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## An exploratory study of technopreneurial intentions: a career anchor perspective

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### Abstract

This study investigated if the career anchors of research scientists and engineers (RSEs) influenced their entrepreneurial intentions and the types of businesses they intended to found. The results showed that the security anchor negatively impacted on entrepreneurial intentions, while the managerial anchor had a positive impact. Mixed results were found for the technical and creativity anchors, while no impact was found for the autonomy anchor. Those with a technical anchor intended to found businesses within their technical field, while those involved in applied research intended to found businesses outside their technical field. Situational factors did not moderate the RSEs' entrepreneurial intentions.

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### 1. Executive summary

This study investigated the degree to which the interests, values, and talents of research scientists and engineers (RSEs), expressed as their career anchors, influenced their intentions to found businesses. Among the RSEs who expressed intentions to found businesses, this study investigated the extent to which career anchors influenced the types of businesses that

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these RSEs intended to found. Finally, the study investigated if situational factors, namely, personal financial constraints, professional limitations, and the availability of organizational opportunities, moderated RSEs' entrepreneurial intentions.

The results from the hierarchical logistic regression analyses showed that RSEs who have a strong security anchor had significantly negative entrepreneurial intentions, while those with a strong managerial anchor had significantly positive intentions. Mixed results on entrepreneurial intentions were found for RSEs who have strong technical or creativity anchors, while no significant impact on entrepreneurial intentions was found for RSEs with a strong autonomy anchor.

Among the RSEs who indicated that they had intentions to found businesses, the results from the hierarchical logistic regression analyses indicated that individuals with a strong technical anchor had significantly greater intentions to start a business in their own field of technical expertise. However, individuals involved in applied research activities had significantly greater intentions to found businesses outside of their field of technical expertise. RSEs who intended to found any type of business were those who had a strong managerial anchor. These were individuals who had a greater need for monetary rewards and recognition. Finally, the results from the moderator regression analyses showed that the RSEs' perceptions of their personal financial constraints, professional limitations, or the availability of organizational opportunities did not significantly moderate their intentions to found a business.

The findings suggest that the vocational decision process of an individual's intention to enter an occupation as an entrepreneur can be predicted based on his/her career anchors. Since an individual's career anchors evolve through a process of career development by which an individual tests himself/herself in various job settings, any job successes experienced strengthen an individual's career anchors in those areas. Hence, governments eager to groom future entrepreneurs and technopreneurs can create government-sponsored agencies or research centers that provide RSEs with opportunities to work in occupational settings or work activities that develop their career anchors in areas that are appropriate for specific types of businesses. In particular, work activities that are targeted at enhancing the RSEs' managerial anchor build their general management skills, which facilitate their interests in founding firms in a wider range of sectors. Work activities that involve applied research enhance RSEs' intentions to found businesses in new areas outside of their current area of technical expertise. Finally, to increase the likelihood of firm foundings, RSEs should be rotated in various work settings and even among different research centers to prevent them from being entrenched in a specific job or organization.

## **2. Introduction**

As newly industrialized countries (NIEs) such as Singapore, Taiwan, Hong Kong, and South Korea mature, they lose their competitive advantage as low-cost manufacturing hubs to low-wage developing countries such as Vietnam, Indonesia, and Myanmar in their ability to attract foreign direct investments. To counter the loss of cost competitiveness as well as to

capitalize on the highly educated and skilled workforces, many NIEs have sought to build new competitive advantage by moving their production and business processes upstream on the technological value chain. As a result, the Malaysian government spent billions of dollars developing the Multimedia Super Corridor to attract foreign direct investments in high-tech businesses. Likewise, the governments of Hong Kong and Japan built science parks to encourage more business activities in areas related to the research and development of new technologies.

Similarly, the Singapore government built technology parks and research centers to encourage more firms to be involved in research and development activities. In fact, as a result of the Asian financial crisis, the Singapore government made urgent calls to Singapore firms to move their manufacturing and other business processes up the technological value chain to compete on the basis of value add. Since Singapore did not devalue its currency, the country became more expensive and less attractive to foreign investors as a low-cost manufacturing site (Ang et al., 2000). The government believed that positioning Singapore as the knowledge hub of Southeast Asia would allow the country to differentiate herself from her neighbors, and thereby attract capital-intensive foreign investments. Firms that upgrade their business and manufacturing processes with technologically intensive assets could enhance their value add, improve their productivity, become resistant to price competition, and hence be more competitive.

To encourage businesses to embrace this vision, the government of Singapore set aside billions of dollars in research grants and venture capital to encourage RSEs in technology-related industries to become technological entrepreneurs or ‘technopreneurs.’ Since new firm creations in these technology-related fields were viewed as the critical driving force for economic growth and employment creation for Singapore in the new economy, RSEs were encouraged to found technology-intensive businesses by making low-cost state funding readily available.

As a result of the Singapore government’s call to encourage technological entrepreneurship among RSEs, this study seeks to investigate factors that would affect RSEs’ intentions to found business ventures. Specifically, the study seeks to understand how the interests, values, and talents of RSEs, expressed as in their career anchors, affected their intentions to found businesses. Among the RSEs who expressed intentions to found businesses, this study investigates the influence of career anchors on the types of businesses that these RSEs intended to found. Finally, the study investigates if situational factors, specifically personal financial constraints, professional limitations, and the availability of organizational opportunities, moderated RSEs’ entrepreneurial intentions.

