



Success criteria in high-tech new ventures

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Abstract

This paper seeks to identify the criteria that influence the performance of high-tech new ventures. Twenty-seven venture capitalists who experienced both failure and success in high-tech ventures were asked to rate one of their most successful ventures and one of the least successful or failed ventures on 38 criteria identified under six groups: entrepreneur quality, resource-based capability, competitive strategy, product characteristics, market characteristics and financial criteria. The venture capitalists were subsequently interviewed to overcome biased or forced results and to know more about success criteria.

The study reveals that entrepreneur quality, resource-based capability, and competitive strategy are the critical determinants of the firm's viability and achievement. It is seen from cluster analysis that successful entrepreneurs develop multiple resource-based capabilities to backup multiple-strategies to push their products through market. Furthermore, it is concluded that it is not the unique products relative to competitors that brings success rather it is the firm's ability to meet the unique requirements of customers that bring success.

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1. Introduction

Several studies (Tyebjee and Bruno, 1984; MacMillan et al., 1985; Knight, 1986) have identified criteria that are used by the venture capitalists to evaluate venture proposals. MacMillan et al. (1987) addressed whether these criteria are actually helpful in distinguishing successful from unsuccessful ventures. They (MacMillan et al., 1987) tested 25 criteria covering four areas: entrepreneur characteristics, product characteristics, market characteristics and financial consideration. Even though their results were significant and interesting, the relatively low explanatory power of their model indicates that new venture performance stems from forces not included or adequately captured by their measures. Stuart and Abetti (1987) and Maidique (1985) have studied the success factors in high-tech industries. Though their regression models have relatively high explanatory power, their studies ignored two important influencers of new venture performance-competitive strategy and resource-based capability of the new ventures. The

recent studies (Chandler and Hanks, 1994; Mahoney and Pandian, 1992; Kakati, 1999) argue that the new venture performance stems among others from multiple strategies, market attractiveness and resource-based capabilities. Their findings are based on the studies on low-tech new ventures and, therefore, may or may not be generalizable to new high-tech ventures. Hence, it seems a useful exercise to conduct a study on factors contributing to success of high-tech using both the old and new criteria. Thus, the purpose of this study is to determine the extent to which success criteria identified in the past and recent studies and by venture capitalists are useful predictors of performance of new ventures in the high-tech industries.

2. Research design

We contacted 43 venture capitalists that are financing high-tech industries and experienced both success and failure. Out of which 27 participated in the exercise. The reason for selecting venture capitalists as respondents is that they have experienced both success and failure, and hence clearly see the differences between success and failed ventures. Furthermore, since, they participated in the venture development process since inception, they

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have strong insight into the working of the ventures they financed. Most of the participated venture capitalists have >50% foreign equity holdings and have their operations in India and South-East Asian Countries. Their mode of financing is equity participation with expected/realized portfolio returns of 30–200%. The usual process of venture evaluation is the investigations of the proposal using some of the criteria taken in the study and the IRR, NPV, Break-even Analysis and Sensitivity Analysis. The size of the venture capitalist team varies from five to 11 with the CEO heading the team. The team includes at least one legal expert and others with industry experts. They specialize by industry and finance only high-tech industries: computer software, IT, pharmaceutical, medical equipments, bio-technology, telecom and data communication, industrial products and machinery (CNC, Sensor, process control, machine vision, instrumentation, pollution and recycling related). The failed and successful ventures reported here belong to these industries.

We followed the methodology of MacMillan et al. (1987) but included 38 criteria under six groups: four groups of MacMillan et al. plus resource-based capability and competitive strategy of the ventures. Our study considered four broad criteria under resource-based capability: managerial capability (problem solving, decision making, employee retention, managing collaboration and networking etc.), technical capability (technology, technical expertise, expertise in product development), marketing capability (expertise in customer service, adaptability to market dynamics, marketing expertise, distribution logistic), and input sourcing capability (access to low cost of capital, raw material, and skilled labor). The study also tested four competitive strategies: cost strategy (emphasis on cost reduction in all facets of operations, process innovation to reduce cost, and improve productivity), quality strategy (emphasis on producing error free product and offering superior products to customer), innovation strategy (emphasis on product innovation, innovation in marketing techniques, packaging etc.), and customization strategy (emphasis on meeting unique customer requirement and tastes).

