variability consistent with the discussion in section 3.6,

Measuring variability – metric and ordinal approaches, and section 3.7, Variability in the ratings.

Figure 13 shows the mean ratings of the four categories of deal performance for the five highest rated criteria. Perhaps not surprisingly, these criteria also have very low variability (see section 3.7, Variability in the ratings).

Figure 13 **Chart of mean ratings for the five highest rated criteria**

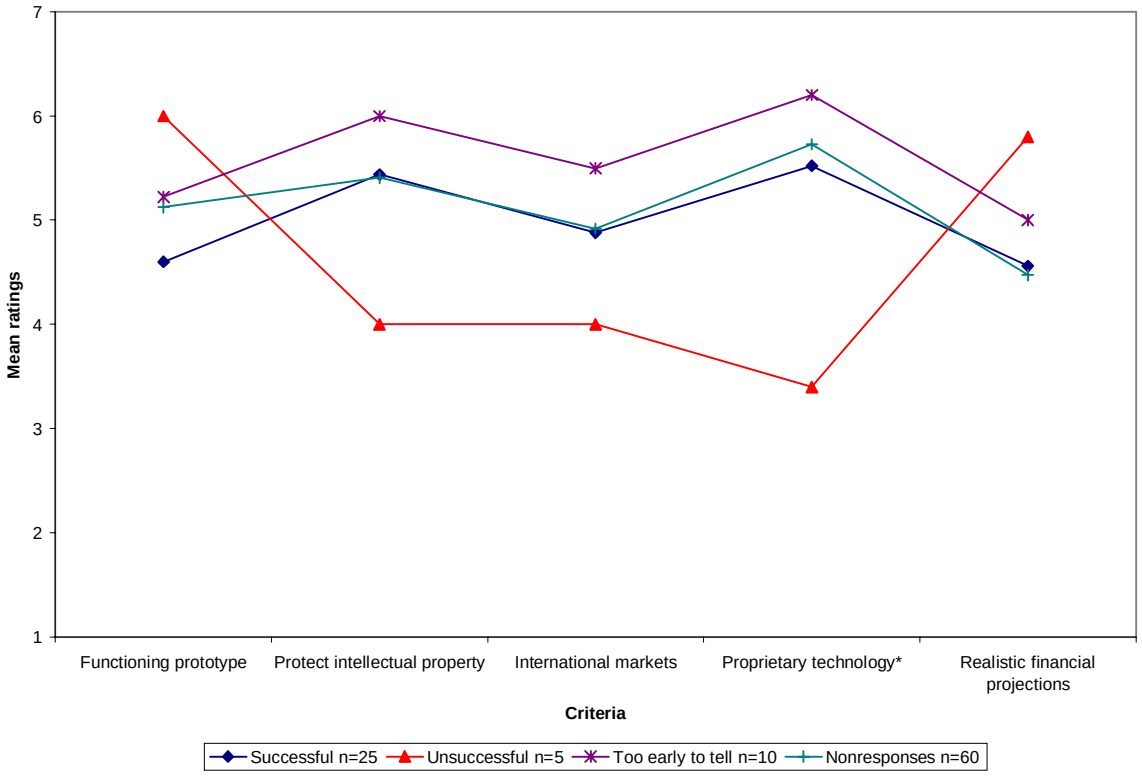


Note. Commitment = The management team's level of commitment to the success of the new venture. Sense of urgency = The management team's sense of urgency regarding the new venture. Market demand = Venture offering is driven by market demand. Superior product = Ability to create a superior product or service compared to that of the competition. Follow through = Ability to follow through on strategy.

None of the five highest rated criteria in Figure 13 have significant *F* values in the ANOVA tests and there is no strong indication in the chart that any of these criteria with low variability distinguish successful from unsuccessful deals.

Figure 14 shows the mean ratings of the four categories of deal performance for the five criteria with the highest standard deviations in ratings (i.e., greatest variability).

Figure 14 Chart of mean ratings for the five criteria with greatest variability



Note. Functioning prototype = Venture offering has been developed as a functioning prototype. Protect intellectual property = Venture offering has or can protect its intellectual property. International markets = Venture offering has the potential to be sold in international markets. Proprietary technology = Venture offering is designed using proprietary core technology owned by the new venture. Realistic financial projections = Provision of realistic financial projections in the business plan.

* This criterion has a significant *F* value at the 5% level in the ANOVA tests.

