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# DETERMINANTS OF NEW VENTURE SUCCESS BEFORE 1982 AND AFTER A PRELIMINARY LOOK AT TWO ERAS

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## Abstract

This expansion of our prior studies (Roure and Keeley, 1989a, b) uses data from 68 technology-based firms, whose business plans were obtained from four venture capital firms. For 34 firms started prior to 1982, success can be predicted ($R^2$=0.50) by three variables representing management, strategy, and industry. The 34 firms that started later behave differently. Returns are substantially lower, variation is less and returns are barely predictable, despite consistency in the explanatory variables. Plans from each venture capital fund follow the same pattern. We believe that such a dramatic shift represents more than an increase in funds available for investment: the nature of competition must have changed in ways not reflected in the business plans.

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# DETERMINANTS OF NEW VENTURE SUCCESS BEFORE 1982 AND AFTER A PRELIMINARY LOOK AT TWO ERAS

## 1. Introduction

In prior studies (Roure and Keeley, 1989a, b) we examined the predictability of success or failure in new, technology-based ventures with very high growth potential. Similar studies (e.g., Stuart and Abetti, 1987, and Van de Ven, Hudson, and Schroeder, 1984) had examined small, technology-based firms with some success, although the results were not entirely consistent. Sandberg and Hofer (1987) studied 17 firms from various industries which sought venture capital and found that aspects of the industry and business strategy correlated with success though their measures of entrepreneurship did not.

We believe that firms with high growth potential have special importance. They have a sizeable impact on the economy, and they may have special value for organizational researchers. They are big enough that their futures do not rest on the vagaries of a single event or person, as may be true with small ventures. Their strategies and markets are similar to those of large firms, but they are simpler and have a defined beginning from which to trace causes and effects.

Based on those studies (cited above) of smaller firms, we hypothesized that management, industry and strategy would all influence success. Any new firm has a limited amount of time in which to establish itself, but a firm which hopes for a sizeable share of a major market must move rapidly on a broad front (establishing manufacturing, obtaining follow-on funding, building the organization, broadening the customer base, developing additional products, etc.). Thus we expected that successful, high potential ventures would have combinations of management, markets, and strategy conducive to rapid, effective expansion. We further expected that the need for speed would impose a certain uniformity, dominating the contingent relationships which normally are an important part of strategy.

A pilot study using the business plans of eight new ventures (Roure and Maidique, 1986) indicated that some simple measures (e.g., the number of potential customers) adequately described a firm's key attributes. That is, they were strongly related to performance in the direction predicted by theory. Based on this, the second author collected similar data for an additional 28 firms. In total 34 firms came from the files of a single venture capital firm (two were carried over from a second firm) and represented essentially all of its start-up investments during the 1974-1983 period.

The sample of 36 was analyzed with a multiple regression model (Roure and Keeley, 1989a, b), a model implying that success stems from a weighted sum of the explanatory variables. That is, strength in one area can substitute for weakness in another. Success was measured by the internal rate of return realized by all shareholders (founders, employees and investors) on all invested funds. Though rarely available, such a measure is conceptually much stronger than accounting or subjective measures (it is the quantity which the other measures attempt to reflect). The ordinal nature of the regressors might be expected to produce many specification problems (non-linear relationships, heteroscedasticity, etc.), but the results were surprisingly well behaved. The results may be summarized as follows:

- Attributes of the management team, the business strategy and the industry all contributed to performance. Certain attributes attained optimum values at interior points as hypothesized. For example, a potential customer base of 100 was better than one of 10 or 1000, and a product development cycle of 11 months was better than one of 3 or 24. A combination of five variables (two of which were quadratic combinations) produced an adjusted $R^2$ of 0.72.

- No attributes (of those measured) of the "entrepreneur" – the leader of the founding team – influenced success. We included education, prior experience in the industry, functions in which the person was experienced, and prior general management experience.

- The use of special "entry wedges" [Vesper's (1980) term] contributed to success.

