RESEARCHERS OF VENTURE CAPITALISTS' DECISION MAKING, BEWARE!

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Abstract

Researchers of venture capitalists' decision making must be aware of potential biases and errors associated with self reported data especially in light of this study's findings that venture capitalists' lack introspection into the policies they "use" to assess likely profitability. Surprisingly, venture capitalists demonstrate some introspection into the policies they "use" to assess probability of survival.

Introduction

Venture capitalists are conspicuously successful at predicting new venture success (Sandberg & Hofer, 1987; Hall & Hofer, 1993) and numerous studies have investigated their decision making. The majority of empirical research on venture capitalists' decision making has produced empirically derived lists of criteria that venture capitalists report they use when evaluating new venture proposals (e.g., Tyebjee & Bruno, 1981; 1984; Bruno & Tyebjee, 1985; Gorman & Sahlman, 1986; MacMillan, Siegal & SubbaNarasimha, 1985; MacMillan, Zemann & SubbaNarasimha, 1987).

Social judgment theorists suggest that "espoused" decision processes may be a less than accurate reflection of "in use" decision processes (Priem, 1992; Priem & Harrison, 1994; Zacharakis, 1995). Therefore, is the prior research which relies solely on the veracity of venture capitalists' introspection likely to be biased and inaccurate? Venture capitalist' decision making is analyzed to determine the accuracy of venture capitalists' introspection.

Venture Capitalists Decision Making Research

Research on venture capitalists' evaluation criteria reveals no thorough integrated explanation of new venture performance (Sandberg & Hofer, 1987, Shepherd, 1997c) with much still to be learned about venture capitalists' assessment decisions (Hall & Hofer, 1993). The primary objective of research into venture capitalists' decision making is to determine the criteria used by venture capitalists in the evaluation of potential

investments. The methods used in previous studies typically ask venture capitalists to list and rank decision criteria based on their presumed affect on the investment decision (for example, Tyebjee & Bruno, 1981; MacMillan & SubbaNarasimha, 1986), on the likelihood of success (for example, Kahn, 1987; MacMillan et al., 1987), and/or on the likelihood of failure, (for example, Gorman & Sahlman, 1986; Meyer, Zacharakis & DeCastro, 1993).

Limitations of this research includes problems of retrospective reporting (for example, Tyebjee & Bruno, 1984), use of questionnaire responses rather than actual evaluations (for example, MacMillan et al., 1987 and Robinson, 1987) and biases and errors associated with self reporting (Sandberg & Hofer, 1987). Self reporting tends to overstate the number of criteria actually used and to understate the weighting of the most important criteria when compared to more sophisticated decision making techniques (Stahl & Zimmerer, 1984, Riquelme & Rickards, 1992).

Shepherd (1997a, 1997b) demonstrates that a model of venture capitalists' decision making that includes industry related competence, competitive rivalry, lead time, key success factor stability, educational capability, mimicry, scope and timing, has explanatory and predictive ability for venture capitalists' assessments of both likely profitability and probability of survival. Shepherd's (1997a, 1997b) model is used here to investigate venture capitalists' introspection.

Research Method

This study follows suggestions that venture capitalists' decision making can be researched through a decision making framework (Riquelme & Rickards, 1992; Muzyka et al., 1996; Zacharakis, 1995). Conjoint analysis is a strong tool for decision modeling research providing significant, structured insight into venture capitalists' decision criteria (Muzyka et al., 1996; Zacharakis, 1995). Conjoint analysis focuses on concurrent rather than retrospective techniques for collecting and analyzing decisions. It uses a variant of regression to decompose a decision into a linear or multilinear equation allowing separation of attribute weights used by a venture capitalist from an overall preference. Respondents' judgments are then subjected to statistical analysis to discover which attributes affected their new venture performance assessments and in which ways. The theoretical basis for this study's use of conjoint analysis is information integration theory (Anderson, 1981; Louviere, 1988). Information integration theory provides a well-developed error theory to support the statistical tests that follow.