### **3. Conceptual background**

#### *3.1. Entrepreneurial intentions*

Entrepreneurship has been defined as the process of ‘emergence’ in the creation of organizations (Gartner, 1988; Gartner et al., 1992). This means that entrepreneurship is viewed

as a process undertaken by individuals to enable an organization to come into existence and is looked upon as a ‘process of becoming rather than a state of being’ (Bygrave, 1989). As a result, entrepreneurial intentions are central to the understanding of the entrepreneurship process because entrepreneurial intentions form the underpinnings for the founding of new organizations (Krueger, 1993). Since entrepreneurship occurs over time (Gartner et al., 1994), entrepreneurial intentions can be viewed as the first step in an evolving long-term process of organizational founding.

It is also important to understand an individual’s entrepreneurial intentions because intentions correspond to a state of mind that directs the individual’s attention, experience, and action toward the goal of founding a business (Bird, 1988). Entrepreneurial intentions also embody an individual’s commitment to start a new business (Krueger, 1993). In addition, intentions toward a behavior have routinely been proven to be the best single predictor of that behavior (Fishbein and Ajzen, 1975). Absent intention, action is unlikely. Hence, entrepreneurial intentions are crucial to understanding the overall process of entrepreneurship as they serve as the key initial conduit for subsequent actions and events that are related to organizational founding (Bird, 1988, 1992; Boyd and Vozikis, 1994; Crant, 1996; Jenkins and Johnson, 1997; Katz and Gartner, 1988; Krueger, 1993; Krueger and Carsrud, 1993).

Factors that may affect an individual’s intentions to found a business include the characteristics of the individual as well as the characteristics of the situation (Reynolds, 1991). Given that not all individuals will become entrepreneurs under comparable external circumstances, the psychological attributes of the individual constitute an integral part of entrepreneurship research (Johnson, 1990; Stewart et al., 1998). Thus, the entrepreneurial intentions process may begin with the individual’s personal needs, values, wants, habits, and beliefs (Bird, 1988). Individuals who have the intentions to found an organization have certain precursor attitudes, interests, values, and talents regarding entrepreneurship, and these form part of the content of their entrepreneurial intentions. However, the specific individual differences that are consistently related to entrepreneurial intentions have been mixed. For example, Scheinberg and MacMillan (1988) reported that the need for approval, the perceived instrumentality of wealth, the degree of community, the need for personal development, the need for independence, and the need for escape led individuals toward new firm formation. However, these motivational factors were not always supported in other studies (see Stewart et al., 1998 for a review). There was no single orientation that explained an individual’s proclivity toward an entrepreneurial career (Vesper, 1980). Some start a business because they enjoy developing a new technology; others do so because they enjoy building and owning their own company. Still others enjoy starting new ventures but dislike managing them.

Situational factors, such as time constraints, task difficulty, and the influence of other people though social pressure, also influence entrepreneurial intentions (Ajzen, 1985, 1987; Boyd and Vozikis, 1994; Tubbs and Ekeberg, 1991). For example, Dyer (1994) argued that entrepreneurial careers are launched when there is a lack of opportunities for employment in existing organizations. Therefore, exogenous factors also influence one’s attitudes toward entrepreneurship (Krueger, 1993). This study attempts to investigate the extent to which

intentions for technological entrepreneurship are affected by individual and/or situational variables.

### 3.2. *Career anchors*

Entrepreneurial intentions are determined by an individual's level of skills, talents, values, interests, and other psychological dimensions (Hollenbeck and Whitener, 1988). A person's beliefs about his/her basic values, skills, talents, and interests will encourage him/her to choose an occupation that is in tune with those beliefs to meet his/her needs (Cromie, 1994). One's career anchor comes closest to embodying this concept.

A career anchor is a cluster of self-perceived talents, motives, and values that forms the nucleus of a person's occupational self-concept. Career anchors evolve through a process of career development, which involves testing oneself in various kinds of work settings and in different kinds of jobs until one has a clearer picture of one's talents, needs, and values (Katz, 1994). Hence, career anchors are (1) self-perceived talents and abilities based on actual successes in a variety of work settings, (2) self-perceived motives and needs based on opportunities for self-diagnosis in real situations and feedback from others, and (3) self-perceived attitudes and values based on actual encounters between the self and the norms and values of the employing organization and work setting (Schein, 1978). A career anchor provides the basis for an individual's career choice because a person is likely to make job and organizational selections that are consistent with his/her self-image. If one moves into a career in which one is likely to fail or which fails to meet one's needs or which compromises one's values, one will be 'pulled back' into something more congruent—hence the metaphor of 'anchor.' A career anchor, therefore, functions as a set of driving and constraining forces on a person's career decisions and choices, serving to guide, constrain, stabilize, and integrate one's career choices (Schein, 1978). One will come to want and value a career in which one is good at, and one will improve upon one's abilities in those areas that one wants or values.

Schein (1978) argues that there are five major types of career anchors. Although he included three more anchors in his later work (Schein, 1996), this study focuses on the five original career anchors that have also been used in most other studies (Barth, 1993; Katz, 1994). The five career anchors are security, autonomy, technical, managerial, and creativity. The following paragraphs describe each of these career anchors.

#### 3.2.1. *Security anchor*

Individuals with a security/stability anchor tie their careers to organizations that provide them with job security and long-run career stability as they are risk-averse (Schein, 1978, 1996). They are unwilling to leave a given organization even if they have to lose some degree of freedom or if their talents go unrecognized (Barth, 1993). People anchored in security tend to do what is required of them by their employers in order to maintain job security, a decent income, and a stable future (Kolvereid, 1996). They accept an organizational definition of their careers and 'trust' the organization to develop their career paths for them. They are labeled the 'organization man' and the conformist because in order to remain in the organization, they

become socialized into the organization's values and norms. Hence, individuals with a strong security anchor are less likely to have entrepreneurial intentions as they are less willing to step outside of their comfort zone to take risks.

