THE PERSONALITY AND MOTIVATIONS
OF TECHNOLOGICAL ENTREPRENEURS

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ABSTRACT

Despite increasing studies of the family and career backgrounds of technological entrepreneurs, little is known of their personality and motivations. Empirical analyses carried out as part of a twenty years research program on technology-based enterprises adds to our knowledge of these entrepreneurial characteristics. From a personality perspective technical entrepreneurs are found to be more extroverted, more intuitive and more thinking oriented than their less entrepreneurial engineering and scientific colleagues. Motivational studies show wide ranges of basic needs within the technical entrepreneur population. Most important is the clear evidence that not all technological entrepreneurs have high need-for-achievement (n-ach), despite common assumptions of this particular drive. The median technical entrepreneur has moderate need for achievement, moderate need for power, and low need for affiliation. Most technical entrepreneurs seem to be fulfilling a long felt need (or at least ambition) in starting their companies, reflecting at least several years of prior general contemplation about going into their own businesses. They reveal primarily a heavy orientation toward independence, being their own boss, some reflection of a continuing search for new and bolder challenges, and considerably less focus on financial gains than might be expected.
Since World War II the formation and growth of myriad new technology-based firms has become a unique characteristic of the United States, regarded by many as the well-spring of post-war U.S. economic growth and industrial leadership. Indeed, worldwide interests in replicating patterns similar to U.S. technological entrepreneurship in their own countries have rapidly increased during the 1980s, even as U.S. international competitive effectiveness has waned. However, during these several decades the opportunities presented by advancing technology have not been seized by all American scientists and engineers. Very few of the millions of individuals highly trained in existing technology have taken those steps needed to organize and launch a technological enterprise.

Increasing numbers of studies are examining the personal backgrounds of entrepreneurs, especially those who are technology-based, and the nature of the organizations that incubate them. (Cooper, 1971; Roberts, 1968; Sexton and Smilor, 1986; Utterback et al., 1988; Van de Ven, Hudson and Schroeder, 1984) Age, education, family background and work experience data have been gathered from entrepreneurial interviews and questionnaires. Few researchers, however, have carried out the detailed testing necessary to get at the underlying personality and motivational dimensions that might shed light on the behavior and drive of these key individuals. This article reviews the related literature and provides new empirical evidence on the personality and motivation of the founders of advanced technology enterprises.

THE ENTREPRENEURIAL MYSTIQUE

Until recently the creators of new enterprises have been treated in the literature only in the folkloric tradition of Horatio Alger. Extensive accounts of the lives of men like J.P. Morgan, Andrew Carnegie, and the Rothchilds produce a feeling for the spirit and mystique of these capitalist giants. However, with a handful of exceptions, modern entrepreneurship has not been subjected to careful empirical examination. Three early works by McClelland, Hagen, and Collins and Moore provide a backdrop for more recent explorations.

David McClelland (1961), primarily a social psychologist, ties the entrepreneur to the elements of economic change and growth, his writings being strongly oriented to those psychological characteristics of
entrepreneurs that make them likely to become business innovators. Everett Hagen (1963) is an economist with a sociological bent, interested in explaining economic growth by the presence in societies of what he calls innovational personalities. With a strong empirical but psychological orientation Collins and Moore (1964) discuss the origins and experience of entrepreneurs.

McClelland sees the entrepreneur as the one who translates need for achievement (n-ach) into economic development. The entrepreneur in McClelland’s scheme is "the man who organizes the firm (the business unit) and/or increases its productive capacity." (p. 205) McClelland’s underlying assumption is that entrepreneurs have a high n-ach which will lead them to behave in certain ways in business situations. A crucial element in almost any business situation is decision making under uncertainty, a circumstance in which some degree of risk is necessarily present. The entrepreneur, driven by his need for achievement, tends to undertake courses of action that have moderate risk characteristics, rather than those at either end of the risk continuum. The rationale for such behavior lies in the satisfaction expected from the different risk-associated decisions. In the situation with complete certainty as to outcomes, the individual making the decision derives little satisfaction of his need for achievement because of the predetermined nature of the solution. McClelland claims that entrepreneurs thrive on situations in which they can get a sense of personal achievement through taking responsibility for success and failure. In the pure chance situation, like winning a lottery, the individual making the decision again derives little satisfaction of his need for achievement because of the lack of effect of his own skill on the outcome. Since almost by definition failure is more probable in extremely high risk settings, the entrepreneur is unlikely to attain his goals in such cases, thereby also frustrating his high n-ach. The outcomes of decisions with moderate risk are dependent on a mixture of skill and chance and thus are most apt to satisfy the high n-ach entrepreneur, according to McClelland.