Venture offering is designed using proprietary core technology owned by the new venture is the only criteria in Figure 14 that has a significant *F* value in the ANOVA tests. This is also the criterion that appears from the chart to best distinguish between successful and unsuccessful deals. This criteria is examined in more detail in section 6.3.7, Technology related criteria. However, overall there is no strong indication from the chart that criteria with low variability distinguish successful from unsuccessful deals. Analyses performed using rankings rather than ratings produce similar results and are not presented here.

The above analyses show little indication that the level of variability in ratings is related to the success of deals. Consequently, evidence for H_4 was not found.

6.3.6 Hypothesis H_5 – first mover-advantage

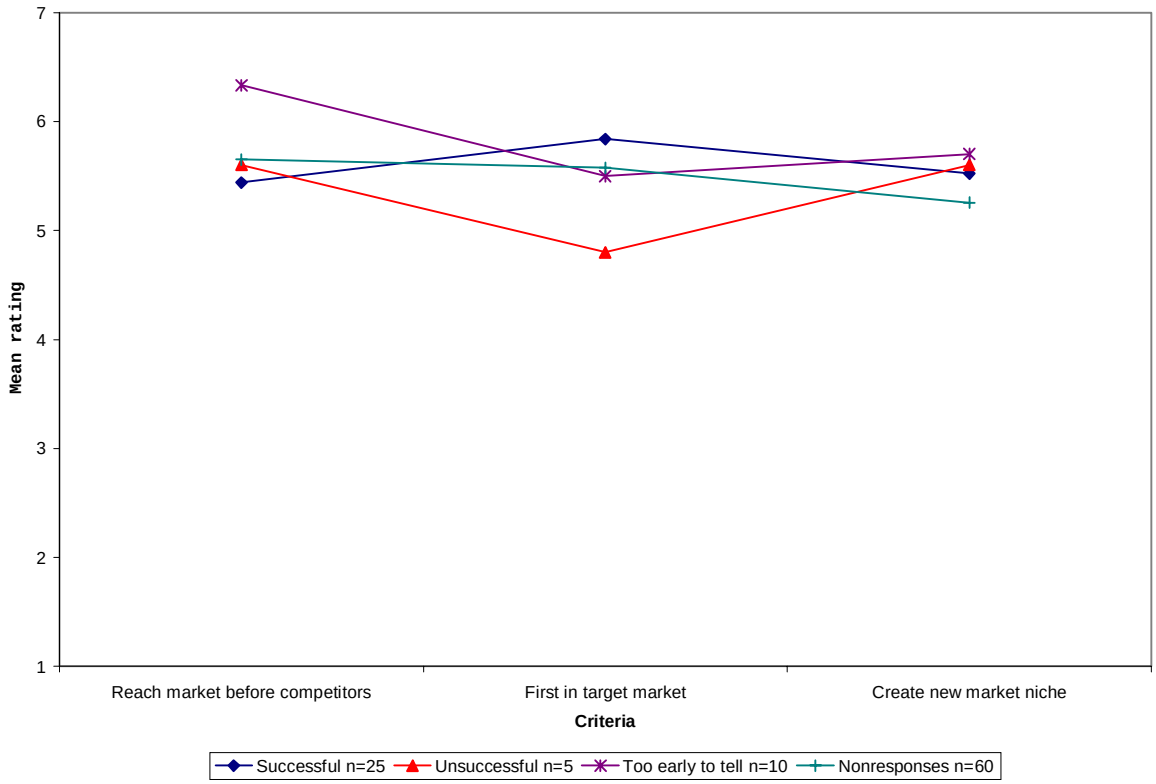
Hypothesis H_5 is that criteria related to first-mover advantage distinguish between successful and unsuccessful deals.

To test this hypothesis, the 114 investment criteria were reviewed to identify those criteria that relate to first-mover advantage. The following three criteria were identified as relating to first mover advantage:

- venture offering reaches the market before its competitors;
- potential to be first within its target market; and
- ability to create a new market niche.

Figure 15 shows the mean ratings of the four categories of deal performance for these three criteria.

Figure 15 Differences in mean ratings for criteria related to first-mover advantage



Note. Reach market before competitors = Venture offering reaches the market before its competitors. First in target market = Potential to be first within its target market. Create new market niche = Ability to create a new market niche.