**Hypothesis 1a:** RSEs with a strong security anchor will have negative entrepreneurial intentions.

### *3.2.2. Autonomy anchor*

On the other hand, individuals with an autonomy or independence career anchor desire freedom from organizational rules and control from supervisors (Schein, 1990). They would seek out work situations in which they are maximally free from organizational constraints so that they can pursue their own interests. They prefer to be on their own to set their own work pace and schedules so that work fits their lifestyles and habits. Hence, the autonomy/independence anchor is similar to Smith and Miner's (1983) 'craftsman' entrepreneurial orientation (Katz, 1994). Feldman and Bolino (2000) found that individuals with the autonomy/independence anchor were most driven by the desire to live as they would like. Since these 'independents' prefer to leave salaried employment for careers that would permit them to define for themselves their areas of interest and on how to pursue them (Schein, 1978; Woo et al., 1991), individuals who have a strong autonomy/independence anchor are likely to have higher levels of entrepreneurial intentions.

**Hypothesis 1b:** RSEs with a strong autonomy anchor will have positive entrepreneurial intentions.

### *3.2.3. Technical anchor*

For individuals who have a technical/functional anchor, they organize their careers around their specific area of technical or functional competencies (Schein, 1978). Such individuals are most interested in a technical career ladder to maximize their opportunities to remain challenged in their specific functional area (Allen and Katz, 1986). Igarria et al. (1991) found that individuals with a technical orientation were more likely to hold technical positions. Similarly, Feldman (1988) found that technically oriented employees were reluctant to switch from technical work to managerial responsibilities. They would only make job moves for advancements within their area of expertise. Although results from past studies do not provide evidence on the strength of entrepreneurial intentions among individuals with a high technical anchor, Vesper (1980) noted that some individuals who enjoy developing technologies and have a technical anchor have started entrepreneurial careers. Since their self-image and criterion for success are determined by feedback that they are experts in their specific technical fields (Barth, 1993), it can be expected that if they have intentions to found a business, it would be in an area within their field of technical expertise.

**Hypothesis 2a:** Among RSEs who have entrepreneurial intentions, those with a strong technical anchor will have greater intentions to found a business in their current field of technical expertise.

### 3.2.4. *Creativity anchor*

Schein (1978) and Barth (1993) argue that individuals with a strong creativity/innovative anchor have a need to create ‘something new.’ Hence, the creativity anchor is similar to Smith and Miner’s (1983) ‘opportunistic’ entrepreneurial orientation (Katz, 1994). Feldman and Bolino (2000) found that individuals with a strong creativity anchor were motivated to become self-employed for the chance to use their skills and be creative as well as to capitalize on a good business idea. They would keep trying their hands at new kinds of projects because they have a restless drive for novelty and challenge. However, past research found that individuals with a dominant creativity anchor are few. Igarria et al. (1991) found only that 4.7% of the respondents in his sample had a creativity anchor while Crepeau et al. (1992) found none among their sample of information systems professionals. Hence, among the individuals who have intentions to found a business venture, it can be expected that those with a strong creativity anchor would be interested in building or creating something that was entirely new (Schein, 1978).

**Hypothesis 2b:** Among RSEs who have entrepreneurial intentions, those with a creativity anchor will have greater intentions to found a business in a new field.

### 3.2.5. *Managerial anchor*

Individuals who have a strong managerial anchor are interested in general management so that they can exercise large amounts of formal authority, power, and influence, and link organizational achievements to their own efforts (Schein, 1978). They are able to perform general management functions well because they have strong analytical competencies, which enable them to identify, analyze, and solve problems under conditions of incomplete information and uncertainty (Schein, 1978). Due to increased competitive pressures and corporate downsizing, individuals face fewer opportunities for promotion in their workplaces (Goffee and Scase, 1992). Instead, they are expected to behave as ‘entrepreneurs’, to be flexible and responsive to changing work requirements (Kanter, 1989). As individuals gain experience managing their own careers, more move toward self-employment, rather than pursue lifelong careers within a single organization (Nicholson and West, 1988). Since individuals who have a strong managerial anchor have general management skills or general human capital that is portable across different types of businesses (Becker, 1964) and typically want a high-level position in a firm because they measure their success by the amount of responsibilities and the size of their job tasks (Schein, 1978), those who have entrepreneurial intentions would be indifferent to the type of business to found.

**Hypothesis 2c:** Among RSEs who have entrepreneurial intentions, those with a strong managerial anchor will have greater intentions to found any type of business.

### 3.3. *Situational context as a moderator*

Entrepreneurial intentions are also embedded in a person’s perceived cultural and social context (Krueger and Brazeal, 1994). Greenberger and Sexton (1988) proposed an entre-

preneurial model that incorporates both individual characteristics and environmental influences. They postulate that decisions concerning new venture creation are an interactive process between personal characteristics and the individual's interpretation of salient events in the environment. Gartner's (1985) conceptual framework also portrayed the new venture creation process as an interaction of the environment, the organization, the individual, and his/her entrepreneurial behavior.