- The strategy chosen had an effect, contingent on the stage of the market. Narrow (focused) strategies were better than broader (e.g., differentiated) strategies if the market was in a pre-commercial or developmental state. Though somewhat surprising (Sandberg and Hofer, 1987, hypothesize the opposite) we suspect this reflects an advantage in dealing with existing customers when a market is at an early stage. Broader strategies may position a firm for a longer term which never arrives.

- No differences based on industry could be detected.

Based on the promising results we expanded the sample in order to determine whether the results would extend across investment groups, and across time. With the larger sample we hoped to find other important influences, such as industry effects.

## The Sample

Three additional venture capital groups agreed to assist with the study, making a total of four (one had been in the pilot study and had provided two business plans). Three had been venture capitalists for over a decade, one was a new fund. The four all had similar objectives. They emphasized early investments (startup or first stage) in technology-based companies. Each co-invested with the others from time to time. All expressed similar investment criteria; that is, they wanted to invest in experienced managers with a proprietary technology targeted at a rapidly growing market. We believed they would provide a relatively homogeneous sample of new ventures. To limit their time commitments we asked them to select a block of consecutive investments in startup companies beginning in 1980 or 1981, and to provide data on at least ten companies. The purpose of stipulating a block of companies was to minimize any selection biases.

The three funds provided data on 34 new firms, making a total of 70. All are technology-based and intended to grow rapidly. Two have grown to over $2 billion in annual sales, and several are well above $100 million. Eleven have been total losses.

The data collected are summarized in **Table 1** (for a detailed discussion of our reasons for using these measures see Roure and Keeley, 1989b). They include several descriptions of the founders, of the initial business strategy and of the firm's target market; however, they are somewhat more limited than the data available for the first 36 ventures (lacking a description of the competitive strategy and biographical data on the firm's CEO). The variables are selected to minimize the judgment required in collecting the data. The ones requiring the most judgment (e.g., the superiority of the proposed product) use simple criteria to decide among alternative values. In this way we planned to maximize the uniformity of the data across researchers. The data are archival; they come from business plans written before the firms began. They are subjective, but most measures deal with relatively factual matters (such as who the firm's competitors and expected competitors are). Thus we feel they are as objective as is possible with a new firm.

The data include the investment history of every company. The most recent investment transaction (up to the first public offering or to an acquisition) sets a "terminal" value for purposes of calculating an internal rate of return – that is, the last transaction sets the value of the company at that date. The use of market values is somewhat unusual in organizational research in part because such values are usually impossible to obtain. This is particularly true of new ventures which are financed in private (but competitive) markets. The conceptual advantage of a market value is easily stated: when used with earlier investments it shows the performance of the firm to that point. All other measures (e.g., profits, return of book value of equity) are merely indicators of trends in market value. By using the actual performance, we eliminate the "noise" inherent in traditional performance measures.

## Results

This study has two objectives: to determine whether our earlier results extend to investment choices of multiple venture capital investors, and to determine whether the initial results (for which 80% of the firms were begun prior to 1982) carry into the 1982-1984 period without change. If so we would have increasing confidence that the results have identified enduring criteria for success in new, high performance, technology-based ventures.

The initial test, a multiple regression which had strong explanatory power for the initial sample, immediately showed that our earlier results would not be repeated. The variables, which had produced an adjusted $R^2$ of 0.60 on our first sample, have essentially no explanatory power for the new sample. Further study suggested that the difference resulted from the heavy representation of firms founded prior to 1982 in our first sample, and the emphasis on younger firms in the newer sample.

Accordingly we divided the sample roughly in half, depending on whether or not a firm received its first funding prior to October 1, 1981, and discarded any firm from the latter half which had a public offering in 1983 (there was one) in order to isolate firms which matured in the mid-1980's from those maturing earlier. We subsequently discarded one additional firm from the latter half which exhibited high leverage in our initial tests. This left 34 firms in each sample.