None of these criteria have significant *F* values in the ANOVA tests. In addition, the differences in the mean ratings between categories of deal performance are relatively small and are inconsistent in direction. The results for mean rankings are similar. Thus, evidence for H_5 was not found.

6.3.7 Technology related criteria

Four out of the eight criteria with significant *F* statistics for ratings (see Table 13) relate to the technology of the new venture. This suggests that there may be a relationship between the importance placed on technology related criteria by the venture capitalist and deal performance.

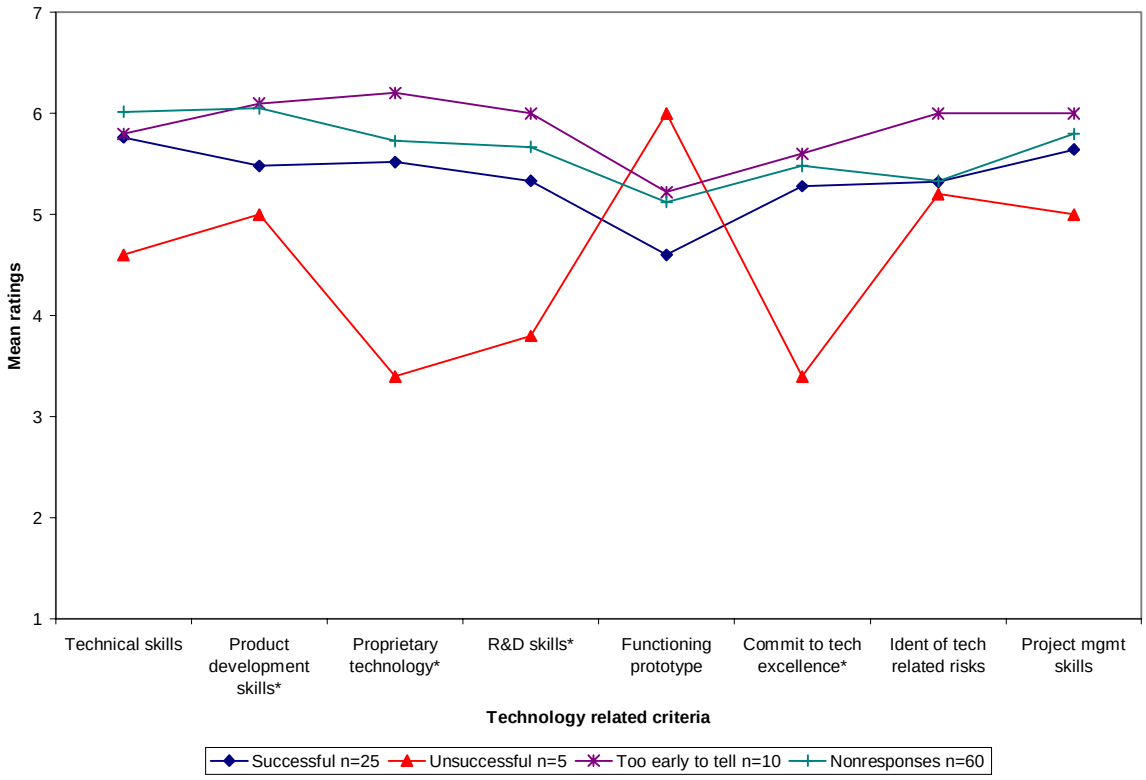
In order to investigate this possible relationshipfurther, the 114 investment criteria were reviewed to identify those that relate to the technology of the new venture. This was done by the author and by two doctoral candidates studying in the area of management of technology. Each of these individuals independently identified and ranked those criteria that they thought were closely related to the technology of the new venture. Eight criteria were identified by one of the individuals and ten criteria by the other two. Seven of the criteria were identified by all three individuals and one criterion was identified by two of the individuals. The remaining five criteria were identified by only one of the individuals. For purposes of the current analysis, the technology related criteria are the seven criteria that were selected by all three individuals and the one criterion selected by two of the individuals. The technology related criteria are:

- technical skills;
- product development skills;
- venture offering is designed using proprietary core technology owned by the new venture;
- research and development skills;
- venture offering has been developed as a functioning prototype;
- the management team's commitment to technical excellence;
- identification of technology related risks associated with the new venture; and
- project management skills.

The technology related criteria are listed in order of the average ranking assigned to the criteria and the criterion identified by only two of the three individuals is listed last.