We develop two sets of questions, identical except for their instructions — the first asked the respondent to rate one of the most successful ventures they have funded and the second asked for a rating of one of the least successful ventures they have funded. We insisted that the chosen ventures registered failure or success within eight years of their operations. An 8 year time horizon was chosen to define a new venture (Biggadike, 1979). In both cases, a five-point scale was used: 1, highly dissatisfactory/disagree; 2, marginally dissatisfactory/disagree; 3, 'neither' satisfactory nor dissatisfactory; 4, marginally satisfactory/agree; 5, highly satisfactory/agree. We were concerned that respondents would tend

to overrate successful ventures and underrate unsuccessful ventures. It was felt that such upward and downward biases would 'force' the results. Hence, we interviewed the respondents with special emphasis on those criteria, which are rated very high or very low and adjusted the rating where necessary.

Success was defined as the achievement of something desired, planned or attempted (Maidique and Zirger, 1985; MacMillan et al., 1987). We asked the venture capitalists to assess the venture performance on seven performance variables [sales, market share, marketing costs, production costs, general and administrative cost, profit and return on investment (ROI)] against their expectations using five-point scale (1, significantly worse than expectation; 2, marginally worse than expectation; 3, achieved expectation; 4, marginally better than expectation; 5, much better than expectation). MacMillan et al. also used the same measures in their study.

Most of the new venture researches have focused on ROI as a measure of new venture performance (Sandberg, 1986), despite the pitfalls of using ROI (i.e. the firms would not be expected to achieve break-even within the first few years and ROI is sensitive to accounting practices). Tsai et al. (1991) advocate market share gain as the best measure of new venture performance as market share gain measures the market acceptance of the new firm's product. This measure may be problematic for pioneering ventures, as they would initially have 100% of the market, only to have this reduced as new firms entered (Miller et al., 1988). The annual level of sales is also another popular measure of performance of new ventures (Doutriaux, 1992; Brush and Vander Werf, 1992) because of being readily available, easy to measure and non-confidential. In this study, multiple performance criteria were used to overcome the deficiency of using a single criterion.

3. Results

Table 1 provides the mean score of the successful and unsuccessful ventures, and significance difference between mean using the *t*-test (*t*-distribution). Out of 38 criteria, the successful venture score significantly higher than unsuccessful in 21 criteria implying that a host of factor together influences the success or failure of a new venture. That means incorporation of limited criteria in the venture performance study or in the evaluation of a venture may overlook important aspects of a venture. Furthermore, the successful ventures are found to differ in nine criteria relating to the characteristics of entrepreneurs out of 13 criteria considered in the study. It indicates that the role of entrepreneurial characteristics in the venture success cannot simply be discounted, reinforcing the venture capitalists' strong belief in the importance of the entrepreneurs' quality in the new venture performance.

Table 1
Mean score of successful and unsuccessful ventures

Criteria	Successful venture	Unsuccessful venture	<i>t</i> -significant
Characteristics of entrepreneurs			
Size of venture team	3.31	3.5	−0.55
Desire for success	4.46	4.17	0.84
Creativity	4.62	3.67	3.33***
Courage	4.23	3.83	1.02
Enthusiasm/capacity for work	4.77	4.08	2.73**
Competence in the field of endeavor	4.62	3.42	2.72**
Capability of sustained intense effort	4.38	3.67	2.15**
Ability to evaluate and react to risk well	4.00	2.58	2.96***
Ability to articulate in the discussion	3.77	2.92	1.72*
Attention to detail	4.00	3.08	2.5**
Familiarity with the target market	4.69	3.58	2.92***
Leadership quality	4.15	3.25	1.72*
Track record that was relevant to venture	3.69	3.00	1.02
Resource-based capability			
Managerial capability	3.92	2.58	2.43**
Technical capability	3.88	2.75	1.85**
Marketing capability	3.92	2.83	1.98**
Input sourcing capability	4.15	3.00	2.79***
Competitive strategy			
Quality strategy	4.23	3.25	1.88*
Cost strategy	3.77	2.92	2.29**
Innovation strategy	4.38	3.08	2.79***
Customization strategy	4.62	3.00	4.76***
Product characteristics			
Uniqueness of product/services relative to competitors	3.92	3.53	1.24
Protection of the product	3.96	3.08	1.71*
Product enjoyed market acceptance	3.92	3.25	0.95
Product developed to functioning prototype	4.15	3.17	2.45**
Product was in early stage of development	3.08	2.5	1.4
Market characteristics			
There was established distribution channel	2.31	2.83	−1.63
There was untapped market potential	2.85	2.92	−0.21
Venture had access to well-established distribution channel	2.38	2.58	0.66
Market enjoying significant growth rate	4.16	2.75	3.76***
Venture stimulated existing market	4.03	2.25	3.53***
Familiarity with industry structure	2.92	2.25	1.69
Competition was present in the first two years	2.92	2.90	0.11
Venture created a new market/segment	2.62	2.12	1.62
Financial consideration			
Investment could be made easily liquid	2.54	2.33	0.6
Expected returns 10 times within 5 years	3.4	2.83	0.24
No subsequent investment	2.15	2.42	−0.79
It was the first round of investment	2.85	2.5	1.60
Performance measures			
Sales	3.85	1.67	6.6***
Market share	3.62	1.58	5.82***
Marketing cost	2.85	1.75	3.54***
Production cost	3.15	1.58	5.41***
General and administrative cost	3.15	1.67	5.1***
Return on Investment	4.75	1.27	19.3***
Profits	4.95	1.55	16.4***