Dependent Variables

Tyebjee and Bruno (1984) found venture capitalists accept/reject decisions can be predicted from their risk and return perceptions. Return is most often evaluated by venture capitalists in terms of profitability (Robinson, 1987; Robinson & Pearce, 1984; Timmons, 1981; Roure & Keeley, 1990) and risk in terms of venture failure (Gorman &

Sahlman, 1986). Profitability was defined as: "net profit on sales, using a ten year time horizon". An eleven point likert type scale was used with end anchors describing "very low profitability" and "very high profitability". Probability of survival is defined as "the probability that this venture will continue to participate in the market using a ten year time horizon". Again an eleven point scale was used with end anchors describing "very low probability of survival" and "very high probability of survival". A ten year time horizon was chosen for both dependent variables. This was chosen to exceed Biggadike (1979) and McDougall, Covin, Robinson & Herron's (1994) choice of eight years to define a new venture as it appears reasonable to assume that ten years captures sustainable performance.

Attributes, Levels and Performance

In developing conjoint profiles, levels were chosen to represent variation that typically occurs in the decision environment of venture capitalists, thereby maintaining believability and response validity. Venture capitalists evaluated a series of conjoint profiles which describe new ventures in terms of eight attributes: (1) Timing of Entry, (2) Stability of Key Success Factors, (3) Educational Capability, (4) Lead Time, (5) Competitive Rivalry, (6) Mimicry, (7) Scope and (8) Industry Related Competence. These eight factors were each manipulated at two levels, and are detailed in Table 1 in Appendix A. Discussions with venture capitalists, accountants and academics confirmed the face validity for both the attributes and their levels detailed above. Appendix B displays an example profile.

Experimental Design

Each of the eight attributes is varied at two levels in an orthogonal fractional factorial design consisting of 16 profiles (Hahn & Shapiro, 1966). This design enabled both individual subject and aggregate subject analysis. Each of the 16 profiles is fully replicated, permitting estimates of individual subject error for use in subsequent analyses of variance (Ettenson et al., 1992). These 32 profiles were randomly assigned to avoid order effects, with a further practice case to familiarize respondents with the task. Therefore the experiment presented 39 profiles.

Participants

Sixty six individual venture capitalists representing 47 venture capital firms completed the survey. Directors, Managing Directors, Executive Chairmen, General Managers and CEOs represent 52% of the sample. Senior managers constitute a further 42% with only 6% of the sample accounted for by analysts. Non government firms represented 74% of the sample with semi government and government contributing 14% and 12% respectively. 94% of their investment was in Australia with those investing overseas predominantly concentrating on Asia. Average total capital under investment using a trimmed mean was $54.650 million and typical investment $2.5 million.

Research Instrument

The research instrument used with venture capitalists contained instructions, conjoint experiment and a post experimental questionnaire that requested self explicated weights as well as information about the characteristics of the respondent. Relevant term definitions were also included on a detachable sheet that could be referred to while completing the survey. Once instructions were clear, respondents considered conjoint venture descriptions and provided a rating on an 11 point scale for its likely profitability and on another 11 point scale the probability of survival. Each performance measure referred to a time horizon of ten years.

After completing 39 profiles, a post experiment questionnaire was completed. The post experiment questionnaire asked each respondent to rate the importance of each factor on an 11 point scale from (1) very unimportant to (11) very important, and also collected personal and firm information. An example of that section of the post experiment questionnaire requesting self explicated weights is displayed in Appendix C.

Analysis of Variance

To identify the determinants of new venture performance that are statistically significant, an individual-subject analysis of variance (ANOVA) was performed on the decision making of each venture capitalist. Although two or more attributes may significantly affect the decision process, it is unlikely that those attributes will be of equal importance (Ettenson et al., 1992). Therefore, statistical significance at the individual level is supplemented with a measure of relative importance. Hay's (1973) omega squared (w^2), a measure of explained variance, was used to assess the relative importance of the eight attributes and selected two-way interactions to each respondent's decision.