Figure 16 shows the mean ratings of each of the four categories of deal performance for the technology related criteria.

Figure 16 **Chart of mean ratings for technology related criteria**



Note. Criteria marked with an asterisk have significant *F* values in the ANOVA tests.

For seven of the eight technology related criteria the mean rating for unsuccessful deals was less than the mean rating for the other three categories. As indicated in Table 16, four of these criteria have significant *F* values in the ANOVA tests.

While the evidence from the above analysis is not conclusive, it strongly suggests that venture capitalists whose investments were ultimately unsuccessful placed less importance on criteria related to the technology of the new venture than did venture capitalists investing in the other ventures.

7 Conclusions

7.1 Implications of the study

The findings of this study have a number of implications for venture capitalists and researchers.

7.1.1 The changing risk and return profile of the venture capital industry

Chapter 1, Introduction, describes the shift in venture capital investment to Internet-related businesses which now account for 60% of total venture capital investments. The analyses in section 6.1.1, Venture capitalists' assessments of deal performance, provide some evidence that Internet-related investments mature more quickly than other technology-related ventures. The analyses also suggest that Internet-related investments have more extreme levels of performance than investments in other technology-based ventures.

Together these findings portray a venture capital industry that is much more volatile than in the past. Such an environment is likely to be less forgiving to the weaker players in the industry.

7.1.2 The nature of the decision-making process

The findings in this study add to the understanding of venture capitalists decision-making processes that has been developed over the past number of years (see section 2.1, Criteria used in the investment decision). In particular, the analyses of the variability in the importance assigned to investment criteria (see chapter 3) found a general hierarchy involving many of the investment criteria. However, the analyses also found a group of criteria that are not part of the hierarchy. These criteria are as important as the highest ranked criteria in some individual cases but are not considered important in other circumstances.

These findings suggest that venture capital investing cannot be reduced to a cookbook or checklist but rather that the criteria emphasized in making the decision to investment must be tailored to the particular venture being considered.

7.1.3 Use of Internet data in researching the venture capital industry

The Internet has become an important source of information in society generally and in academic research. Accordingly, the findings in section 6.2.2, Comparison of survey responses and Internet data, have important implications to researchers. The analyses found that information about events affecting ventures obtained from the Internet was generally accurate but was sometimes incomplete. Researchers gathering similar information using the Internet will need to consider how this may affect the reliability of the data they gather.

7.1.4 Staged investments

The analysis in section 6.2.1, Consistency of measures of deal performance, found that subsequent financing occurred in new ventures that failed as well as those that succeeded. The analyses in section 6.3, Decision-making criteria and deal performance, found that it is difficult to distinguish successful from unsuccessful new ventures based on assessments made at the time of the initial investment.

Together these findings suggest that success reveals itself only over time and that venture capitalists provide financing over several rounds in order to wait for the ventures to evolve before committing their full investment to the venture. Early rounds of financing by venture capitalists can be thought of as purchases of options that allow them to wait for future information before committing additional funds to the venture.

7.1.5 Importance placed on technology-related investment criteria

The analyses in section 6.3.7, Technology related criteria, suggest that venture capitalists whose investments were ultimately unsuccessful placed less importance on criteria related to the technology of the new venture than did venture capitalists investing in the other ventures. It is somewhat surprising that some venture capitalists would not emphasize technology-related issues given that all of the investments studied were in technology-based businesses.

An important implication of this finding is that venture capitalists need to pay particular attention to the technologies and technological capabilities of the ventures in which they invest. To do this, venture capitalists need to be sufficiently knowledgeable about the technologies used by the ventures they are evaluating to adequately assess the technology.

7.1.6 Depth of assessment of technology related criteria

Figure 16 shows that venture capitalists whose investments were ultimately unsuccessful placed greater importance on the criterion that the venture offering has been developed as a functioning prototype than other venture capitalists though they placed less importance on the other technology-related criteria. A new venture's technological capabilities include both its existing technology assets and its ability to grow and expand these assets in the future. Emphasizing a functioning prototype while de-emphasizing the other technology-related criteria may reflect a superficial appraisal of the new venture's technological capabilities by the venture capitalist.