The early sample is predominantly from the venture capitalist who provided the initial data ("Venture Capitalist 1"). The later sample is evenly represented by all four venture funds with 7 to 10 ventures each. **Table 1** compares the two, showing mean values and standard deviations of the management, strategy, industry and performance measures. Differences between the two were tested using F tests, Chi Square tests, or Kruskal-Wallis tests, depending on the nature of the variable. The two samples are strikingly similar in all respects except performance. Seven of the 25 measures show statistically significant changes but, of these, only competition is a predictor of performance in the early sample. On the whole, the earlier and later samples seem very much alike.

## Table 1

Comparison of Early and Late Samples

| | UNITS | MEAN VALUE | | | STD. DEV., | | | TEST |
|---|---|---|---|---|---|---|---|---|
| | | EARLY (N-34) | LATE (N-34) | | EARLY | LATE | | |
| MANAGERIAL VARIABLES | | | | | | | | |
| Team Completeness (X1) | % | 69.7 | 68.7 | | 21.4 | 25.4 | | F,B |
| Similar Experience | % | 83.3 | 72.1 | + | 22.2 | 27.8 | | F,B |
| High growth Experience | % | 83.6 | 66.8 | * | 28.0 | 35.6 | | F,B |
| Joint Experience | % | 51.9 | 37.9 | + | 28.9 | 29.1 | | F,B |
| Founders' Share of Stock | % | 45.4 | 48.6 | | 18.7 | 15.6 | | F,B |
| INDUSTRY CHARACTERISTICS | | | | | | | | |
| St age(X2° 1 or 0) | 1-5 | 2.5 | 2.4 | | 0.9 | 0.7 | | C,B |
| Competition (X3) | 1-5 | 3.0 | 3.6 | * | 1.1 | 1.3 | | K,B |
| Growth | %/yr | 37.4 | 53.6 | * | 17.8 | 32.5 | ** | F,B |
| Future Barriers | 1-5 | 2.6 | 2.7 | | 0.8 | 0.7 | | K.B |
| Buyer Concentration | 1-5 | 2.9 | 3.0 | ** | 1.1 | 1.5 | + | C,B |
| Segmented – Features | # | 9 | 11 | | | | | C |
| Customers | # | 11 | 3 | | | | | C |
| Both | # | 11 | 14 | | | | | C |
| COMPETITIVE STRATEGY | | | | | | | | |
| Product – Superior? (X4) | 1-5 | 3.4 | 3.5 | | 1.1 | 1.0 | | C,B |
| – New vs. Imitative | # | 13 | 17 | | | | | C |
| – Development Time (X5) | Mo. | 11.5 | 13.5 | | 5.7 | 6.9 | | C,B |
| Plan Quality' | 1-5 | 3.3 | 2.9 | | 1.3 | 1.2 | | C,B |
| Projected Mkt. Share | % | 14.5 | 14.5 | | 16.8 | 14.6 | | F,B |
| Entry Wedges | #/co. | 0.5 | 0.7 | | | | | C |
| Second Source | # | 2 | 6 | | | | | C |
| Cust. Sponsor | # | 2 | 6 | | | | | C |
| Govt. Regs. | # | 1 | 0 | | | | | K |
| Supply Shortage | # | 7 | 4 | | | | | C |
| New Mkt.Channel | # | 5 | 7 | | | | | C |
| New Market & New Product? | # | 6 | 12 | + | | | | C |
| OTHER | | | | | | | | |
| Industry Dummy Variables | 1-8 | | N.S. | | | | | K |
| Initially public in 1983 | # | 7 | 0 | ** | | | | K |
| Company Became Public | # | 13 | 8 | | | | | |
| Time in Portfolio | yrs. | 5 | 4 | * | 2 | 1 | ** | F,B |
| IRR – All $ (Y1) | %/yr | 93 | 18 | * | 176 | 71 | ** | F,B |
| IRR to Investors | %/yr | 64 | 1.5 | * | 140 | 58 | ** | F,B |

Notes:

1. Variables which are repressors in equations 1 and 2 are identified as X1, X2, etc.
2. Statistical significance is p<0.01 (**). p<0.05 (e), p<0.10 (+).
3. Statistical tests: B= Bartlett's test (of variance). C- Chi Square test, F- F test, K& Kruskal-Wallis test.