* Significant at 0.1.

** Significant at 0.05.

*** Significant at 0.01.

Major difference between successful and unsuccessful ventures was noticed in the case of eight criteria, four of them related to resource-based capability and another four of them to venture competitive strategy. These criteria were either ignored or given less focus/important by the previous researchers on venture capitalists' decision criteria and new venture success criteria.

Unlike the previous three categories of characteristics, the product characteristics do not appear to be as critical as it was thought to be. Product uniqueness (which depends on R&D intensity) was shown not be a significant factor in determining initial success, despite the tendency of high-tech firm to emphasize R&D and technological excellence. Once the product is designed and developed up to a functioning prototype and enjoys some protection, it appears that further R&D intensity to make it an unique product is not necessary for initial success. The findings support the previous study of Stuart and Abetti (1987) on the high-tech new ventures, where R&D intensity showed up negative relationship with initial venture success.

The significant difference was also not seen in the case of most of the market related criteria. Out of the seven criteria considered here, difference was seen in only two criteria: market growth rate and stimulating existing market. It appears that one can achieve initial success more easily and rapidly in the growing market and by stimulating existing market instead of creating a new market. All other criteria within this category appear to have insignificant influence on the venture performance.

No significant difference between successful and unsuccessful venture was seen in respect of financial considerations. That means financial consideration itself is not important determinant of venture success but if the right entrepreneur, right strategy and right product are chosen and right capability is developed, return will follow. The finding supports the practice of many venture capitalists that do not consider financial aspects in the proposal screening stage but try to capture risk/return potentials through several of other criteria examined by them.

The above findings must be interpreted cautiously for two reasons. Firstly, though we have interviewed the venture capitalists, there is still some possibility that they may overrate the successful one and underrate the unsuccessful one. Secondly but most importantly, the study found 17 insignificant criteria. It does not mean that all of them are unimportant. Some of them may be important in that sense that their absence may cause serious problem to the venture success. Hence, it is desirable to classify criteria into two- winning criteria and qualifying criteria. The winning criteria are those, which directly and significantly contribute to winning business. Raising performance in winning criteria will either result in more business or improve the chances of gaining more business. All the significant criteria in Table 1 may be

called winning criteria. Qualifying criteria may not be the major determinants of success, but important in another way. Any reduction in the performance of qualifying criteria will be particularly serious if it drops below the critical level. Once above the critical level, further improvement in qualifying criteria is unlikely to contribute much to the success. Some criteria (desire for success, courage, uniqueness of products), appear to be qualifying criteria. Both the successful and unsuccessful ventures score high in these variables. High score perhaps is not helping the failed ventures to be successful but poor performance could have drifted the successful ventures into a trouble.