Some support for this possible explanation is provided by an analysis of the experience of the venture capitalists. Four of the five venture capitalists (80%) whose investments were ultimately unsuccessful had five or fewer years' experience as a practicing venture capitalist. Overall 50% of the venture capitalists in the survey had six or more years experience. The limited experience of the four out of five venture capitalists whose investments were ultimately unsuccessful may indicate a lack of knowledge to evaluate the technological

capabilities of the new ventures. While the evidence is quite limited, a superficial appraisal of the new venture's technological capabilities would explain the apparent anomalous result.

This finding implies that venture capitalists need to perform detailed rather than superficial assessments of the technology of new ventures and that their assessment needs to consider all aspects of the new ventures technological capabilities.

7.1.7 Summary of major findings

The analysis of rankings in addition to ratings and the consideration of ordinal variation (Blair & Lacy, 2000) in the examination of the importance assigned by venture capitalists to investment decision criteria provides new insights into the investment decision process. Specifically, the analyses identify criteria with high variability that are qualitatively different from the other criteria. The criteria with high variability reflect factors whose importance to the investment decision varies significantly from investment to investment.

The findings that Internet-related investments mature more quickly than other technology-related ventures and that they have more extreme levels of deal performance provide insight into this important new segment of the venture capital industry.

The finding that few criteria distinguish successful from unsuccessful deal performance is consistent with the findings of MacMillan, Zemann & Subbanarasimha (1987). The current study extends this finding to Internet-related investments and identifies the assessment of the technological capabilities of the new venture as an important distinguishing characteristic.

7.2 Limitations

Because of the method used to develop the network of venture capitalists in the original survey, the original survey is not a random sample. Consequently, the generalizability of the findings is an issue.

A second limitation of the study involves the number of responses to the follow-up survey and the inability to supplement the sample using the Internet. The result of this limitation is that the analysis of the follow-up survey is based on only the 40 questionnaires received.

A related limitation involves the number of investments in the unsuccessful category. Only five unsuccessful investments were identified in the follow-up survey. The fact that the survey took place during a very strong economic period may have affected the number of unsuccessful investment identified.

Together these limitations mean that the evidence in this study is more suggestive than conclusive.

7.3 Future research

A number of areas for future research are suggested by the findings of this study.

Research into the changing risk and return profile of the venture capital industry as a result of the shift to Internet-related investments can provide insight into changes in the structure and profitability of the venture capital industry.

Extending the study to include more investments in different economic periods can help to confirm or refute the findings of the study. In particular, further research into the

importance of technology-related considerations in the investment decision and the related impact on investment performance is warranted.

In addition, further research into developing valid and reliable tools for assessing the technologies and technological capabilities of new ventures may benefit venture capitalists. These tools could also benefit entrepreneurs seeking venture capital.

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Appendix A Calculation of Ordinal Variation

This appendix describes the formulas used to calculate ordinal variation using Blair & Lacy's formula for 1-*l* (Blair & Lacy, 2000).

For an ordinal variable with *k* predetermined categories

$$1-l=\frac{d_{\max}-d}{d_{\max}}$$

where:

$$d_{\max}=\sqrt{d^2_{\max}}$$

$$d^2_{\max}=\frac{k-1}{4}$$

$$d=\sqrt{d^2}$$

$$d^2=\sum_{i=1}^{k-1}\left(F_i-1/2\right)^2$$

$$F_i=\sum_{j=1}^{i}p_j$$

Table A.1 Variables and their descriptions

Variable	*Description*
p_j	Proportion of total sample items in the *j*th of the *k* categories
F_i	Cumulative relative frequency for the *i*th category
d^2	Nonnormed measure of ordinal concentration
d^2_{max}	Maximum possible value of d^2. Occurs if all scores fall in a single category
1-*l*	Normed measure of ordinal dispersion

Appendix B Survey Instrument

[Date]

[Name of Venture Capitalist]

[Title]

[Name of Venture Capital Firm]

[Address]

Survey of Decision-Making Criteria Used by Venture Capitalists - A Follow-up

Thank you for participating in a survey of decision-making criteria used by venture capitalists conducted last year by members of the Institute for Innovation Research ("IIR") group at the University of Waterloo.

One of the interesting findings from the study is that, while many criteria are consistently rated as either important or unimportant, there are other criteria that are considered important in some individual cases and unimportant in others. These findings have led us in the IIR to the development of additional research ideas. In particular, the objectives of our current research are to further investigate the variability in the importance of decision-making criteria and to relate the decision-making criteria to the subsequent performance of the investment in the new venture. We are writing to request your participation in this follow-up survey.