Herron and Sapienza (1992) argued that the intentions by individuals to found a new venture are most directly influenced by the interaction of the individuals' skills and their level of job dissatisfaction. Specifically, Dyer (1992) reported that negative work experiences in large companies convinced many individuals that an entrepreneurial career would be more satisfying for them. Dubini (1988) also argued that entrepreneurs are mostly individuals who were unhappy with their previous working conditions and were driven to start their own business mainly by negative situations such as dissatisfaction with a previous job or a lack of other more interesting career opportunities. Likewise, Gartner et al. (1989) also found that one group of entrepreneurs started their business to seek escape from their previous jobs that they perceived to offer them few rewards in terms of salary, challenging work, and promotion opportunities. Hence, the situational context faced by an individual at his/her current job situation has an effect on the person's intentions to found a business (Learned, 1992). Greenhaus et al. (1978) found that a person's intentions to pursue a particular type of employment were not only a function of the organization's attractiveness, but were also influenced by the accessibility or feasibility of the choice. Hence, personal constraints such as financial difficulties, the inability to raise money for a new venture, or outstanding financial or personal obligations constrain an individual's intentions to found a business.

**Hypothesis 3:** Perceived personal financial constraints, professional limitations, and organizational opportunities will moderate an individual's intentions to found a business.

## 4. Method

### 4.1. Sample and data

The sampling frame was individual R&D personnel who were employed by R&D organizations in Singapore in 1997. A list of 5605 names of R&D personnel was obtained from these R&D organizations in the private sector, higher education sector, government sector, and public research institutes.

A survey questionnaire was used to collect the data, given the large sample size and the need to get information in the most efficient manner. The preliminary questionnaire was pretested on 10 R&D professionals to ensure that the terms and phrases used in the questionnaire were not ambiguous. Although 1389 usable questionnaires were obtained, representing a response rate of 24.8%, only 959 responses from RSEs, representing 17.1% of the response rate, were used. R&D support staff who had responded to the survey but were

not RSEs were not included for further analyses since the purpose of the study was to investigate the level of entrepreneurial intentions among the RSEs.

#### 4.2. Independent variables

In this study, we examined the impact of RSEs' career anchors on their intentions to found businesses. The independent variables comprised of continuous variables, dichotomous variables, as well as the mean values of five factors from a factor analysis of 20 questionnaire items. The 20 items, which assessed the respondents' career anchors, were modified from Schein's (1990) Career Orientations Inventory (COI). For example, only items that were related to the five career anchors of interest in this study were used, eliminating items that assessed respondents' career anchors in pure challenge, lifestyle, and sense of service. Also, the wordings on some of the items were modified to make them more neutral. As an example, in the original COI, one item that assessed the creativity anchor asked the respondent to indicate the extent to which 'I am always on the lookout for ideas that would permit me to start and build my own enterprise.' Since the original wordings in the COI would be too similar to the dependent variable, which would create severe common method variance bias, we reworded the item as 'to pursue my own ideas.' Since the factor structure of the original COI has not been firmly established (Igarria et al., 1991; Crepeau et al., 1992; Igarria and Baroudi, 1993), a principal components factor analysis with varimax rotation was conducted on these 20 items. The factors with eigenvalues that are greater than 1.0 are reported in Appendix A.

The technical anchor was evaluated by two variables. The TECHNICAL FACTOR was measured by the mean value of the five five-point Likert-type scaled items from the factor analysis that assessed the individual's interest level in R&D activities. In addition to this measure, the technical anchor was also assessed by a dichotomous variable that categorized the nature of the R&D activities that the individual performs (TYPE OF R&D WORK), with 1 coded for work that involved applied research and 0 for other types of research activities, such as pure research.

The creativity anchor was evaluated by two variables. The CREATIVITY FACTOR was measured by the mean value of four five-point Likert-type scaled items from the factor analysis that assessed the degree to which the individual's work activities involved original work and ideas. In addition to this measure, the creativity anchor was also assessed by a dichotomous variable that categorized the nature of creative work that the individual performs in his/her job (LEVEL OF CREATIVITY IN WORK), with 1 coded for work that is related to the creation of new products and 0 for other work activities that involved less creativity such as engineering support, programming, and process improvement.

The security anchor was evaluated by two variables. The SECURITY FACTOR was measured by the mean value of four five-point Likert-type scaled items from the factor analysis that assessed the degree to which the individual would remain in the organization. In addition to this measure, the security/stability anchor was also assessed by a continuous variable that measured the individual's tenure or length of time in an organization (YEARS

IN ORGANIZATION). An individual with a strong security anchor can be expected to have a longer tenure in an organization.

The managerial anchor was measured by the mean value of four five-point Likert-type scaled items from the factor analysis that assessed the degree to which the individual had interests in general management (MANAGERIAL FACTOR). Finally, the autonomy anchor was measured by the mean value of three five-point Likert-type scaled items from the factor analysis that assessed the degree to which the individual wanted to work on his/her own (AUTONOMY FACTOR).

Four control variables were considered in this study. The first control variable was the age of the individual (AGE), which is coded as 0 for those 34 years of age and younger and 1 for those who are 35 years of age or older because the median age of Singaporeans is 34 (Mydans, 2001). A younger individual may be more adventurous and, hence, may have greater intentions to start a new business venture. Alternatively, an older person who has done everything in life and who has some financial security might be more inclined to try his/her hand at founding a new business venture as a retirement job. Leana and Feldman (1992) found that self-employment was more prevalent among older workers because they were more vulnerable to age discrimination at the workplace.