We repeated the comparisons of **Table 1** across the four venture capital firms for the later sample (for brevity the results are omitted, although they are available from the authors upon request). Statistically significant differences appear (above a 10% level) on eight of 25 measures, of which team completeness and product superiority are important explanatory variables (for the earlier sample). Performance differences are not statistically significant. The differences among the four groups do not show any patterns which would result from differing investment strategies. For example, the portfolio of a venture capital firm specializing in very young companies might have less complete, less experienced management groups; early stage markets with relatively little competition; relatively long development cycles; a high proportion of new products; and frequent links to customer sponsors. No such patterns are in evidence; the differences appear random.

We suggest that the sample is essentially homogeneous with respect to managerial, industry and strategy variables. This homogeneity extends across venture capital firms and over time. But performance changes dramatically from the early period to the later one, shifting from an annual average IRR of 93.3% in the early sample to 18.7% in the late sample. In addition, the attributes which predicted performance well in the early sample no longer predict it nearly as well in the later one.

The early sample is somewhat different from the one on which our prior studies are based. Nine investments of Venture Capital Company 1 are shifted to the later sample and are replaced by a total of seven investments from Venture Funds 2 and 3. The resulting sample of 34 new ventures still shows a strong relationship between performance and managerial, strategy and industry variables as shown in equations (1) and (2). In both expressions, the explanatory variables represent the three areas of management quality, business strategy, and industry structure – a finding which we have consistently found in our earlier work. Limited efforts failed to find any contingent relationships (e.g., segmentation of markets by both customer groups and product features is detrimental in a developmental market) which might further explain performance. Equations 1 and 2 remain consistent with our hypothesis that the dominant consideration for a high potential, technology-based firm is to be able to move quickly with a proprietary product into a well defined, growing market.

$$Y_1 = 117.5+3.09\ X_1 +86.0\ X_2 - 58.4\ X_3+35.4\ X_5 - 1.73\ X_5^2 \qquad (1)$$
$$(-0.83)\ (2.64^{*})\quad (1.75^{+})\ (-2.36^{*})\qquad (F[2,28]=2.79^{+})\qquad \text{adj } R^2=0.50^{**}$$

$$Y_1 = -446.0+3.76\ X_1 +85.1\ X_2 - 66.7\ X_4 \qquad \text{adj } R^2=0.55^{**} \qquad (2)$$
$$(-5.24)\ (3.64^{**})\qquad (2.19^{*})\ (3.48^{**})$$

Note: t statistics are in (). $p<0.10$ (+); $p<0.05$ (*) $p<0.01$ (**).

The later sample behaves differently. A split sample test, applying the relationships from the early period to the later one, is barely significant. Multiple regressions similar to equations 1 and 2 show no relationships in the later sample. Dummy variables based on industry or investor show no effects – also true for the early sample.

The forces promoting success or failure in new, technology-based ventures seem to have shifted dramatically in the early 1980's, and the stability of the investors' behavior suggests that changes were not apparent at the time. "Discontinuous" changes in industries have been discussed many times (e.g. Drucker, 1969; Mensch, 1979), and are widely thought to influence entrepreneurial opportunities.

We have two related questions. Why the change in performance? Why the change in predictability? Several possibilities exist including:

1. *The 1983 New Issue Market:* The early performance results from an unusually highly priced new issue market in 1983 which the early firms could use, but the later ones could not (because they were just getting started).

2. *Overpricing by Venture Capitalists:* The enormous growth of venture capital during the 1980's has led to overpricing ("too much money chasing too few good deals") and low returns.

3. *Increased Competition:* The growth of venture capital has led to many new entrants in every new market with a resulting decrease in survival rates and a sacrifice of resources in competitive battles.

4. *Changed Competition:* Changes in competitive forces mean that a firm can no longer succeed by following previously successful practices (such as having a complete management team). Competition has moved into new realms and the old variables no longer have any predictive ability.