Entrepreneurs according to McClelland tend to work hard and to do things in an innovative rather than traditional manner. They work harder when there is a challenge and when the completion of work to be done requires ingenuity rather than standard procedures. But they require concrete
feedback in the form, for example, of production volume or profit as measures of how well or how poorly they are doing. Entrepreneurs are future oriented in that they tend to think ahead more in their decision making. Lastly, entrepreneurs are coordinators of the efforts and activities of other people. In most cases they must be effective in leading the work of others if they are to be effective at all in their entrepreneurial endeavors.

Winterbottom (cited in McClelland, p. 46), in a study of 29 eight year old boys, determined that mothers of high n-ach boys had different attitudes toward child-raising. The mothers of the high n-ach boys expected their sons to master earlier such activities as knowing their way around the city, being active and energetic, trying hard for things for themselves, making their own friends, and doing well in competition. The mothers of the low n-ach boys, on the other hand, imposed more restrictions such as not wanting their sons to play with children not approved by the parents and not wanting them to make important decisions by themselves. Many such studies indicate that careless or indulgent parents who do not expect great things from their children clearly contribute to a child developing low n-ach. A child growing up in an environment which is strictly controlled or rigidly authoritarian will probably have a lower n-ach than the child who is reared in a less structured manner. (pp. 351, 352)

McClelland argues that one of the strongest factors directly associated with the development of n-ach are parental values, indicated strongly by their religious orientation. His data and those of others demonstrate differences in n-ach among the three primary religions in the United States. (pp. 356-362) In *The Achieving Society*, McClelland concludes (pp. 361, 365):

1. More traditional Catholics appear to have some of the values and attitudes that would be associated with lower need for achievement.
2. Other groups of Catholics exist, at least in the United States and Germany, which have moved away from some of these traditional values toward the "achievement ethic".
3. There is little doubt that the average need for achievement among
Jews is higher than for the general population in the United States at the present time.

Everett Hagen, in his book *On the Theory of Social Change*, defines entrepreneurship as "... the organization of a group of human beings into a going concern that carries out a new concept." (p. 87) He, like McClelland, attempts to explain economic growth by the characteristics of entrepreneurial groups of people. However, he considers much more than n-ach as integral to economic development. In his study of economic growth in Colombia Hagen found that one particular group of people, the Antioquenos, were, more frequently than any other group, founders of substantial enterprises. Using the Thematic Apperception Test (T.A.T.), Hagen compared a group of Antioqueno businessmen with a group of community leaders from another Colombian region. To a high degree the Antioquenos manifested needs for autonomy, order and achievement. Hagen suggests that these personal characteristics increase the likelihood that the individual will be an innovator which in turn increases the likelihood that he will be successful as an entrepreneur.

One of the few modern empirical investigations of U.S. entrepreneurs is the Collins and Moore study, *The Enterprising Man*. In-depth interviews and Thematic Apperception Tests were used to determine the psychological motivation behind entrepreneurs' behavior. Unfortunately from our interest, the 150 business initiators studied were seldom involved in technology-based companies, most being shopkeepers or operators of small service businesses.

They found that entrepreneurs tend to subscribe to the Protestant Ethic, (Weber, 1956) a value system that stresses hard work and striving to produce an earthly, i.e., pre-heavenly, reward. According to Collins and Moore, entrepreneurs do not have aspirations of moving up the social hierarchy and do not seem to need to achieve positions of authority. They have an obsessive drive to push themselves even harder, what we often call "workaholics". They tend to overextend themselves in their activities within the business, but rarely have feelings of love for it. Accomplishment of goals within the business are rarely satisfying for long and the need to undertake new problems or endeavors is obsessive. Collins and Moore found entrepreneurs to be patronizing with their subordinates, usually seeing them as either eager
and industrious or sloth and rebellious. Authority is a difficult area for the entrepreneur. He is unwilling to submit to it, unable to work with it and has a strong need to escape it. This is thought by Collins and Moore to arise from the entrepreneur's childhood perception of the male authority figure as cold and unsupporting but possessing awesome power.

Collins and Moore conclude that their non-technical entrepreneur's relationship to adult figures, more than any other single factor, makes him different from an organization man. The entrepreneur cannot easily accept another's leadership and cannot exist in a situation where his behavior is controlled and dictated by others.