The follow-up involves gathering information on the performance of the investment based on the attached questionnaire supplemented by information gathered from publicly available sources (e.g., Internet websites, and news releases). Upon completion of the study, an executive summary will be developed and distributed to the study's participants.

The follow-up survey involves answering three questions related to the investment you made in the new venture. The questions are attached and will take less than five minutes to complete. You may omit any question you prefer not to answer. Participation is voluntary and there are no known or anticipated risks to participation in this study.

Your answers will be kept strictly confidential. Only members of the research team will have access to individual data. All information collected will be presented in aggregate manner in any publications, presentations or workshops. The data collected through this study will be kept for a period of at least five years in a secure location at the IIR.

Please feel free to contact us with any questions concerning the research process or scope of the work. This project has been reviewed by, and received ethics clearance through, the Office of Research Ethics at the University of Waterloo. If you have any questions or concerns resulting from your participation, please contact Dr. Susan Sykes in the Office of Research Ethics at (519) 888-4567, Ext. 6005.

Thank you for your past participation in our research and we hope you will participate in this follow-up. We request that you respond by July 31, 2000 if possible. We will send reminder notes to those we have not heard from at that time to ensure that all past participants have the opportunity to respond.

Sincerely,

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Survey Response

Instructions

Please answer the following survey questions and return this page to us using the enclosed envelope. Alternatively, you can fax your response to the IIR at (519) 888-4884.

While completing this survey, please keep in mind the specific venture you had in mind when completing the original survey. To aid you in recalling this specific venture, below is the description of the new venture that you provided in the previous survey:

[Description of new venture provided in original survey]

Survey Questions

1. What changes have occurred in the venture since the time of investment (indicate all that apply):

- ❑ Venture has ceased operations
- ❑ Venture has been acquired – the venture and *your investment in it have been acquired* by another entity
- ❑ Venture has merged – the venture has merged and *your investment continues* in the merged entity
- ❑ Venture has received additional subsequent financing – from you or another investor
- ❑ Venture has gone public

2. Please provide your assessment of the success of your investment in the venture:

Dismal failure		Break even		Outstanding success	Too early to tell
1	2	3	4	5	x

3. What was the annualized rate of return for this deal?

- ❑ _____%
- ❑ rate of return is not yet determinable
- ❑ unwilling to provide this information

Thank you for completing the survey. If we can assist you in any way, or if you have any questions or comments, please contact us.

[Venture code] - This code is used for data entry purposes.

Appendix C Investment Decision Criteria

Criteria number	*Description*	*Mean rating*	*Standard deviation of rating*	*Mean ranking*	*Standard deviation of ranking*
1	Ability to recruit people for the new venture's team	6.00	1.22	40.44	28.77
2	Ability to create value for future shareholders	6.16	1.10	34.91	24.95
3	Ability to create high standards of team performance	5.80	1.07	46.96	26.24
4	Ability to reward performance fairly	4.69	1.23	75.64	23.88
5	Ability to manage cash flow conservatively	4.80	1.41	71.38	30.41
6	Ability to follow through on a strategy	6.18	0.99	36.00	24.20
7	Ability to be flexible with the new venture's strategy	5.80	1.20	45.14	27.47
8	Ability to anticipate need for change of strategy in the new venture	5.94	1.14	42.52	27.67
9	Ability to effectively manage change within the new venture	5.73	1.18	47.64	26.97
10	Ability to accept a change in roles as the evolving new venture requires	5.52	1.30	53.91	28.95
11	Ability to respond positively to constructive criticism from others	5.18	1.36	62.92	27.55
12	Ability to anticipate problems early on in the new venture	5.60	1.28	50.22	25.11
13	Ability to discuss risks facing the new venture among team members	4.87	1.40	69.50	25.99
14	Ability to create a work environment that fosters knowledge sharing within the team	5.01	1.18	68.59	26.29
15	Ability to seek and learn from the competencies of mentors	4.75	1.51	71.62	28.91
16	Ability to sustain high intensity work in the new venture	5.78	1.18	47.37	28.21
17	Ability to encourage the team to be decisive on issues	4.97	1.40	66.88	28.16
18	Ability to encourage the team to be results-oriented	5.54	1.42	51.61	29.52
19	Ability to learn from mistakes made as the new venture evolves	5.33	1.30	57.38	26.60