The above grouping was based on the performance of the ventures, not on the chosen criteria. We now want to do the reverse, first to group ventures having similar profiles across the criteria chosen and then to see the performance of each group. That will provide us insight on whether there are particular profiles of ventures with similar characteristics, and how the pattern or profile influences venture performance. Some of the successful and unsuccessful ventures may share similar pattern. MacMillan et al. also noticed that each of their classes of successes has a look-like class of failures that are very similar except some flaws. We want to see how many failed and successful ventures show similar pattern, and how many of them show distinct pattern. We chose cluster analysis to do so.

3.1. Cluster analysis

A two-step cluster analysis technique was used. In the first step, a hierarchical agglomerative method was used to determine appropriate number of cluster. Ward's minimum variance method was used to determine the cluster linkage. All solutions between two and ten were investigated and finally three-cluster solution was used to group ventures having similar profiles across the criteria chosen. Several criteria guided the choice of three cluster solution:

1. three cluster solution generate solution in which the ventures had a relatively even distribution among the clusters;
2. highest flattening in the dendogram when three cluster solution was used; and
3. the clusters were better and well separated based on the Euclidian distances from their centers when three cluster solution was used.

From this preliminary analysis, the centroids associated with the three-cluster solution were then used in the second step as initial starting values in an 'iterative partitioning analysis' (using SPSS Quick Cluster) for the final solution. Table 2 shows the result of cluster analysis along with mean cluster scores. In order to allocate a

Table 2
Cluster score and global mean of sample new ventures

Criteria	Cluster1	Cluster2	Cluster3	Global mean	SD
Characteristics of entrepreneurs					
Size of venture team	3.0	3.8	3.5	3.4	0.86
Desire for success	4	5	4	4.3	0.85
Creativity	3.5	5*	3.2	4.1	0.87
Courage	3.1	4.8	4.2	4.04	0.97
Enthusiasm/capacity for work	3.8	4.5	4.2	4.3	0.71
Competence in the field of endeavor	3.1	4.5	3.2	4.04	1.05
Capability of sustained intense effort	3.6	4	3.5	3.7	0.88
Ability to evaluate and react to risk well	1.6*	5*	2.7	3.3	1.37
Ability to articulate in the discussion	2	5*	3.2	3.3	1.33
Attention to detail	2.8	4.4*	3	3.4	1.08
Familiarity with the target market	3.1	4.5	3.7	4.2	1.16
Leadership quality	2.6*	5*	3.2	3.72	1.1
Track record that was relevant to venture	2.5	4.6*	2.7	3.3	1.07
Resource-based capability					
Managerial capability	1.5*	5*	3	3.2	1.33
Technical capability	1.66*	5*	3.2	3.08	1.38
Marketing capability	1.6*	5*	3.5	3.4	1.44
Input sourcing capability	2.1*	4.8*	3.4	3.6	1.11
Competitive strategy					
Quality strategy	2.5*	5*	3.5	3.76	1.23
Cost strategy	2.5	4.5*	2.7	3.3	1.03
Innovation strategy	2.4*	5*	3	3.7	1.26
Customization strategy	2.3*	5*	3.5	3.84	1.1
Product characteristics					
Uniqueness of product	3	4.2	3	3.6	1.03
services/services relative to competitors					
Protection of the product	2.6	5*	2.7	3.4	1.08
Product enjoyed market acceptance	2.6	4.2	3.5	3.6	1.38
Product developed to functioning prototype	2.5	4.3	3.5	3.68	1.14
Product was in early stage of development	2.5	1*	3.2	2.8	0.78
Market characteristics					
There was established distribution channel	2.3	3.4	3	2.56	0.91
There was untapped market potential	3	3.5	2.2	2.8	0.78
Venture had access to well-established distribution channel	2.3	3.03	2.5	2.6	0.82
Market enjoying significant growth rate	2.5	3.5*	2.7	2.8	0.70
Venture stimulated existing market	1.3*	3.6*	2.5	2.5	0.98
Familiarity with industry structure	2.1	2	2.5	2.2	0.95
Competition was present in the first two years	2.6	3	3.2	2.9	0.86
Venture created a new market/segment	2.3	1.8	2.3	2.3	0.87

(continued on next page)

descriptive label to each of the three clusters, the cluster mean for each criterion from the original data set was compared to the respective global mean for that criterion. Interpretation and evaluation of the clusters was done by identifying as key diagnostic criteria those with group mean that differed by 1 SD from the global mean calculated from the raw, untransformed data [as suggested by Birley and Westhead (1992)].