OVERALL SAMPLE SELECTION AND DATA COLLECTION

Technical entrepreneurs cannot be described solely in terms of their fathers' careers or their own educational and work backgrounds, as has been done in recent studies. The personality and motivations of the entrepreneurs themselves form a critical part of the entrepreneurial phenomenon, and any attempt to describe which individuals become entrepreneurs would be grossly incomplete without at least some concern for these issues, however "soft" our methods might have to be in this area. Three different sources of information help us to define these entrepreneurial characteristics: two sets of psychological tests, one aimed at specifying personality and behavioral preferences and the second focused on needs and motives; and structured interviewing of all the entrepreneurs, inquiring as to their reasons for starting their businesses. These data were related in our analyses to other aspects of formation and growth of the technological enterprises.

The data presented here are part of a twenty years study of all aspects of the formation and growth of high-technology new enterprises, including more than 40 separate but related research studies. Elements of the data collected in fifteen of those studies (shown in Table 1) are used in this article, covering information from several hundred firms founded by former employees of MIT major laboratories and engineering departments as well as by the former employees of a government laboratory, a major non-profit systems engineering organization and two large technological corporations. In addition, as part of this overall research effort specific studies were
Table 1. **Data Sources for Entrepreneurial Personality and Motivation Study** *

**A. Basic Information on Entrepreneurial Spin-offs from Technological Source Organizations**

<table>
<thead>
<tr>
<th>Sources of New Enterprises</th>
<th>New Companies Identified</th>
<th>Participants in Research Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT major laboratories (4 studies)</td>
<td>107</td>
<td>96</td>
</tr>
<tr>
<td>MIT academic departments (5 studies)</td>
<td>74</td>
<td>60</td>
</tr>
<tr>
<td>Air Force Cambridge Research Laboratory</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>MITRE Corporation</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Electronic systems company</td>
<td>45</td>
<td>39</td>
</tr>
<tr>
<td>Diversified technological company</td>
<td>58</td>
<td>23</td>
</tr>
<tr>
<td>Totals</td>
<td>305</td>
<td>238</td>
</tr>
</tbody>
</table>

**B. Psychological Analyses of Entrepreneurs**

<table>
<thead>
<tr>
<th>Tests</th>
<th>Individuals who Participated in Research Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thematic Apperception Tests (TATs) of high-technology entrepreneurs</td>
<td>51</td>
</tr>
<tr>
<td>Myers-Briggs tests of participants in MIT Enterprise Forum and 128 Venture Group</td>
<td>78</td>
</tr>
<tr>
<td>Total</td>
<td>129</td>
</tr>
</tbody>
</table>

* Among my research assistants and thesis students who contributed importantly to this research study were John W. Cuming and Andrew L. Gutman, as well as my former research associate Herbert A. Wainer, and Irwin M. Rubin, a former faculty colleague in the MIT Sloan School of Management.
undertaken of participants in two Boston-area new venture related organizations, the MIT Enterprise Forum and the 128 Venture Group. The specific data collection methods used in each study are discussed in more detail in the relevant portions of this paper. As very few female entrepreneurs were found in any of these samples of technical entrepreneurs, the male pronoun is used in the remainder of this article in referring to the entrepreneurs.

THE ENTREPRENEUR'S PERSONALITY

Psychological Types: Background

The noted psychologist Jung believed that people are different in fundamental ways, reflected in how they prefer to function. Jung's four dimensions for psychological typing are: Extroversion/Introversion, Sensation/Intuition, Thinking/Feeling and Judging/Perceiving. (Keirsey and Bates, 1978) The combinations of each possible preference along these dimensions create sixteen possible prototypes. The Myers-Briggs Type Indicator (MBTI) measures people in accord with Jung's typology, and decades of research by Educational Testing Services (using the MBTI) have amassed data on the psychological characteristics of individuals who perform various activities. Unfortunately, no prior application of the Myers-Briggs test to technological entrepreneurs could be found. Recently a brief news item in INC. magazine (1988) described a mail questionnaire study, using the Myers-Briggs methodology, of 159 successful CEO-founders, including an unidentified number of technical firms. But the results characterized the CEO-founder as very similar in personality to a "college professor", a finding rather hard to accept as credible.

Although subtle distinctions exist along each of the four Jungian dimensions, the archetypes are easy to define simply in terms of key preferences. "Extroverts" are energized or "tuned up" by interacting with other people. "Introverts" on the other hand seem to draw their energy from pursuing solitary activities, such as working quietly alone, reading or meditating. Prior research indicates that 75 percent of the general U.S. population are extroverts. (Bradway, 1964) Since entrepreneurship involves frequent interaction with colleagues, subordinates, customers and others I
expect to find the technical entrepreneurs generally extroverted in their preferred functioning, even despite the usual introversion of technologists.