Reliability

Experimental formats may have been new and unfamiliar to venture capitalists and therefore it was important to test consistency of responses within each individual. This provides an indication of the consistency with which they apply their decision making strategies. Sixteen replicated profiles were evaluated with the 16 original/identical cases and were used in a test-retest measure using Pearson R correlations. Discussions with respondents indicated they were unaware that cases had been repeated.

Respondent's Insight

For each respondent, their self explicated weights were investigated in relation to their omega square (w^2) values, derived from ANOVA. If venture capitalists have insight into their own decision making, then Pearson R correlation are expected to be high.

Results

In the post-experiment questionnaire, respondents were asked to indicate the importance of each of the eight factors in the evaluation of likely profitability and then perform the same task for probability of survival. For each factor these assessments were made on a scale of 'Not at all Important', scored 1, to 'Very Important', scored 11. "Self explicated" reports of factor importance, averaged across venture capitalists are shown in Table 2 for profitability assessments and Table 3 for probability of survival assessments.

Omega squared is used as a measure of "Conjoint derived" importance weight. The mean omega squared value for each attribute in venture capitalists assessment of profitability and probability of survival are also shown in Tables 2 and 3 respectively. Mean reliability for profitability assessments across venture capitalists is .62 and .69 for probability of survival assessments.

Table 2: Average Self Explicated Weights: Profitability

Factor	Self Explicated Weight	Conjoint Derived Weight
Industry Related Competence	9.24	0.23
Competitive Rivalry	9.31	0.10
Key Success Factor Stability	7.31	0.04
Lead Time	7.97	0.05
Timing of Entry	7.89	0.09
Scope	7.50	0.03
Educational Capability	7.32	0.09
Mimicry of Entry Wedge	6.52	0.03

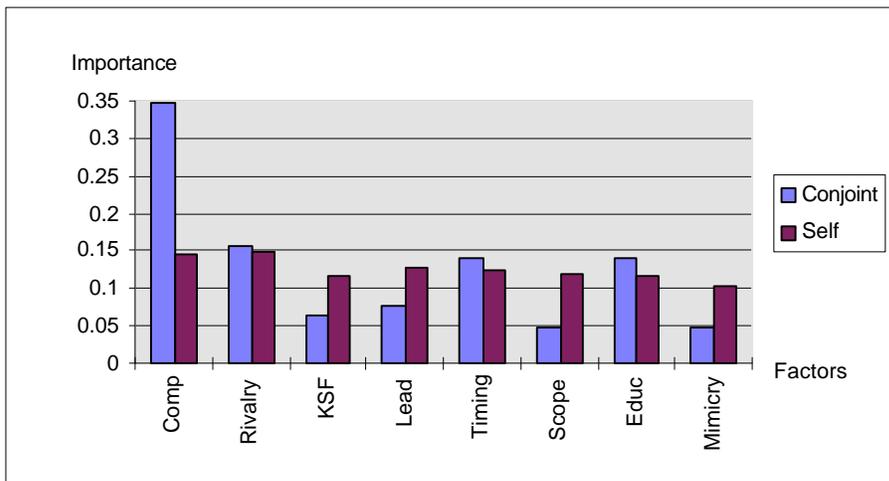**Table 3: Conjoint Derived and Self Explicated Weights: Probability of Survival**

Factor	Self Explicated Weight	Conjoint Derived Weight
Industry Related Competence	9.71	0.31
Competitive Rivalry	8.10	0.07
Educational Capability	7.79	0.11
Timing of Entry	7.57	0.07
Scope	7.37	0.02
Lead Time	6.92	0.03
Key Success Factor Stability	6.92	0.06
Mimicry of Entry Wedge	6.14	0.03

Since conjoint analysis is thought to be a more valid assessment of respondent's decision making, the question becomes what is the relationship between a participant's self reports of factor importance and importance measures derived from conjoint analysis. To

address this question, the relationship is first explored diagramatically at an aggregate level and Pearson R correlations computed between each participant's "self report" of factor importance and their "conjoint derived" measure of factor importance.

Relative importance of each factor was calculated as a ratio of factor importance over total importance of all eight factors. Figures 1 and 2 demonstrate relative aggregate importance of attributes derived from conjoint analysis compared to those relative measures calculated from self explicated methods for venture capitalists' assessments of profitability and probability of survival.