The first cluster consists of exclusively 20 failed ventures. The entrepreneurs of these ventures lack leadership quality and ability to evaluate and react to risk. They, however, have the other desired qualities of an entrepreneur (though in a modest scale) and that help them to get qualified for first round of investment from venture capitalists. One of the biggest flaws in this group is that they have failed to gather resources to enhance

Table 2 (continued)

Criteria	Cluster1	Cluster2	Cluster3	Global mean	SD
Financial consideration					
Investment could be made easily liquid	2.1	3.2	1.7	2.4	0.92
Expected returns 10 times within 5 years	1.8	2	1.7	1.8	0.52
No subsequent investment	2.1	3	2.5	2.6	0.8
It was the first round of investment	3*	1*	2.5	2.2	0.7
Performance measures					
Sales	1.45*	4.2*	3.05	2.76	0.82
Market share	1.5*	3.81*	2.82	2.6	0.88
Marketing cost	1.9	2.7	2.38	2.3	0.78
Production cost	2.1	2.9	2.22	2.35	0.74
General and administrative cost	2.3	2.83	2.24	2.41	0.73
Return on Investment	1.12***	4.9***	3.68	3.01	0.46
Profits	1.3***	4.96***	3.88	3.21	0.57

* Cluster mean which deviates more than one time standard deviation from the respective global mean.

*** Cluster mean which deviates more than three time standard deviation from the respective global mean.

their capabilities (managerial, technical, marketing and input sourcing) and to develop competitive strategies to push their product through markets. The group has failed to show strong emphasis on any of the strategy and to stimulate the existing markets. The group has shown very poor performance in respect of sales, market share, profit and ROI.

The second group of ventures comprises the 15 successful ventures and has opposite characteristic of the first group of ventures. This group has exceptional entrepreneurial quality — the venture team is creative and gives attention to details. The team has ability to articulate in the discussion and to evaluate and react to risk well. The team has good leadership quality with good track record. The most important aspect is that this group has developed capability to gather resources and to use them effectively. The presence of a diversified management team, in which technological expertise is balanced with other business skills and capabilities help this group of ventures to achieve early success in their new ventures. They also use multiple strategies in concert to stimulate existing and growing markets. Their products enjoy protection. The products they have selected evolved over years and gained market acceptance. Due to the above reasons, the group enjoys higher sales, market share, profit and ROI.

The third group consists of 19 ventures out of which 12 are successful and seven are failure. In this group, the successful and unsuccessful ventures share common properties. In none of the criteria, the group scores exceptionally high or low. The ventures of this group occupy the middle position of first and second group and are taking the high risk of being either successful or unsuccessful.

3.2. Regression model

Several step-wise regression analyses were run to determine those criteria that had significant betas for each of the performance measures in the study. The results are shown in Table 3. The relatively high R^2 values indicate that the criteria selected in this study can explain most of the variations in the performance measures. This is in contrast with other previous studies where R^2 was found to be low, probably due to exclusion of two important sets of criteria- resource-based capability and competitive strategy.

As can be seen from Table 3, 54% of the variations in the expected sales can be explained by the three criteria:

1. ability to evaluate and react to risk well;
2. protection of product; and
3. stimulating existing market.

The ventures, which surpass the venture capitalists' expectation in sales are those that could protect their products from competitors' attacks, who stimulate the existing markets and anticipate and are proactive to unforeseen events.

The venture enjoying high market share are those, which could stimulate existing established markets through customization strategy, i.e. offering products or services tailoring to the needs of individual customers. These two factors together explain 52% of the variations of market shares of the ventures. It appears that stimulating established markets are essential condition for getting bigger cake (sales or market share) in the markets.

There is little difference between the successful and unsuccessful ventures in respect of their performance in

Table 3
Multiple-regression model

Criteria with significant Beta	Performance variables						
	Sales	Market share	Marketing cost	Production cost	General administrative cost	ROI	Profit
Size of venture team						−0.21	
Capability of sustained intense effort						−0.302	
Ability to evaluate and react to risk well	0.34						
Attention to details					0.487		
Technical capability				0.516			
Input sourcing						0.759	
Capability							
Customization strategy		0.525	0.57	0.37		0.15	0.53
Protection of the product	0.32						
Product was in the early stage of development				0.35			
Venture stimulated existing market	0.45	0.44					0.381
R^2	0.54	0.52	0.326	0.801	0.53	0.87	0.606
F	16.7	12.35	11.14	28.24	12.42	18.02	15.43
Significant F	0.00	0.0035	0.0029	0.000	0.002	0.000	0.0001

marketing costs. Whatever difference is there, it is influenced by the degree of customization. Those ventures, which have gone for mass markets eventually met with high marketing costs. On the other hand, those offered customized package to limited customers met with low marketing costs.