The "sensation"-preferring individual is seen as "sensible", firmly grounded in reality and facts. He or she focuses on past experience and actual past and present happenings. The "intuition"-oriented person is innovative, future oriented and imaginative, attracted by visions and inspirations. Despite the fact that again 75 percent of the general U.S. population are oriented toward sensation, I perceive founding entrepreneurs as more likely to prefer intuition as their mode of functioning.

Jung describes "thinking" individuals as preferring an impersonal basis for choice -- decision-making based on logic, principles, law. "Feeling" individuals, in contrast, decide on a personal basis, subjectively considering the effects of each choice on the decision-maker and others. Because 60 percent of the thinkers are men and 60 percent of the feelers are women, thinkers and feelers are distributed about equally in the general U.S. population. Both thinking and feeling methods of decision-making seem reasonably applicable to entrepreneurs. But the dominance of highly educated males among technical entrepreneurs suggests that slightly more thinking-orientation should be expected among the entrepreneurs of interest to us.

The judging/perceiving dichotomy also divides the general U.S. population about 50-50. "Judging" persons prefer closure and the settling of things, planning ahead and working to a deadline. They have a work ethic such that work comes before all else. "Perceiving" individuals prefer to keep options open and fluid, maintaining flexibility, and adapting to whatever happens. Entrepreneurship appears more akin to the judging preference.

My review of the Jung psychological dimensions thus concludes that I should hypothesize technical entrepreneurs to be more extroverted (E), intuitive (N), thinking-oriented (T) and judging (J), identified as ENTJ types, or "the field marshall" in the popular work by Keirsey and Bates (p. 73), perhaps an appropriate label for some entrepreneurs!

Data Collection on Personality Types
To test this hypothesized personality profile, a shortened version (31 questions, about 20 minutes completion time) of the MBTI was distributed at one meeting each of the MIT Enterprise Forum and the 128 Venture Group, monthly organizational groups in the Boston area that focus on technical entrepreneurship and venture capital activities. Data analyses were carried out on 73 usable responses, which included 48 people who had already founded one or more companies at some point in their lives (54 of the 90 companies they had founded are still active), and an additional 6 people with strongly expressed entrepreneurial desires. 86 percent of the respondents were male and 68 percent had received a master's or doctorate degree, making them comparable educationally to our research samples of technical entrepreneurs.

The Technical Entrepreneur's Personality

The first tests that were performed compared the psychological profiles of the entrepreneurs within this two organization sample to the general population. On a statistically significant basis the group of technical entrepreneurs was found to be more introverted (I) (0.10), more intuitive (N) (0.05), and more thinking-oriented (T) (0.05) than the general population, and not different in judging preference (J). Indeed Keirsey and Bates describe the INTJ personality that was found as a "scientist" (p. 72), a bias that might have been expected for our overall sample of well-educated technologists. These results add confidence to our use of the shortened version of the MBTI tests.

With these overall results on our total sample we then compared the entrepreneurial to the non-entrepreneurial groups within the MIT Enterprise Forum and 128 Venture Group respondents. Table 2 shows the data from the 72 usable MBTI tests. Within this group of generally introverted technologists, those with stronger entrepreneurial tendencies are significantly more extroverted (E)(0.03). Relative to other engineers and

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1 For convenience throughout this article the level of statistical significance associated with each research finding is indicated by placing the probability number within parentheses, as shown here, instead of (p=0.10).
Table 2. **Personality Dimensions and Entrepreneurial Tendency**