Figure 1: Conjoint Derived Weights and Self Explicated Weights: Profitability

Figure 2: Conjoint Derived and Self Explicated Weights-Probability of Survival
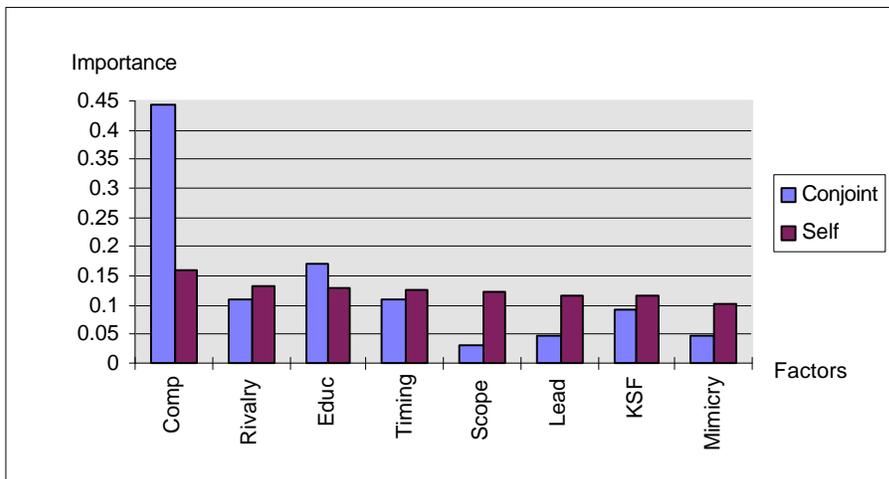
When compared to conjoint derived importance weights, the self explicated weights underestimate the most important criteria and over estimate the least important criteria.

If participants have insight into their decision strategies, large and significant correlations should be found between their self reports of factor importance and their omega squared values, since they are presumably measuring the same thing. Furthermore, since participant's provided their assessment of attribute importance immediately after completing the conjoint task, their insight into the use of the eight factors should be considerably better than might otherwise be the case. Results from this correlation analysis for venture capitalists profitability assessments are presented in the diagonal in Table 4 and venture capitalists' probability of survival assessments in the diagonal in Table 5.

Table 4: Conjoint/Self Explicated Correlation Matrix: Profitability

W2/self	Comp	Rivalry	Educ	KSF	Lead	Mimicry	Scope	Timing
Comp	0.122							
Rivalry		0.190						
Educ			0.465*					
KSF				0.160				
Lead					0.195			
Mimicry						0.137		
Scope							-.0.083	
Timing								0.231

1 tailed significance p< .05

From Table 4, it appears venture capitalists lack insight into their profitability assessment with only one of the self explicated weighted factors significantly correlated with a derived factor weight. Average correlation across the eight factors is only 0.17. Therefore, venture capitalists lack accurate introspection into their profitability assessments.

Table 5: Conjoint/Self Explicated Correlation Matrix - Probability of Survival

W2/self	Comp	Rivalry	Educ	KSF	Lead	Mimicry	Scope	Timing
Comp	0.512*							
Rivalry		0.388*						
Educ			0.482*					
KSF				0.213*				
Lead					0.334*			
Mimicry						0.189		
Scope							0.071	
Timing								0.232*

1 tailed significance p< .05

From Table 5, venture capitalists' "espoused" importance of educational capability and competitive rivalry is significantly different from the conjoint derived importance of educational capability and competitive rivalry in their probability of survival assessments. However, the "espoused" importance of timing, scope, mimicry, lead time, key success

factor stability and industry related competence were significantly correlated with the respective conjoint derived importance weights. Six out of eight significant correlations could be considered high in conjoint versus self explicated weight research. For example, Ettenson et al. (1992) found two significant correlation coefficients ($p<.05$) from his study using eight product attributes and concluded a lack of introspection. For this study the average correlation between 'self explicated' probability of survival assessment policy and 'in use' policy is .30.