5. *Maturing Technologies and Markets:* Broad market opportunities for new firms, based on the emerging high performance microprocessors, were disappearing by 1981. Evolution in new markets was toward more specialized products. Such markets have diverse requirements. Broad measures of a firm's attributes are no longer useful. Management, strategy and industry are still relevant, but the measures must have a finer focus, and be more adapted to each industrial situation.

We consider changes in returns first because they may give some insight about any changes in competitive forces. **Table 2** presents several additional measures of financing histories in both samples. It includes a column in which the estimated effect of going public during the 1983 IPO market is removed. [1]

**Table 2** shows that the difference between the two groups stems from lower profits on the winners in the late sample, not from more losers. The number of losing investments is identical. Removal of the estimated effect of the 1983 IPO market (7 firms in the early sample were in this group) narrows the difference between the groups, but the average payoff on investment by any of our several measures remains higher for the early sample. We cannot attribute the performance of the early sample solely to the 1983 IPO market.

Equations (1) and (2) change very little when we remove the estimated effect of the 1983 IPO market – goodness of fit remains the same and significance levels of the coefficients change very little. We conclude that the strong explanatory power of management, strategy and industry variables in the early sample is not an artifact of the 1983 IPO market.

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1 We treat any company having an initial public offering between September 1982 and April 1984 as falling into the 1983 IPO market – a period of high activity and high prices by comparison with prior or subsequent times. Seven of the 21 public companies in these samples (i.e., 7 of 13 from the early sample) are in the 1983 IPO market. We estimated the difference between the 1983 market and just being a public company as the difference between the dummy variable for going public in 1983 and the dummy variable for going public at another time. For the variables expressed as multiples on investment (rather than rates of return) we used logs of the multiples because such multiples are roughly log normally distributed. In addition, we lowered one value in the 1983 group whose multiple on investment was well over 2000, setting it equal to the second highest value in the combined samples which was about 45.

## Table 2

Financial Histories of Early and Late Samples

| | UNITS | EARLY | | 1983 IPO Adjustment | | LATE | TEST |
|---|---|---|---|---|---|---|---|
| CHANCE OF LOSS | | | | | | | |
| IRR <O | (%) | 32 | | | | 32 | |
| INVESTMENT/FINAL/VALUES | | | | | | | |
| Final Value – Mean | $,K | 75,447 | | 44,879 | | 50,879 | F |
| – S.D. | $,K | 98,542 | | 47,980 | ** | 78,701 | B |
| Initial Investment | $,K | 1,218 | ** | | | 2,412 | F |
| Total Investment | $,K | 14,146 | | | | 17,587 | F |
| PERFORMANCE | | | | | | | |
| IRR – All $ – Mean | %/yr | 93.3 | * | 41.6 | | 18.7 | F |
| – S.D. | %/yr | 176.3 | ** | 117.8 | ** | 71.2 | B |
| Multiple on Total Inv. | | 6.0 | ** | 4.0 | (+) | 2.5 | F |
| Multiple on Initial Price | | 9.5 | * | 7.4 | (+) | 3.7 | F |
| INVESTMENT/DATES/ROUNS | | | | | | | |
| Date of First Financing – Ave. | Mo/yr | 9/79 | ** | | | 6/82 | F |
| Terminal Date – Ave. | | 8/84 | ** | | | 6/86 | F |
| Time (Terminal – First) | yr | 4.93 | * | | | 3.98 | F |
| Rounds of Financing | | 5.26 | ** | | | 4.15 | K |

Notes:

1. Adjustment for 1983 Initial Public Offering stems from regression:
   Performance = Constant+ a (Public but not 1983) + (Public During 1983)
   Performance is "IRR – All $" or log ("multiple on price", log ("Multiple on total investment").
   Adjustment is (a-b) which shifts the IRR by -100%, and multiplies the "Multiple of Total investment" by .386 and "Multiple of Initial Price" by .662.
2. Statistical significance is p<0.01(**), p<0.05(*), p<0.10 (+).
   Comparisons are with the late sample
3. Statistical tests are
   B = Bartlett's test (Variance equality)
   F = F Test
   K = Kruskal – Wallis Test

**Table 2** does not show dramatic changes in funding patterns, although the amount invested in the first round is up significantly. If we make an allowance for the different ages of the two groups, and for the rapid inflation of the early 1980's, the funding patterns in real dollars appear very similar.