As expected, technical capability influenced production cost significantly. Higher the level of technical capability better is the performance of the venture in respect of production costs. Surprisingly, customized and nascent products help the ventures in reducing the production costs. The very high R^2 in this regression model indicates that the production costs are relatively easier to predict.

The reduction of general and administrative costs is found in those ventures where venture team had given attention to details. The size of the venture team and their sustained intense efforts are found to depress ROI. On the other hand, the ventures with better input sourcing capabilities and customization strategy could do better in respect of the ROI. Furthermore, more profits are reported by those who could exploit existing markets with customization strategy.

As can be seen from the regression table, there are two criteria (customization strategy, stimulating existing market) that predict venture performance across several performance variables. The result suggests that at the generic level the most desirable ventures are those for which there is existing market and ventures concentrate on specialized products in market segments where customization and high levels of customer service create unique advantage or opportunity. It is evident that serving the customer well should be the utmost important to new ventures.

3.3. Factor analysis

The responses were factor-analyzed to determine the major groupings among criteria. An R-mode principal components analysis (PCA), with a varimax rotation (using SPSS), was used to reduce the data. For the purpose of describing the underlying factor structure, the 'eigenvalue-one criterion' was used to determine the number of components to extract for further analysis. Using a conservative component loading of 0.4 as a cut-off for significance (Nunnally, 1978), none of the vari-

ables loaded on more than one component. On the basis of the component loadings, the nine factors extracted by PCA were given descriptive names. Since the success of the new venture depends on the effectiveness of managing risks of the ventures, the factors are patterned around the concern for risk management. The results of the factor analysis are shown in Table 4.

Factor one loads on several attributes related to venture team general capability, their capability to gather resource and to develop appropriate strategy. The factor

reflects a grouping of criteria around the ‘incapability risk’ — the danger that the team will not be able to develop capabilities required to succeed. This factor is analogous to the ‘management risk’ factor identified by previous researchers (MacMillan et al., 1985; Tyebjee and Bruno’s study, 1984) except inclusion of many more criteria from resource-based capability and competitive strategies. This factor is the major factor explaining 37.9% of the total variance.

The next factor has been named as ‘inexperience risk’,

Table 4
Results of factor analysis

Factors (factor loading)	Eigenvalue (cumulative)	% variance
Factor 1: Incapability risk	15.14	37.9(37.9)
Size of venture team (0.464)		
Creativity (0.779)		
Competence in the field of endeavor (0.661)		
Ability to evaluate and react to risk well (0.814)		
Attention to detail (0.574)		
Leadership quality (0.74)		
Managerial capability (0.815)		
Technical capability (0.64)		
Marketing capability (0.866)		
Input sourcing capability (0.842)		
Quality strategy (0.804)		
Cost strategy (0.784)		
Innovation strategy (0.815)		
Customization strategy (0.804)		
Factor 2: Inexperience risk	4.9	12.3 (50.2)
Familiarity with the target market (0.544)		
Track record that was relevant to venture (0.827)		
Factor 3: Product risk	3.68	9.2 (59.4)
Uniqueness of product/services relative to competitors(0.65)		
Protection of the product (0.548)		
There was untapped market potential (0.465)		
Factor 4: Competitive exposure risk	2.64	6.6 (66)
Competition was present in the first two years (0.542)		
Familiarity with the industry (0.575)		
Ability to articulate in the discussion (0.718)		
Factor 5: Entrepreneurial risk	2.1	5.3 (71.3)
Enthusiasm/ capacity for work (0.454)		
Capability of sustained intense effort (0.645)		
Courage (0.558)		
Factor 6: Market risk	1.63	4.1 (75.3)
Product enjoyed market acceptance (0.746)		
Venture stimulated existing market (0.475)		
Market enjoying significant growth rate (0.699)		
Factor 7: Market penetration risk	1.57	3.9 (82.9)
There was an established distribution channel (0.455)		
Venture had access to a well-established distribution channel (0.462)		
Factor 8: Infancy risk	1.44	3.6 (82.9)
Product was in early stage of development (0.588)		
Product developed to functioning prototype (0.733)		
Venture created a new market/ segment (0.425)		
Factor 9: Investment Risk	1.15	2.9 (85.8)
Investment could be made easily liquid (0.563)		
It was the first round of investment (0.538)		

which captures the risk of initiating high-tech venture without relevant track record and market knowledge.