A second control variable was the educational level of the individual (EDUCATION), which is coded as 2 for those with a PhD degree, 1 for those with a master's degree, and 0 for those who have an educational level lower than a master's degree. Crant (1996) found that entrepreneurial intentions were significantly associated with education level. Individuals with more education may be more willing to found a business venture because they can always find a job if the venture fails.

A third control variable was the gender of the RSE (GENDER), which is coded as 0 for males and 1 for females. Crant (1996) also found that entrepreneurial intentions were significantly associated with gender. Females may have greater intentions to found businesses because they face discrimination in the workplace in terms of limited promotion opportunities. Self-employment is also more attractive to females because it allows them to balance work and family demands (Goffee and Scase, 1992).

Finally, the nationality of the RSE was considered a control variable for this study (NATIONALITY) and is coded as 0 for Singaporeans and 1 for non-Singaporeans. This is because Aldrich (1990) and Aldrich and Waldinger (1990) argue that immigrant groups may face discrimination in the workplace and are thereby compelled to seek self-employment.

#### 4.3. Moderating variables

The moderating variables in this study were nine five-point Likert-scaled items that were factor-analyzed using principal components analysis with varimax rotation. The factors with eigenvalues over 1.0 are reported in Appendix A. Professional constraints (PROFESSIONAL LIMITATIONS) were measured by the mean value of five five-point Likert-type scaled items that assessed limitations that the individual faced in the workplace in performing his/her professional responsibilities adequately. Organizational opportunities (ORGANIZATIONAL

CONSTRAINTS) were measured by the mean value of four five-point Likert-type scaled items that assessed the respondent's perceived attractiveness of his/her organization. Finally, personal financial constraints (PERSONAL CONSTRAINTS) were measured by a dichotomous variable in which the respondents indicated if they would have difficulty obtaining financing if they were to start their own new high-tech venture, which is coded as 1, and 0 if they have no problems obtaining financing.

#### 4.4. *Dependent variables*

Four dichotomous dependent variables were used in this study to align to the purpose of the study (Leclere, 1999), which was to find out if the RSEs have entrepreneurial intentions or not. The first dependent variable measured the RSEs' intentions to found a business venture (INTENTIONS TO FOUND), which was coded as 0 for those who indicated no intentions and 1 for those who did. Among those individuals who expressed intentions to found a business, the second dependent variable, BUSINESS IN OWN FIELD, was coded as 1 for respondents who indicated that they have intentions in becoming an entrepreneur in their current field of expertise and 0 for those who did not. Among those individuals who expressed intentions to found a business, the third dependent variable, BUSINESS IN OTHER FIELD, was coded as 1 for respondents who indicated that they have intentions in becoming an entrepreneur in another field that is not related to their current field of expertise and 0 for those who did not. Among those individuals who expressed intentions to found a business, the fourth dependent variable, BUSINESS IN ANY FIELD, was coded as 1 for individuals who have intentions in becoming an entrepreneur in any field and 0 for those who did not.

#### 4.5. *Statistical analysis*

Hierarchical logistic regression analyses were used to test Hypotheses 1a, 1b, 2a, 2b, and 2c, after controlling for age, education, nationality, and gender. In testing Hypotheses 2a, 2b, and 2c, only RSEs who indicated intentions to found a business were included in the analysis ( $n = 668$ ). Hierarchical moderator logistic regression analyses were used to test Hypothesis 3.

## 5. Results

Table 1 shows the means, standard deviations, and intercorrelations of the variables in this study. None of the independent variables was significantly correlated above .70, indicating no severe multicollinearity effects.

A hierarchical logistic regression analysis was performed to test Hypotheses 1a and 1b. Hypothesis 1a states that RSEs who have a strong security anchor would have negative entrepreneurial intentions while Hypothesis 1b states that those with a strong autonomy anchor would have positive entrepreneurial intentions. After controlling for the RSEs' education level, age, gender, and nationality, the five career anchors were regressed against the RSEs'

Table 1  
Correlation matrix

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
(1) Intentions to found	0.69	0.46																		
(2) Business in own field	0.40	0.49	.55**																	
(3) Business in other field	0.10	0.30	.23**	-.28**																
(4) Business in any field	0.19	0.39	.32**	-.39**	-.16**															
(5) Technical factor	3.74	0.75	-.12**	.10**	-.21**	-.11**														
(6) Creativity factor	3.84	0.72	.04	.10**	-.17**	.05	.34**													
(7) Managerial factor	3.71	0.69	.17**	.01	-.1	.20**	.05	.26**												
(8) Security factor	2.92	0.79	-.12**	.04	-.07*	-.13**	.35**	.12**	.14**											
(9) Autonomy factor	3.94	0.65	.13**	.09**	-.07*	.09**	.21**	.42**	.32**	.01										
(10) Years in organization	4.96	5.16	-.11**	-.04	-.01	-.06	.02	.06	.03	.17**	-.04									
(11) Level of creativity in work	0.44	0.50	.11**	.15**	-.07*	.01	.17**	.11**	-.07*	-.01	.12**	.03								
(12) Type of R&D work	0.76	0.43	.13**	.07*	.06	.02	.04	.04	.09**	-.01	.15**	-.02	.17**							
(13) Personal constraints	0.40	0.49	-.01	.01	.01	-.03	.03	.01	-.02	-.05	.01	-.08*	.03	.02						
(14) Professional constraints	3.18	0.83	.12**	-.07*	.15**	.12**	-.30**	-.11**	-.04	-.44**	-.04	-.10**	-.08*	.03	.04					
(15) Organizational constraints	3.20	0.76	-.05	.10**	-.13**	-.08*	.40**	.15**	.19**	.70**	.10**	.11**	.07*	.02	-.05	-.44**				
(16) Education	0.65	0.82	-.08*	.07*	-.14**	-.08*	.20**	.32**	.01	.20**	.07*	.17**	.11**	.01	-.08*	-.34**	.19**			
(17) Gender	0.16	0.37	-.17**	-.15**	.10**	-.08*	-.06	-.08*	-.09**	-.12**	-.05	-.04	-.12**	-.07*	.07	.03	-.13**	-.10**		
(18) Nationality	0.41	0.49	.06	.23**	-.13**	-.12**	.15**	.09**	-.02	.05	.09**	-.18**	.11**	.04	.04	-.18**	.08*	.19**	-.05	
(19) Age	0.37	0.48	-.07*	.06	-.05	-.11**	.12**	.09**	-.02	.26**	-.01	.52**	.05	-.01	-.11**	-.21**	.21**	.33**	-.12**	.02