Discussion and Conclusion

The findings of this study provide insight into research methods for those researching venture capitalists' decision making. For both profitability and probability of survival assessments, venture capitalists have a tendency to overstate the least important criteria and understate the most important criteria when compared to models derived from conjoint analysis. However does this mean that venture capitalists' lack introspection into their decision making? The findings show that venture capitalists lack introspection into their profitability assessments. However, the findings also demonstrate some introspective ability into probability of survival assessments.

Therefore those studies investigating the decision making of venture capitalists' profitability assessments using self reported data are likely biased and have errors. On the other hand, this may not be the case for venture capitalists' decision making research into probability of survival assessments where the use of self reported data could represent a reasonable approximation of the decision making actually used. It is unclear whether studies using self reported data to investigate either new venture performance or the overall accept/reject decision are biased, as both dependent variables include assessments of profitability and probability of survival. One clear message from this study to those researchers investigating venture capitalists' decision making using self reported data is, BEWARE!

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Appendices

Appendix A

Table 1: Factors, Levels and Definitions

Factors	Levels	Definition
Timing of Entry	Pioneer	Enters a new industry first
	Late Follower	Enters an industry late in the industry's stage of development
Key Success Factor Stability	High	Requirements necessary for success will not change radically during industry development
	Low	requirements necessary for success will change radically during industry development
Educational Capability	High	considerable resources and skills available to overcome market ignorance through education
	Low	few resources or skills available to overcome market ignorance through education
Lead Time	Long	an extended period of monopoly for the first entrant prior to competitors entering the industry
	Short	a minimal period of monopoly for the first entrant prior to competitors entering this industry
Competitive Rivalry	High	intense competition among industry members during industry development
	Low	little competition among industry members during industry development
Entry Wedge Mimicry	High	considerable imitation of the mechanisms used by other firms to enter this, or any other industry, e.g., a franchisee
	Low	minimal imitation of the mechanisms used by other firms to enter this, or any other industry, e.g., introducing a new product
Scope	Broad	a firm that spreads its resources across a wide spectrum of the market, e.g., many segments of the market
	Narrow	a firm that concentrates on intensively exploiting a small segment of the market, e.g., targeting a niche
Industry Related Competence	High	venturer has considerable experience and knowledge with the industry being entered on a related industry
	Low	venturer has minimal experience and knowledge with the industry being entered or related industry

Appendix B

CASE 28: Venture WPM

1. This venture's entry wedge mimicry - <u>high</u>.
2. This venture's educational capability - <u>low</u>.
3. This venture's timing of entry - <u>late follower</u>.
4. This venture's market scope - <u>narrow</u>.
5. This venture's industry related competence - <u>low</u>.
6. The industry's first entrant's lead time - <u>short</u>.
7. The industry's competitive rivalry - <u>high</u>.
8. The industry's key success factor stability - <u>low</u>.

Assessment 28 A: Probability of Survival
Based on the above venture description (using a 10 year time horizon),
how would you rate the probability that this venture will survive?
(Circle the number that best represents your response)

Very Low Probability of Survival	1	2	3	4	5	6	7	8	9	10	11	Very High Probability of Survival

Assessment 28 B: Profitability
How would you rate this venture's profitability,
relative to competitors (use a ten year time horizon)?
(Circle the number that best represents your response)

Very Low Profitability	1	2	3	4	5	6	7	8	9	10	11	Very High Profitability

Appendix C

CRITERIA EMPHASIS

Instructions: Part A

Now we would like you to <u>rate the importance</u> of the various criteria
when assessing ventures' **Probability of Survival**.
(Circle the number that best represents your response).

<u>Mimicry</u>

| Very Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Very Important |

<u>Educational Capability</u>

| Very Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Very Important |

<u>Timing of Entry</u>

| Very Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Very Important |

<u>Scope</u>

| Very Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Very Important |

<u>Industry Relatedness of Venturer's Competence</u>

| Very Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Very Important |

<u>Lead Time</u>

| Very Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Very Important |

<u>Competitive Rivalry</u>

| Very Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Very Important |

<u>Stability of Key Success Factors</u>

| Very Unimportant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Very Important |