The third factor reflects the risk arising out of product features. In the case of novel or untried ideas, there is a risk of whether the product can be produced and commercialized. Even technically elegant products may fail to exploit the untapped market. Even if the market accepts the product, there is risk that competitors may incorporate the new features immediately due to the absence of legal or artificial protection.

Furthermore, the initial success of the product may invite new competitors to the industry. The venture capitalists may specialize by the industry and yet anticipating such risk may be difficult. The factor four captures this risk i.e. risk of being exposed to competition after initial success and yet not being perceived even if venture capitalists and entrepreneurs have enough exposure to that industry.

The next risk factor is the 'entrepreneurial risk' factor, which arises due to dampening effort/personal attention of the entrepreneur with the passage of time. Young, innovative entrepreneurs may have bright ideas, but due to lack of hard work, courage and sustained effort, they may fail to implement their ideas successfully.

The next factor is named as market risk, which may result from several factors such as non-acceptance of products by customers, declining growth rate, failure to stimulate existing market through innovative products etc.

Non-access to the distribution facilities could also bring risk to the new venture in general and specially to the products for mass market. Absence of this facility restricts geographical penetration and make marketing the products very costly. The factor seven captures this risk.

When both product and market are new, another risk may arise due to uncertainty surrounding both the product and market. The product may not be developed to the satisfaction of customers and the venture may fail to develop the new market for the new product. This risk we have named as 'infancy risk' or 'implementation risk'. A venture may be insulated from product failure if the entrepreneur has already developed a prototype and market for the product. The last factor is named as 'investment risk'. A venture, which can be made easily liquid and does not require subsequent investment is not much exposed to the risk of loss of investment.

The factor analysis shows a moderate convergence with findings of the previous studies. The management risk, competitive exposure risk, inexperience risk was found in MacMillan et al. (1985). Tyebjee and Bruno's study (1984) also discovered investment risk, management risk, competitive risk, implementation risk and Pandey (1996) study discovered market risk, product risk, and entrepreneurial risk. Of course, the criteria grouped under various risk factors are not exactly same.

The foregoing discussion suggests that high-tech ventures are fraught with many risks and need to identify and manage various sources of risk. Among them, the most dangerous sources of risk appear to be 'incapability risk' (being highest number of significant criteria clubbed under this risk). Though venture capitalists spend considerable time in assessing this risk, the subjective nature of assessment of this risk creates immense problem for them specially when the entrepreneur is a first generation entrepreneur. Nevertheless, there is need for honing the venture capitalists skills in assessing the capability of entrepreneurs in gathering resources and developing strategies appropriate for the market environment. Most venture capitalist feels that product and market risk are not prominent as they are specialists by industry. But when both product and market is new, infancy risk cause major concern.

4. Discussions and conclusions

Several interesting findings are observed from the study as follows.

1. The study disagrees with some of the earlier researchers (Sandberg and Hofer, 1987) who tend to discount the role of the entrepreneur in favor of other variables (such as resource-based capabilities, strategy and industry structures) in the success of a new venture. Our mean analysis, cluster analysis and regression model suggests that entrepreneurial quality play as critical role as other variables in the success of a new venture. In a start-up firm, it is the founders that gather resources and develop strategies to use them and to push the product through market. The resources alone are not sufficient to achieve competitive advantages and above-average performance. For them to occur, organization leadership must transform resources into rent achieving capability. It is ultimately the entrepreneur quality that impact resource-based capability and the strategy the firm select. They are inter-related as evidence from the grouping of many variables of resource-based capability, strategy and entrepreneurial quality under the factor one in our factor analysis.
2. The successful ventures appear to follow multiple patterns of strategic behavior, i.e. venture performance is superior when two or more competitive strategies are used in concert. The finding is remarkably consistent with the international evidence for new venture performance (Sandberg, 1986; McDougall, 1989). Among the four competitive strategies, customization strategy (emphasis on meeting unique customer requirement and tastes at shortest possible time) appears to work best on most of the performance measures used in the study. This result contradicts the