<table>
<thead>
<tr>
<th>Personality Dimension</th>
<th>Low (18)</th>
<th>Medium (20)</th>
<th>High (34)</th>
<th>Total (72)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Extroversion</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>3</td>
<td>4</td>
<td>13</td>
<td>20</td>
</tr>
<tr>
<td>(X²=10.60, p=0.03)</td>
<td>Medium</td>
<td>5</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>High</td>
<td>10</td>
<td>5</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td><strong>Intuition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>2</td>
<td>8</td>
<td>6</td>
<td>16</td>
</tr>
<tr>
<td>(X²=5.43, p=0.25)</td>
<td>Medium</td>
<td>8</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>High</td>
<td>8</td>
<td>6</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td><strong>Thinking</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>6</td>
<td>2</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>(X²=4.53, p=0.34)</td>
<td>Medium</td>
<td>6</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>High</td>
<td>6</td>
<td>10</td>
<td>13</td>
<td>29</td>
</tr>
<tr>
<td><strong>Perceiving</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>8</td>
<td>3</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>(X²=10.76, p=0.005)</td>
<td>Medium</td>
<td>20</td>
<td>9</td>
<td>29</td>
</tr>
<tr>
<td>High</td>
<td>10</td>
<td>22</td>
<td></td>
<td>32</td>
</tr>
</tbody>
</table>
scientists the entrepreneurs are characterized generally by more sociability, interaction, external orientation and interests, and a multiplicity of relationships. Also, even within this highly intuition-oriented group, the entrepreneurs tend to be still more intuitive (N) (0.25). They work on hunches, are speculative and future-oriented, use imagination and ingenuity in their actions. Similarly within this highly thinking-oriented group, the entrepreneurs tend to show slightly further thinking preference (T) (0.34.) They try to be objective and impersonal, are analytically-oriented, behave with firmness in accord with standards.

Only with respect to Jung's judging/perceiving dimension are the results surprising. Despite a judging bias in the overall sample those with high entrepreneurial tendencies are significantly more perceiving-oriented than non-entrepreneurs (P) (0.005). Perhaps entrepreneurs choose to "be their own boss" because they dislike the constant deadlines and pressures of the corporate world, reflecting their "perceiving preference".

Intriguingly Keirsey and Bates describe this ENTP personality profile, determined by the findings in Table 2, as an "inventor", a title which seems aptly to describe many technical entrepreneurs. In fact, they said: "The ENTP can be an entrepreneur and cleverly makes do with whatever or whoever is at hand, counting on ingenuity to solve problems as they arise, rather than carefully generating a detailed blueprint in advance." (p. 186)

THE ENTREPRENEUR'S MOTIVATIONS

Background and Needs Measurement

As discussed at the beginning of this article, McClelland and Collins et al. emphasize, to the exclusion of some other factors that I think are also important in the identification of entrepreneurs, the entrepreneurs' motivations. This section describes motivational characteristics of entrepreneurs in our samples. It is useful to discuss briefly the method we used for measuring motivation primarily because, even as McClelland says, "Human motivation has always been a topic of key interest to psychologists, but the lack of adequate methods for measuring it has seriously hampered the
development of systematic knowledge of the subject." (Atkinson, 1958, p. 7)
Following McClelland's lead we used as our instrument for measuring
motivation the Thematic Apperception Test (T.A.T.). Since our interests were
in describing entrepreneurs, it seemed reasonable to utilize McClelland's own
version of the T.A.T. which concentrates on assessing three needs: need for
achievement (n-ach), need for power (n-pow) and need for affiliation (n-aff).

A summarization of my previous comments about McClelland's views
provides a definition of the need for achievement. Individuals high in need for
achievement are presumed to take moderate as opposed to high or low risks.
In addition they usually perform better at tasks that are moderate in risk.
Neither low nor high risk situations are seen as achievement-oriented
because accomplishment is either too easy or impossible. On the other hand,
moderate risk tasks can be accomplished in an innovative manner through the
efforts of the achieving individual. High n-ach individuals tend to choose and
work hard at tasks in which they can achieve in personally determined novel
or innovative ways. Their high n-ach does not lead them to work hard and
perform well at merely anything. The high n-ach individual prefers concrete
feedback on his actions and must perceive that the end results are at least in
part due to his actions. The implication here is that the concrete feedback is
external to the individual, i.e. profits from his business rather than personal
satisfaction that he is a good manager. As McClelland points out, however,
money and profits do not have intrinsic interest for the high n-ach individual.
Instead, "Money, to them, was the measure of success. It gave them the
concrete knowledge of the outcome of their efforts that their motivation
demanded." (p. 237) McClelland sees the association of high n-ach with the
choice of entrepreneurship as a career as also following from the above.
Clearly inherent in the entrepreneurial situation are most of the
characteristics that may satisfy individuals high in n-ach.

Need for Power (n-pow) is "that disposition directing behavior toward
satisfactions contingent upon the control of the means of influencing another
person... The means of control can be anything at all that can be used to
manipulate another person." (Atkinson, p. 105)

Need for Affiliation (n-aff) is concerned with the establishment,
maintenance or restoration of positive relationships with other people. These
relationships are most adequately described by the word "friendship". Statements of liking or of desire to be liked, accepted or forgiven are manifestations of this motive. Interpersonal feedback is implied in that the individual who is high in need for affiliation has to have the internal feeling that he or she is liked or accepted. Note that this feedback is of a different sort than the feedback on performance or results that one might expect to be necessary to an individual high in n-ach.