\* Correlation is significant at the .05 level (two-tailed).

\*\* Correlation is significant at the .01 level (two-tailed).

intentions to found a business venture (INTENTIONS TO FOUND). The results in Model 1 of Table 2 indicate that the autonomy anchor had no significant impact on RSEs' intentions to found a business venture at  $p < .05$ . Both measures of the security anchor, the SECURITY FACTOR and YEARS IN ORGANIZATION, had negative impact on RSEs' intentions to found a business at  $p < .01$  and  $p < .05$ , respectively. Hence, there was support for Hypothesis 1a but not for Hypothesis 1b. The results in Model 1 also indicate that individuals with a high level of the managerial anchor (MANAGERIAL FACTOR) as well as those who work on new product development (LEVEL OF CREATIVITY IN WORK) and applied research (TYPE OF R&D WORK) had positive intentions to found businesses at  $p < .05$ .

Among the 668 RSEs, or about 70% of the respondents, who indicated that they had intentions to found a business, Table 2 shows the results of the hierarchical logistic regression analysis for Hypotheses 2a, 2b, and 2c. Hypothesis 2a states that among the RSEs who have entrepreneurial intentions, those with a strong technical anchor would have greater intentions to found a business in their current field of expertise (BUSINESS IN OWN FIELD). The hierarchical logistic regression results in Model 2 show that one measure of the technical

Table 2  
Logistic regression analyses of career anchors on entrepreneurial intentions

	Model 1 Found ( $\beta$ )	Model 2 Own field ( $\beta$ )	Model 3 Other field ( $\beta$ )	Model 4 Any field ( $\beta$ )
<i>Control variables</i>				
Education	-0.28**	0.26*	-0.58**	-0.01
Gender	-1.04**	-0.37	1.04**	-0.48
Nationality	0.29	1.17**	-1.05**	-0.82**
Age	-0.25	0.47*	0.10	-0.59**
	$\chi^2(4)=41.81,$	$\chi^2(4)=72.70,$	$\chi^2(4)=49.93,$	$\chi^2(4)=28.98,$
	$p < .001$	$p < .001$	$p < .001$	$p < .001$
Nagelkerke $R^2$ (%)	6.3	14.5	13.3	6.5
<i>Independent variables</i>				
Managerial factor	0.54**	-0.54**	-0.09	0.71**
Security factor	-0.31**	0.23	0.13	-0.32*
Autonomy factor	0.21	-0.13	-0.01	0.18
Years in organization	-0.05*	0.01	0.01	-0.01
Creativity factor	0.14	0.25	-0.60**	0.10
Technical factor	-0.54**	0.44**	-0.62**	-0.13
Level of creativity in work	0.61**	0.31	-0.59*	-0.04
Type of R&D work	0.44*	-0.25	0.87*	-0.23
	$\chi^2(8)=86.02,$	$\chi^2(8)=44.10,$	$\chi^2(8)=47.54,$	$\chi^2(8)=36.00,$
	$p < .001$	$p < .001$	$p < .001$	$p < .001$
Nagelkerke $R^2$ (%)	18.4**	22.6**	24.9**	14.1**
<i>n</i>	959	389	99	180

\*  $p < .05$ .

\*\*  $p < .01$ .

Table 3

Regression analyses of the interaction between career anchors and situational constraints on entrepreneurial intentions

	Intentions to found ( $\beta$ )
<i>Control variables</i>	
Education	– 0.29**
Gender	– 0.87**
Nationality	0.31
Age	– 0.08
$\chi^2(4) = 25.47, p < .001$	
<i>Independent variables</i>	
Creativity factor	0.22
Technical factor	– 0.56**
Managerial factor	0.49**
Security factor	– 0.47**
Autonomy factor	0.20
Years in organization	– 0.03
Level of creativity in work	0.63**
Type of R&D work	0.43*
Professional constraints	0.09
Organizational constraints	0.26
Personal constraints	– 0.13
$\chi^2(11) = 77.11, p < .001$	
<i>Interaction terms</i>	
Creativity factor*Professional constraints	– 0.51**
Technical factor*Professional constraints	0.10
Managerial factor*Professional constraints	0.20
Security factor*Professional constraints	0.17
Autonomy factor*Professional constraints	– 0.05
Years in organization*Professional constraints	0.03
Level of creativity at work*Professional constraints	0.04
Type of R&D work*Professional constraints	– 0.05
Creativity factor*Organizational constraints	– 0.15
Technical factor*Organizational constraints	– 0.10
Managerial factor*Organizational constraints	0.13
Security factor*Organizational constraints	0.17
Autonomy factor*Organizational constraints	– 0.29
Years in organization*Organizational constraints	0.03
Level of creativity at work*Organizational constraints	0.48
Type of R&D work*Organizational constraints	– 0.59
Creativity factor*Personal constraints	0.11
Technical factor*Personal constraints	– 0.50
Managerial factor*Personal constraints	– 0.17
Security factor*Personal constraints	0.27
Autonomy factor*Personal constraints	– 0.61