findings of the similar study on low-tech new ventures by Kakati, 1999, where it was found that customization strategy is least effective strategy in the low-tech new venture. In fact, the customization strategy in the low-tech ventures has severely affected profitability, retarded growth and business volume. This observation is intuitively plausible in that, relative to low-tech industries, high-tech industries can charge higher price premium for their unique and customized offerings as the prospective consumers may not be as cognizant of what constitutes a reasonable product price and therefore, price may not be as important a purchase criteria. In the low-tech industries the situation may be somewhat different. In low-tech industries consumers are frequently familiar with the product offerings and consequently, often have good sense of what the product 'should' cost. Relatively low prices give prospective consumers the impression that they will be getting a bargain price and therefore, firm cannot charge higher price even for unique and customized products. Hence, the customization strategy is less effective in low-tech but more effective in high-tech industries. Of course, data do not justify any specific conclusions relating to the relative effectiveness of customization strategy in low-tech and high-tech industries. Future research into this issue could be very worthwhile.

3. Much has been debated on the appropriate choice of strategies for a start-up firm. Some researchers support broad based strategies while entering growing markets and focus strategy while entering mature market. The other supports focus strategy in the early stage of products. Though this issue was not directly explored in our study, it tentatively suggests that choice of strategy should be linked to resource-availability with the firm in addition to the industry structure. Our cluster analysis shows that the failed ventures could not develop capabilities to backup any single strategy (lowest cluster scores in capability and strategic variables), whereas most of the successful ventures developed multiple resource-based capabilities to backup multiple-strategies (highest cluster scores in both). Multiple strategies are the logical choice provided the firm acquires multiple resources. Of course, it is difficult for many new ventures to develop multiple resources to effectively implement and to capitalize on broad breadth strategies. They (those with limited resources) should pursue focus/customized strategy with specialized products in market segments where customization and high levels of customer service create unique advantage or opportunity. Performance of a new venture is enhanced when there is a fit between firm's resources and strategies (Chandler and Hanks, 1994).
4. It appears that the development of new technology or product does not in itself guarantee commercial suc-

cess for firms operating in the high-tech industries. The presence of diversified skills and capabilities, in which technological expertise is balanced with business skills and capabilities in other areas such as marketing, input-sourcing, and general management, is the key determinant of success in technology-based start-ups. Furthermore, once the product is designed and developed up to a prototype and enjoys some protection, over-emphasis on technological side of the business or R&D efforts to make unique products may not lead to success. Rather, there should be a corporate transformation from a technology-driven to a market-led enterprise, in which technical, marketing, input sourcing skills and capabilities should be put together to produce products and services to meet unique/customized requirements of customer. It is not the unique product that is important for success. The most important is the meeting the unique requirement of customers. This is consistent with the view of some authors (Roberts, 1991; Berry, 1996) who propose that technology-based firms must undergo a transformation from a management philosophy of merely identifying profitable commercial markets for the company's R&D output to one that is market-driven with far tighter linkage being established between R&D efforts and identified market opportunities. The business must evolve from a primarily inward orientation focused upon technical inventiveness towards an outward orientation where management/entrepreneur increasingly devotes its attention to the needs of customers and the marketplace.

5. The relatively low explanatory power of the most of the previous new venture performance models suggests that the venture performance stems from forces not included in their studies. This study tried to use many more variables in the analysis from the review of past researches and from the interview of few venture capitalists. We, however, do not suggest that the study represents a complete picture of new venture performance. Neither can we claim that we exhausted every variable that impacts venture performance, in the administration of our questionnaire and interview. However, we can suggest that the traditional new venture model (that have dominated the academic research) must be extended to incorporate variables related to entrepreneurs, resource-based capabilities, strategies, industry/market structure, fit between resource availability and strategies, between market structure and strategies, and interactive effect of these factors. Though some efforts have been made recently [for example Chandler and Hanks (1994), the model exploring all these factors is yet to be tested. Hence, it may provide a fruitful stream of future research.

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