N-ach has different behavioral manifestations than either n-pow or n-aff in terms of the individual's relationships with people. N-pow and n-aff are interpersonally oriented needs. Implicit in the definitions is the existence of other human beings with whom the n-pow or n-aff motivated individual can influence and control or be friends. N-ach, on the other hand, is more of an internalized need than either n-pow or n-aff. The n-ach motivated individual may need other people to help him to satisfy his n-ach but the nature of his relationship with them, or more appropriately his effectiveness with them, will be determined by needs other than n-ach. N-ach seems to be a primary consideration determining behavior, other than interpersonal, that leads to high company performance (e.g., decision making characteristics, commitment to work, recognition of the need for plans leading to tangible outcomes such as profits or sales volume). N-pow and n-aff are primary considerations determining interpersonal behavior that affects company performance (i.e., being concerned about people, being authoritarian, being paternal). N-pow and n-aff, therefore, can be looked upon as having strong implications as determinants of managerial style.

Data Collection on Motivations

T.A.T. scores for the three needs were developed for a subset (n=51) of our total sample of technical entrepreneurs, scoring done for us by staff of the Harvard University Motivation Research Group with which McClelland is associated, so as to assure coding reliability. (Indeed, despite presumed "softness" of the underlying T.A.T. data the average intercoder reliability obtained was in the high 0.80 range.) The demographic characteristics of the entrepreneurs tested, such as family background and education, matched closely with comparable data from the entire group of technological entrepreneurs, lending support to the notion that the selected group is
The Technical Entrepreneur's Motives

Table 3 presents the resulting needs data. The most important finding from the table is that technical entrepreneurs' needs are not simply stated. Each measure varies over a wide range. For example, despite mythology and mistated empiricism to the contrary, all entrepreneurs do not have high need for achievement; only some do. Indeed, although McClelland focuses his descriptions of the n-ach motive on entrepreneurial behavior, I cannot find in his writings any reference to studies of company founders. Evidently his claims regarding those he calls "entrepreneurs" rely more on data from businessmen and others. Our data indicate that the median technical entrepreneur has moderate n-ach, moderate n-pow and low n-aff. These might be interpreted to describe a typical technical entrepreneur as having some push to succeed, a willingness both to take charge and to share control with others, and little requirement for relationships with others. But a wide variety of motivational "types" is possible within these recorded data.

These entrepreneurial needs are not independent of each other. N-ach is positively related to n-pow (.01) and negatively related to n-aff (.01); and higher need for power is reasonably linked to lower need for affiliation (.05).

Since I assume that these needs might well influence managerial
behavior of the entrepreneur, I plan to examine in a later analysis of my database whether and how any of these drives affects performance of the newly created firm.

More on Motivation: Additional Data Collection

For further illumination of the entrepreneurs' motives in starting an enterprise I turn to the data gathered in our basic investigations of the spin-off companies. To collect this information we began with strong cooperation of senior managers in each source organization (Table 1, part A) and developed initial lists of suggested names of spin-off entrepreneurs from that organization. Follow-up interviews were used to screen these lists for inappropriate names as well as to generate further suggestions in a "snowball" sample creation process. Rigorous criteria were applied to include only those who had been former full-time employees of the source organizations, who later participated as founders of wholly-new for-profit companies.

Structured interviews with a detailed questionnaire, lasting typically one to two and one-half hours, were used to gather data from each entrepreneur personally, with telephone interviews used in less than ten percent of the cases and mailed interviews used only as a last resort in less than one percent of the cases. Some interviews stretched to seven or eight hours over two or three sessions! Despite extensive efforts to include all spin-offs from each source organization studied, no doubt some minor bias has crept into the sample of companies studied in that it is likely that any companies not located were less successful than those traced.

Answers to the detailed questionnaires led easily to the quantification of information. Most all of the answers were coded and arranged in computer data files. Other than altering the sample size in each table, incomplete information on some of the companies does not particularly affect the data analysis as relevant codes were given to isolate missing information.

Why Do You Want to Start a Business?