Table 3 (continued)

	Intentions to found ( $\beta$ )
<i>Interaction terms</i>	
Years in organization*Personal constraints	– 0.03
Level of creativity at work*Personal constraints	0.21
Type of R&D work*Personal constraints	– 0.26
$\chi^2(24) = 28.89$ , n.s.	
Nagelkerke $R^2$ (%)	21.9**
<i>n</i>	959

\*  $p < .05$ .\*\*  $p < .001$ .

anchor, the TECHNICAL FACTOR, had a positive impact on the RSEs' intentions to found a business in their current field of technical expertise at  $p < .01$ . However, the second measure of the technical anchor, which measured work activities that involved applied research (TYPE OF R&D WORK), had no significant impact on the RSEs' intentions to found a business in their current field of technical expertise at  $p < .05$ . Hence, there was only partial support for Hypothesis 2a.

Hypothesis 2b states that among those RSEs who have entrepreneurial intentions, those with a strong creativity anchor would have greater intentions to found a business in a new field (BUSINESS IN OTHER FIELD). The results in Model 3 show that among the RSEs who indicated that they had intentions to found a business, those with a higher level of both measures of the creativity anchor (CREATIVITY FACTOR) and those who worked in the creation of new products (LEVEL OF CREATIVITY IN WORK) had negative intentions to found a business outside their current fields of expertise at  $p < .01$ . Hence, there was no support for Hypothesis 2b. The results in Model 3 indicate that RSEs who work in applied research activities (TYPE OF R&D WORK) had positive intentions to found businesses outside of their current area of technical expertise at  $p < .05$ .

Hypothesis 2c states that among those RSEs who have entrepreneurial intentions, those with a strong managerial anchor would have greater intentions to found any type of business (BUSINESS IN ANY FIELD). The results in Model 4 show that for RSEs who indicated that they had intentions to found a business, those with a higher level of the managerial career anchor, MANAGERIAL FACTOR, had significantly greater intentions to found any type of business at  $p < .01$ . The results support Hypothesis 2c. The results in Model 4 also indicate that RSEs who have a strong security anchor have negative intentions to found any type of business at  $p < .05$ , lending support to Hypothesis 1a.

Table 3 shows the results of the hierarchical moderator logistic regression analysis. Hypothesis 3 states that perceived personal financial constraints, professional limitations, and organizational opportunities would moderate RSEs' intentions to found a business. The nonsignificant chi-square value [ $\chi^2(24) = 27.64$ ] from the interaction terms indicates that personal, professional, and organizational factors had no significant moderating impact on RSEs' intentions to found a business. Hence, Hypothesis 3 was not supported.

## 6. Discussion

Research by Reynolds and Miller (1992) indicated that the most frequent first event in the life history of a nascent venture is the personal commitment of the lead entrepreneur to found a business. To understand the entrepreneur, Shaver and Scott (1991) argued that one has to look at the individual's mental representations and career characteristics. The results of this study suggest that the vocational decision process of an individual to enter an occupation in self-employment (Katz, 1992) can be predicted based on his/her career anchors.

Specifically, the results indicate that RSEs who have a strong security anchor had negative entrepreneurial intentions. Since starting a business venture involves business risks and uncertainties, RSEs who want a stable work environment would prefer to tie their careers to organizations that provide them with job security and long-run career stability. This finding supports Schein's (1978) argument.

However, RSEs' autonomy anchor had no significant impact on their intentions to found a business venture. One possible reason may be because the nature of research and development activities that RSEs are involved in provides them with the freedom and independence to experiment in their work. Since their autonomy anchor would naturally be high given this type of career, this anchor would not significantly differentiate between RSEs who have intentions to found businesses with those who do not. Instead, the results seemed to indicate that it is the specific nature of the research and development activities that the RSEs were involved in, such as new product development or applied research, that significantly influenced their intentions to found businesses. For example, RSEs who were involved in new product creation may form ideas on the different uses of a particular new product and, hence, have greater intentions to found a business to exploit the full potential of that new product. Likewise, RSEs who work on applied research activities experiment on the new uses of a technology and, hence, may form ideas on how the technology can be applied in other fields. Hence, these RSEs may have greater intentions to found businesses to exploit these new opportunities. Therefore, in understanding the entrepreneurial intentions of RSEs and the types of businesses they would found, it is important to look beyond their autonomy anchor to look at specific R&D activities that they are involved in.

The findings also suggest that the RSEs' managerial anchor, or the need to exercise authority, power, and influence as well as to link the organization's achievements to their efforts have an influence on their intentions for firm founding. The results indicate that these RSEs tend to have greater interests in founding any company as long as they are in control and can obtain the sole credit for the venture's success. When *t* tests were conducted to compare between the RSEs who have a strong managerial anchor against those who do not, the former had greater intentions to found any type of business because of a stronger need for monetary rewards (mean difference = 0.23,  $p < .01$ ) and recognition (mean difference = 0.12,  $p < .05$ ). Since their strengths are in general management and they work through other people to achieve their objectives (Schein, 1978), they have no strong preference for the type of businesses to found.