Overall, we conclude that performance decreased from the early group to the later group, and the decrease was mainly attributable to having fewer "big winners." Funding patterns look largely unchanged which adds to the consistency observed in **Table 1**. Although the amount of venture capital activity changed a great deal between the two periods, the quality of the investments, as measured by the characteristics of **Table 1**, does not appear to have changed. Nor is there evidence of excessive amounts being invested during the later period. We remain in

a situation where the two groups appear very similar except that performance can be predicted well in one case and not at all in the other. As possible explanations, we may consider whether opportunities changed or whether the nature of competition changed.

Opportunities may have changed. The introduction of 16-bit microprocessors in the late 1970's accelerated the growth of personal computers and made the low-cost workstation possible. These in turn created needs for higher-capacity peripheral equipment, networks, and software. In turn, the use of workstations in circuit and in semiconductor design facilitated the growth of new sectors of the semiconductor industry. Independently, the biotechnology revolution was just beginning. Conceivably the 1978-1981 period (in which the early sample is concentrated) offered better opportunities for new ventures than the 1982-1984 period (in which the later sample is based). If opportunities were dramatically different, the criteria for success might also be.

To test the possibility that opportunities had changed, we collected two further items on every company in the sample:

- The projected market size four years after first funding (rated on a five point scale with one being less than a $75 million annual market and five being a market of over $2 billion).
- The "scope" of the enterprise with respect to product breadth and complexity and with respect to the number of types of customers (also a five point scale using the average of the two ratings). One was assigned to companies with a single product using a single technology intended for a single customer group. For example, a blood sugar monitoring system for home use received a score of one. Five was assigned to firms which used several technologies in a broad product line which was sold to many types of users. An example would be a scientific workstation company which sold directly to end users.

If opportunities had diminished, we believed the later sample would shift toward smaller markets and less "scope". **Table 3** presents the mean values and variances of these measures. The changes are negligible. This, combined with the absence of changes in industry composition or market characteristics as detailed in **Table 1**, continues to show a remarkable similarity between the two groups.

## Table 3

Comparison of Market Size and Business Scope between Early and Late Samples

| | | EARLY (N—34) | LATE (N—34) | TEST |
|---|---|---|---|---|
| Market Size | -mean | 2.88 | 3.18 | F |
| | -std. dev. | 1.15 | 1.11 | B |
| Business Scope | -mean | 3.12 | 3.12 | F |
| | -std. dev. | 1.17 | 1.04 | B |

Note: F – F test, and B – Bartlett's test for variance equality. Differences were not significant at $p<0.10$.

Even if market opportunities remained the same, the nature of composition could have changed, as a very simple model of a firm's value will illustrate. Assume that market value (V) a few years after startup equals a constant (K) multiplied by annual sales (S). Sales in turn is simply the total market (M) multiplied by the market share (sh). Finally, let market share of firm 1 ($sh_1$) equal a "figure of merit" ($FM_1$) for firm 1 (as given, e.g., by equation 1 or 2) divided by

the combined figures of merit of its competitors. (i=2,...N). The market value in this simple case is shown as equation 3.

$$V_1 = K \bullet S = K \bullet M - sh_1$$
$$= K \bullet M \bullet FM_1/(FM_2 + FM_3 + ....+FM_N) \quad (3)$$

Equations 1 and 2, which predict performance well in the early sample, treat the denominator of this expression as being independent of the numerator, and look only at $FM_1$ (our competition variable is a reflection of the size of the denominator, but it looks mainly at the number of competing firms and not at their total strength). That is, variations in the competitive response of existing firms or other new entries contribute only to the unexplained error, provided the total competitive response is independent of the quality of the firm in our sample ($FM_1$). If the response has a strong positive correlation with $FM_1$, it will lose its predictive ability. Or, if the average value of the denominator were to increase between the early and late samples, that would also diminish the usefulness of FM1 as a predictor of performance in the later sample.