Among the several hundred people examined in Edgar Schein's studies of
"career anchors" he found a small number of entrepreneurs. "These people discovered early in life that they had an overriding need to create a new business of their own by developing a new product or service, by building a new organization through financial manipulation, or by taking over an existing business and reshaping it in their own image." (1987, p. 168) Many of the technical entrepreneurs in our studies had thought about starting or owning a business long before they formed their companies. A few had the thought and immediately went into business. Table 4 displays the number of years between the first occurrence of the idea to go into some business and the founding of the spin-off company for a subset of 62 entrepreneurs in our studies. Only twenty one percent (13) of the entrepreneurs first thought about going into business within the same year they actually formed their companies. An additional twenty-seven percent (17) thought about going into business more than one year but less than five years before forming their new enterprises. At the other extreme, twenty-four percent (15) of the entrepreneurs had thoughts of going into business for more than ten years. For the entrepreneurs leaving the diversified technological company, as another data point, the median had been contemplating such a move for nine years.

<table>
<thead>
<tr>
<th>Number of Years Between</th>
<th>0</th>
<th>1-2</th>
<th>3-4</th>
<th>5-6</th>
<th>7-8</th>
<th>9-10</th>
<th>11-15</th>
<th>16-20</th>
<th>&gt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Entrepreneurs</td>
<td>13</td>
<td>7</td>
<td>10</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>7</td>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>

The pattern is considerably different for the time lag between having the specific idea for the particular spin-off and the formation of the company. Table 5 displays those data for 107 technical entrepreneurs. Over half of the entrepreneurs more-or-less immediately formed their companies once the specific thought occurred. Nearly eighty percent of the firms were formed within less than two years after the specific thought for them.
occurred, and all except one in this group were formed less than six years after they were conceived.

---

Table 5. **Years between Conceiving of Specific Spin-Off Company and Its Founding** (n=107)

<table>
<thead>
<tr>
<th>Number of Years Between</th>
<th>Number of Entrepreneurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>56</td>
</tr>
<tr>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>&lt;12</td>
<td>1</td>
</tr>
</tbody>
</table>

It is difficult to find general explanations for why some entrepreneurs thought of going into business and immediately did, while others did not. Each case is different. As to why the thoughts about starting the spin-offs materialized so rapidly into the formation of companies, explanations can only be given *ex post facto* (i.e., once the company materializes, we can conclude that the thoughts for it occurred fairly recently).

The reasons for going into any business depend on many factors. Traditionally, business "ownership" is a way in which the American goal of independence is evinced. From an economic theory perspective, business ownership is motivated by the profit which can be captured by the individual. Increasingly clear, as evidenced from the research cited earlier in this paper, is the fact that business initiation and whatever ownership results is really influenced by the complexity of factors such as age, education, religion, work experience and the family background of an individual.

Unfortunately, only one question in our general research protocol relates directly to the entrepreneur's motivation for starting his own business. (More specifics about precipitating technological events in forming the business are discussed in Roberts, 1988.) Shown below is the version of that question used in many of the studies.
At the time you started your new enterprise what feature of going into business for yourself did you consider most attractive? (Check all which apply, then rank those you have checked, 1, 2..., with 1 being the most important.)

\[
\begin{array}{c|c}
\checkmark & \text{Rank} \\
\hline
 & \text{Salary} \\
 & \text{Being own boss--independence} \\
 & \text{Challenge--do something others could not} \\
 & \text{Challenge--taking on and meeting broader responsibilities} \\
 & \text{Freedom to explore new areas} \\
 & \text{See things through to completion} \\
 & \text{Other} \\
\end{array}
\]

Results from our various samples of entrepreneurs indicate that the features of business initiation that appealed to them are conventional. Table 6 displays what was attractive to a subset of MIT spin-off entrepreneurs. One specific characteristic of independence, "being own boss", was the most appealing feature to 25% of those entrepreneurs. As a primary or secondary feature it appealed to over 40% of the entrepreneurs. The feature of independence, in one form or another, was of prime importance to 39% of the entrepreneurs.

Monetary appeal was stated to be of prime importance to less than fifteen percent of the entrepreneurs and of primary or secondary importance to only twenty percent of the entrepreneurs in this cluster. Those who look for financial greed as the explaining drive of technical entrepreneurs will find that only a small fraction of the cases across-the-board fit that stereotype, by their own categorization. Of course, more entrepreneurs may well have been attracted by the potential of making money in a new enterprise than were willing to admit it. "Money" has become a dirty word to many in our society, and this factor may have prejudiced the responses to this particular question.