Criteria number	*Description*	*Mean rating*	*Standard deviation of rating*	*Mean ranking*	*Standard deviation of ranking*
20	Ability to place the new venture in a position of market leadership	6.11	1.12	36.53	24.51
21	Ability to create a superior product or service compared to that of the competition	6.19	1.16	33.89	23.42
22	Ability to focus on customers needs	6.11	1.22	36.30	24.89
23	Ability to reject a deal that may be unfavorable to the new venture	5.26	1.34	60.06	26.44
24	Ability to adhere to ethical business practices	5.95	1.29	41.31	30.23
25	Ability to focus the new venture on building "core competencies" that may yield a competitive advantage	5.75	1.25	46.16	24.88
26	The management team's shared commitment to a vision of the new venture	5.89	1.17	44.21	27.26
27	The management team's recognition of chances of failure	4.16	1.47	83.62	24.95
28	The management team's commitment to technical excellence	5.34	1.33	57.51	28.78
29	The management team's understanding of the instability of new ventures	4.32	1.46	80.52	25.00
30	The management team's extent of personal contacts within the business community	5.02	1.55	63.27	32.93
31	The management team's reputation within the business community	5.49	1.34	53.45	31.35
32	The management team's compatibility with the venture capitalist(s)	5.74	1.31	47.30	29.21
33	The management team's educational background	4.33	1.41	81.78	27.89
34	The management team's entrepreneurial experience in a prior venture	5.53	1.52	52.31	33.12
35	The management team's leadership experience	6.00	1.03	41.03	24.64
36	The management team's personal accomplishments	5.38	1.24	58.15	29.88
37	The management team's experience in working together in a prior venture	4.32	1.45	80.42	27.30
38	The management team's previous related work experience within the industry sector of the new venture	5.72	1.19	48.72	28.54

Criteria number	*Description*	*Mean rating*	*Standard deviation of rating*	*Mean ranking*	*Standard deviation of ranking*
39	The management team's willingness to accept risk related to the new venture	5.14	1.39	62.72	27.74
40	The management team's level of commitment to the success of the new venture	6.53	0.82	25.92	18.38
41	The management team's sense of urgency regarding the new venture	6.31	0.93	31.65	21.68
42	Communication skills	5.94	0.98	42.52	24.48
43	Marketing skills	5.87	1.35	40.89	29.02
44	Sales skills	5.69	1.33	46.89	28.96
45	Technical skills	5.86	1.14	44.81	27.86
46	Research and development skills	5.53	1.35	52.21	29.46
47	Product development skills	5.86	1.03	43.82	23.90
48	Project management skills	5.74	1.01	48.06	24.06
49	Finance skills	4.55	1.64	75.20	28.04
50	Negotiation skills	5.19	1.39	60.93	27.83
51	Venture offering has been developed as a functioning prototype	5.04	1.90	60.11	36.52
52	Venture offering is designed using proprietary core technology owned by the new venture	5.61	1.71	47.03	34.71
53	Venture offering has or can protect its intellectual property	5.40	1.86	51.80	37.57
54	Venture offering is designed on clear customers requirements	5.93	1.31	41.23	29.33
55	Venture offering is driven by market demand	6.23	1.04	34.20	25.16
56	Venture offering has a well-defined market niche	5.88	1.09	43.02	24.44
57	Venture offering has the potential to be sold in international markets	4.92	1.79	64.57	34.61
58	Venture offering is designed to be user-friendly	5.00	1.47	65.19	28.37
59	Venture offering has a well-defined product launch strategy	4.89	1.39	69.39	26.78
60	Venture offering can keep pace with changes in market needs	5.67	1.20	49.86	26.04
61	Venture offering is competitively priced	5.08	1.40	65.03	28.84