The time period of this study was one in which venture capital activity grew rapidly. Venture *Capital Journal* recorded an average of 66 seed and startup investments annually between 1978 and 1980. This exploded to 223 in 1981 and reached 343 by 1984, increasing the tendency for multiple new ventures in the same markets. If such startups occurred within a short period, they might fail to be aware of each other during business plan preparation and thus our competition measure would understate the situation each would find upon reaching the market. Alternatively, if some new firms were already known to be in the market, we might find subsequent entries choosing management and strategy parameters which will allow them to outperform the early entries. This will create a positive correlation among "figures of merit" and will undermine our predictors. An increasing awareness by established competitors of the threat posed by new ventures could also contribute to an increase in the competitive response experienced by firms in the later sample.

The increased competition would lead to decreased returns as we observe. The absence of a change in the failure rate could be explained by the increased funds available coupled with the fact that most of our markets are segmented. Thus the firms might be able to reposition themselves and survive – though such changes in their plans would require extra investment and would probably lead to lower sales than originally planned.

Changes in competition of the type described in equation 3 still imply importance for the variables which make up $FM_1$ – the explanatory variables from our earlier studies. Alternatively, competition could have changed such that new forces have replaced the ones which we measured. For example, intangible qualities of the management team, rather than completeness, may be what determine success in the later sample. Similarly, one venture capitalist suggested that financial strength may have become important, and essentially overpowered all other previous determinants. Our data set does not include intangible qualities so we cannot address that possibility, though it remains difficult to understand why the old explanations would not continue to be of some importance. In the case of financial strength we tested funding levels against performance and found only the mild negative effect which one expects (because the amount of funding is the "denominator" of the performance measures).

Another change in competitive forces would cause strategies and market characteristics to depend much more on the individual case. Broad measures such as product superiority (based on technical attributes) or buyer concentration would no longer be adequate. We suspect that

such changes occurred, but have not been able to find combinations of market stage, industry, and other variables which have differential success rates. With a sample of 34 we cannot create many subdivisions before our numbers are too low for useful statistical tests. It may be that a larger sample would show some groups in which various combinations of the old explanatory variables are effective, or in which a new set of variables will predict performance.

Our tentative explanation, a change in competitive response and a shift toward more intangible, more industry specific determinants, should be verifiable in a longitudinal study of the sample which we hope to conduct in the near future.

## Conclusion

If competitive response (as described by equation 3) explains the loss of predictive power of our model, the findings of our earlier (Roure and Keeley, 1989a, b) study remain important. The explanatory variables still influence success, though they are not sufficient in themselves. One must also take account of the competitive dynamics in a given market, and recognize that capital market forces can cause simultaneous shifts across industries.

On the other hand, if the determinants of success have changed, perhaps moving to less tangible qualities, then the period of the early sample represents a way station in a rapid competitive evolution. It remains interesting as a stage in which results were explainable with relatively simple theories and measures; a stage in which one model was valid across a range of technology-based industries.

In any case our earlier results are a point of departure for developing and testing theories of competitive evolution. The traditional static economic analysis (that an increase in capital supply leads to more investment, increased competition and lower returns) fails to explain why our generic characteristics of a successful competitor lose their power to establish relative rankings. Most theories of competitive evolution or organizational evolution center on the lifecycle of a product or industry as a driving force. This study represents a situation where an important change occurred even though our “lifecycle” measures of industry stage, size and scope remained constant.

The contrast between the two periods highlights a challenge for investors and entrepreneurs alike. In order to make reasonable judgments about new industries one must have some model of common requirements – a model which remains constant even though the underlying businesses are in turbulent, discontinuous environments. Such models tend to evolve slowly because the results of each new investment are only known after a period of years. This is one reason why our two samples are so similar with respect to management, strategy and industry measures. If the changes which occurred between our two samples have continued, a slowly evolving model can never provide reasonable guidance for decisions. The problem is how to find a replacement.

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