The challenge that starting a new business affords was attractive to a sizeable proportion of the entrepreneurs. Thirty percent listed challenge (1)
to do something that others could not or (2) to take on and meet broader responsibilities as the most appealing feature. The feature of challenge as an

Table 6. **Attractiveness of Business Initiation to MIT Spin-Off Entrepreneurs** (n=72)

<table>
<thead>
<tr>
<th>Features of Going into Business*</th>
<th>Primary Feature</th>
<th>Secondary Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monetary:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Salary</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Challenge:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Do something that others could not</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>(2) Taking on and meeting broader responsibilities</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Independence:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Being own boss</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>(2) Freedom to explore new areas</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>(3) See things through to completion</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Other:**</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>Total Responses</td>
<td>72</td>
<td>49</td>
</tr>
</tbody>
</table>

* This group included 72 respondents to the relevant question; of these, 49 also indicated secondary features.

** The entrepreneurs who mentioned other attractions generally stated features that were specific incidences of independence, challenge, or money.

attraction can easily be understood. These technical entrepreneurs are highly educated and highly trained. Employment either at their source laboratories
or in industry in general was fairly well guaranteed for them. In these environments the individual is rather secure. Starting and trying to run and build a new enterprise, on the other hand, provides a more risky situation in which the individual's achievement is directly reflected by the success of his company. The business can succeed or fail on the accomplishments of the individual; and its success or failure is his responsibility. The challenge of business initiation lies in the setting wherein the individual can measure for himself his "true worth". This desire for self-assessment is, of course, what frequently distinguishes these men as entrepreneurs. Schein's evidence is supportive: "...these people seem to have an overarching need to build or create something that was entirely their own product. It was self-extension...a measure of their accomplishments." (1978, p. 149)

An array of findings from several other samples from our research presents much the same picture. As Table 7 demonstrates, even the consumer-oriented manufacturing entrepreneurs coincided in expressed drives with their technological brethren. In one of our other samples of computer-related entrepreneurs, 16 out of 22 said that "being my own boss" was the primary motive for getting started.

<table>
<thead>
<tr>
<th>Research Sample</th>
<th>Independence (Being own boss)</th>
<th>Financial (Salary or capital appreciation)</th>
<th>Challenge (Unique, broader)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT laboratory spin-offs</td>
<td>39</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>Spinoffs from electronic</td>
<td>38</td>
<td>23</td>
<td>25</td>
</tr>
<tr>
<td>systems firm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Searchers for venture capital</td>
<td>32</td>
<td>14</td>
<td>32</td>
</tr>
<tr>
<td>Computer-related enterprises</td>
<td>30</td>
<td>30</td>
<td>--</td>
</tr>
<tr>
<td>Consumer-oriented manufacturers</td>
<td>32</td>
<td>27</td>
<td>11</td>
</tr>
</tbody>
</table>

Cynically, despite the consistency among the various sub-samples, these three most frequent answers may indeed merely reflect the socially
acceptable or "pat" responses. All three no doubt manifest other deeper motivations, rather than merely being motivations themselves. For example, an individual who indicates financial gains as his key motive for starting a new enterprise may really be indicating his need for power or higher social status. But unfortunately our probes in this direction do not reach deeper. In fact, analyses of the entrepreneur's motivation in relation to background demographic factors mentioned earlier, such as his religion, educational level and his father's occupational status, produced very little in explainable differences.

**SUMMARY**

From a personality perspective technical entrepreneurs are likely to be more extroverted than their rather introverted technical colleagues. They represent extremes in orientation to use of both intuitive and analytic thought processes, both dimensions already strong among engineers and scientists. Our studies also find the technical entrepreneur to be perceiving-oriented, generating a personality profile that Keirsey & Bates have rather aptly (for many) labelled "the inventor".

Our motivational studies show wide ranges of basic needs within the technical entrepreneur population. Despite the fact that all those we studied are indeed entrepreneur company founders, they do not all have high need-for-achievement (n-ach), although of course some do. The median technical entrepreneur has moderate n-ach, moderate n-pow, and low n-aff.

By far most of the technical entrepreneurs seem to be fulfilling a long felt need (or at least ambition) in starting their companies, reflecting at least several years of prior general contemplation about going into their own businesses. But when asked to state why, these technical entrepreneurs reveal primarily a heavy orientation toward independence, being their own boss, some reflection of a continuing search for new and bolder challenges, and considerably less focus on financial gains than might be expected by the cynical observer of entrepreneurs.
Table 8. **Personality and Motivational Dimensions of Technical Entrepreneurs**

"Inventor" personality

"Moderate" needs for achievement and power, low need for affiliation

Long-felt desire for own business

Heavy orientation toward independence, as well as search to overcome challenges, less concern for financial rewards
REFERENCES