RSEs who have a strong technical anchor in general have negative intentions to found a business venture. One possible explanation is that starting a business venture would take the

RSEs' attention and time away from working on their R&D work. Hence, RSEs who have greater passions for R&D work may shun the administrative aspects of running a business and are therefore less interested in founding a business venture. However, among those who indicated that they intended to found a business, the *t* test indicates that they perceived greater limitations in technical-oriented promotions than those who had no intentions (mean difference = 0.11,  $p < .05$ ). Hence, RSEs with a strong technical anchor would only be interested in founding a business when their career paths along their technical field were stagnated. It is not surprising, therefore, that the types of business ventures they intended to found were those in their current field of technical expertise. The results confirm Schein's (1978) argument that individuals with a strong technical anchor make career moves essentially to maximize their opportunities to remain as experts in their fields. Career growth for these individuals is focused only on continued advancement within their area of expertise.

Perceived personal, professional, and organizational constraints did not have a significant moderating effect on the RSEs' intentions to found a business. Satisfaction with one's present working conditions or dissatisfaction with one's job or the difficulty of obtaining funding did not moderate one's intentions to found a business. A future research study should consider other situational factors that may moderate RSEs' entrepreneurial intentions. Examples of other contextual factors include the accessibility to markets and customers, as well as the social and psychological difficulties of having to start over if the venture failed.

Potential entrepreneurs in this study appeared to be driven only by their career anchors. Although the results suggest that career anchors are robust in predicting entrepreneurial intentions, a major limitation of this study was the focus on entrepreneurial intentions as the dependent variable. A follow-up study should be conducted to assess the extent to which RSEs who indicated that they had intentions to found a business venture actually did so within 5 years. By evaluating these individuals' entrepreneurial intentions before the creation of a new enterprise, a future study that assesses if these respondents actually founded a business would demonstrate causality (Gartner, 1989). Another limitation of this study is the use of self-report measures, which may cause common method variance. However, this problem is minimal because the correlations between these four dichotomous dependent variables and the independent variables were all relatively low ( $r < .25$ ).

Since an individual's career anchors evolve through a process of career development by which an individual tests himself/herself in various job settings, any work-related successes that the individual experiences strengthen his/her career anchors in those areas. Hence, those governments who are eager to groom future entrepreneurs and technopreneurs should create government-sponsored agencies or research centers that provide their RSEs with opportunities to work in specific occupational settings and work activities to develop their career anchors toward the founding of specific types of businesses. In particular, work activities that are targeted at enhancing the RSEs' managerial anchor build their general management skills, which facilitate their interest in founding firms in a wider range of sectors. Work activities that involve applied research enhanced their intentions to found businesses in new areas that are outside their current area of technical expertise. Finally, to increase the likelihood of firm

foundings, RSEs should be rotated in various work settings and even among different research centers to prevent them from being entrenched in a specific job or organization. This is because the longer an individual stays in the same job or is given greater occupational stability, the less intentions he/she has in founding businesses in the future.

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### Appendix A. Questionnaire items

Questionnaire items related to career anchors:

1. Number of years in current organization: \_\_\_\_\_ years.
2. Level of creativity in R&D work: 1 = *creation of new knowledge/products*; 0 = *work not related to creation of new knowledge/products*.
3. Type of R&D work: 1 = *applied research*; 0 = *others*.

	Technical factor	Creativity factor	Managerial factor	Security factor	Autonomy factor
I have regrets about being a research scientist/engineer (reverse).	0.75				
I see long-term prospects in a R&D career.	0.71				
I am proud to be involved in R&D work.	0.70				
I sometimes think of leaving R&D work completely (reverse).	0.69				
I am satisfied with my career in R&D.	0.68				
To make significant scientific discovery		0.77			
To contribute to a body of scientific and technical knowledge		0.74			
To pursue my own ideas		0.73			
To have freedom to be creative and original		0.68			
To develop and utilize management skills			0.86		
To advance to upper levels of management			0.85		
To be evaluated on the basis of management skills			0.80		

	Technical factor	Creativity factor	Managerial factor	Security factor	Autonomy factor
To help the organization enhance its overall performance			0.48		
Adequate career path for technical personnel				0.79	
Emphasis on HR development through training				0.77	
I am fairly rewarded in this organization.				0.74	
I receive clear criteria for promotions.				0.71	
To work independently					0.71
To develop commercially successful products					0.68
To work on professionally important projects					0.59
Eigenvalue	4.63	2.81	2.23	1.36	1.08
Percent of variance	23.16	14.06	11.14	6.80	5.40
Cronbach's $\alpha$	.79	.77	.79	.77	.77

Questionnaire item related to situational constraints.

1. Difficulty in securing financing if you were to start your own new high-tech venture:

1 = *yes*; 0 = *no*.

	Professional limitations	Organizational opportunities
I am not provided with adequate training for the job.	0.80	
I am not provided with adequate facilities and equipment.	0.74	
I am not provided with adequate coaching and supervision.	0.74	
I lack R&D project management skills.	0.73	
I am not provided with adequate technical support.	0.63	
The company inspires the very best in me in the way of job performance.		0.81
The company is a dynamic place to work.		0.80
The organization gives me much room to generate ideas.		0.69
Top management is committed to R&D.		0.64
Eigenvalue	3.68	1.47
Percent of variance	40.87	16.29
Cronbach's $\alpha$	.81	.75

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