Criteria number	*Description*	*Mean rating*	*Standard deviation of rating*	*Mean ranking*	*Standard deviation of ranking*
62	Venture offering is superior compared to competition	5.89	1.17	42.42	24.70
63	Venture offering reaches the market before its competitors	5.66	1.14	50.09	26.51
64	Venture offering is innovative	5.91	1.22	43.49	28.14
65	Potential to be the first within its target market	5.60	1.54	48.70	31.80
66	Ability to create a new market niche	5.38	1.50	54.76	31.79
67	Identified the potential customers targeted by the new venture	5.78	1.31	44.96	29.34
68	Projected the market size to be captured by the new venture	5.69	1.21	49.99	29.27
69	Projected the new venture's market growth rate	5.08	1.36	65.20	29.30
70	Ability to develop competitive pricing of product or service	5.05	1.31	65.95	27.00
71	Ability to generate multiple revenue streams	4.71	1.59	71.75	29.05
72	Potential to create brand recognition of the new venture's product or service	5.13	1.45	61.35	29.36
73	Potential to create long-term relationships with customers	5.65	1.26	49.18	26.38
74	Received positive media coverage	3.70	1.67	90.83	22.84
75	Access to effective distribution channels	5.49	1.40	52.42	30.32
76	Recognized the time taken to close a sale with potential customers	4.95	1.47	66.46	28.25
77	Potential for the new venture to provide a high level of customer service	4.75	1.54	71.17	29.25
78	Developed a strategy to create "mind share" of the new venture	4.66	1.55	72.66	28.58
79	General trends within the industry	5.88	1.23	43.96	27.93
80	Potential to form partnerships with larger companies to accelerate the new venture's growth	5.67	1.36	49.71	31.67
81	Resources of current competitors	4.78	1.43	69.73	28.64
82	Ability of potential competitors to arise in the market	4.99	1.26	66.28	26.39
83	Anticipation of competition's likely response to the new venture's entrance into the market	4.88	1.29	69.45	26.05

Criteria number	*Description*	*Mean rating*	*Standard deviation of rating*	*Mean ranking*	*Standard deviation of ranking*
84	Strategy of the new venture to respond to possible attack from competitors	5.25	1.19	60.12	25.17
85	Macro-economic factors affecting the new venture	4.33	1.59	79.58	28.32
86	Strategy to contend with changes in macro-economic factors affecting the new venture	4.12	1.52	84.56	24.73
87	Ability of team to recognize a change in the economic climate affecting the new venture	4.54	1.64	73.80	29.69
88	Overall quality of the business plan	4.50	1.40	76.82	25.73
89	Clarity of the executive summary in the business plan	5.10	1.53	61.88	31.03
90	Presence of detailed biographies of the management team	5.27	1.50	58.29	33.75
91	Reflects the true thoughts of the management team	5.20	1.54	59.38	31.19
92	Describes facts trusted by the venture capitalist	4.64	1.65	71.26	29.89
93	Level of competitive analysis in the business plan	5.35	1.34	56.65	27.11
94	Level of customers needs analysis in the business plan	5.53	1.24	53.19	27.70
95	Level of market analysis in the business plan	5.69	1.10	49.34	25.42
96	Level of product or service analysis in the business plan	5.10	1.32	64.35	26.54
97	Presentation of a reasonable business model	5.73	1.31	47.44	27.50
98	Clarity of communication in the new venture's business plan	5.17	1.37	60.62	27.60
99	Conciseness of the business plan	4.66	1.54	71.62	27.57
100	Provision of realistic financial projections in the business plan	4.62	1.67	71.83	31.82
101	Projection of amount of venture capital required by the new venture	5.30	1.42	59.37	32.67
102	Amount of sales at which the new venture is profitable	4.66	1.51	73.42	29.36
103	Time taken to reach positive cash flow by the new venture	4.96	1.36	67.77	29.25
104	Projected profit margin of the new venture	5.38	1.23	58.18	29.18

Criteria number	*Description*	*Mean rating*	*Standard deviation of rating*	*Mean ranking*	*Standard deviation of ranking*
105	Potential for an initial public offering (IPO) by the new venture	5.69	1.20	48.72	31.29
106	Potential for an acquisition of the new venture by a larger company	5.75	1.26	46.51	29.25
107	Agreement between the venture capitalist and management team regarding exit strategy for investors	5.34	1.59	55.38	32.34
108	Identification of technology related risks associated with the new venture	5.39	1.43	55.84	26.70
109	Identification of market related risks associated with the new venture	5.89	1.03	43.93	23.94
110	Identification of management team related risks associated with the new venture	5.59	1.26	51.12	26.85
111	Contingency plan developed by the new venture	4.18	1.35	84.43	22.89
112	Estimated cost of research and development	4.49	1.44	77.97	26.19
113	Estimated cost to acquire a new customer	4.84	1.53	69.33	30.86
114	Estimated cost to provide support to a new customer	4.58	1.39	76.17	24.85