



## **Positive Illusions, Motivations, Management Style, Stereotypes, Stress, and Psychological Traits:**

A Review of Research Literature on Women's Entrepreneurship in the Information Technology Field

William Aspray and J. McGrath Cohoon

### Introduction

If our psychological make-up inclines us to entrepreneurial careers, then women's underrepresentation could be explained as a poor match between their typical traits and those that lead to entrepreneurship. This article highlights the evidence regarding psychological analysis of entrepreneurship, with special interest in research that considers women and the information technology field. The largest body of literature discusses differences and similarities in psychological traits between male and female entrepreneurs, and between female entrepreneurs and female managers; and this is the topic that receives the greatest attention in our review. Other topics covered here include motivations for becoming an entrepreneur, including motivations for leaving large companies to start a business; psychological differences in leadership and management style; psychological factors in adolescents that may be predictive of an entrepreneurial career; the role of stereotypes; the role of positive illusions, in particular overconfidence; and stress.

### 1. Personality Traits

What personality traits predispose men and women to become entrepreneurs? This question was a more popular subject for academic study in the 1980s than it is today; so much of the literature is dated.<sup>1</sup> Recent

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<sup>1</sup> Since the early years of scholarship on women and entrepreneurship, beginning in the 1960s there has been an effort to explain the underrepresentation of women as entrepreneurs by considering the psychological differences between male and female entrepreneurs (Schrier, 1975; Schwartz, 1976). This is part of a general trend in the early scholarship to focus on the individual as the unit of explanation – not only psychological traits but also demographics, educational background, and work experiences. There has also been an effort to differentiate the psychological makeup of managers compared to entrepreneurs. A number of literature reviews discuss this line of study. (For example, Gundry, Ben-Yosef, and Posig, 2002; Brush, 1992; Kaplan, 1988.)

Unfortunately, many of the earliest studies (for example, McClelland, 1961; Collins and Moore, 1969) based their measures of entrepreneurial traits in women on studies solely of men, and there is thus some question as to whether they offer good tools for understanding the personality traits of women entrepreneurs (Hurley, 1991). Almost all these early studies also had small samples, making generalization more problematic.

Studies from the late 1970s and 1980s used improved research measures, and for the most part they presented similar psychological profiles for male and female entrepreneurs (Hagan, Rivchun, and Sexton, 1989). Topics studied included: personality factors (Sexton and Bowman, 1986), risk-taking propensity (Masters and Meier, 1988), psychological characteristics (Welsch and Young, 1982; Dugan, Feeser, and Plaschka 1990); and motivations for becoming entrepreneurs, such as independence, achievement, and job satisfaction (Longstreth, Stafford and Mauldin, 1987; Chaganti, 1986; Geoffee and Sease, 1985; Hisrich and Brush, 1983; Welsch and Young, 1982; Schwartz, 1976; Schrier,

research finds some personality traits that distinguish entrepreneurs from managers and may distinguish men from women entrepreneurs.<sup>2</sup> These studies reach little consensus, in part, because of variety in the traits they investigate. There are some common themes, however, particularly with respect to risk-taking tendencies.

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1975). Sexton and Bowman (1986) and Sexton and Bowman-Upton (1990) found that women differ only in having a lower risk-taking propensity and energy level.

Like the earliest studies, research from the 1970s and 1980s has also been called into question on methodological grounds and inconsistency of results. As a result, some researchers abandoned hope of finding individual factors that predispose people to an entrepreneurial career. For example, Zhao, Seibert, and Hills (2005) argue that: "Previous research in this area has tended to lack a strong theoretical orientation; variables have been examined in isolation and have sometimes been included with no clear theoretical rationale. This approach has resulted in an extensive list of possible antecedents but few consistent findings, leading some scholars [such as Gartner (1989)] to doubt that individual-level antecedents of entrepreneurship can ever be found." Nevertheless, other researchers, including Zhao, continue to pursue this line of inquiry today, though in more subtle ways than his predecessors.

What did this line of research look like? Bowen and Hisrich (1986) review the early literature on the personality traits of entrepreneurs. The four traits most commonly studied were: need for achievement, locus of control, risk-taking, and gender identity. The literature failed to demonstrate a strong correlation between achievement motivation and entrepreneurial activity. Only two studies specifically about women entrepreneurs are mentioned. One is by DeCarlo and Lyons (1979) in which female entrepreneurs self-reported much higher levels of need for achievement than females in general, using the Edwards Personal Preference Schedule. In a later study (Waddell, 1983), women entrepreneurs showed higher need for achievement than secretaries but lower than managers, using the Mehrabian and Bank achievement questionnaire.

Research on locus of control focused mostly on the notion of internality (of having a sense of control over one's life) versus externality (Waddell, 1983; Mescon and Stevens, 1982). The findings were mixed about entrepreneurs in general, but the thrust was that entrepreneurs tend to exhibit more internality than the general populace but not more than other managers; and all three studies that examined the correlation between need for achievement and internality found none.

The literature on risk-taking was contradictory. In some studies there was no difference in propensity to risk-taking between entrepreneurs and the general public. In other studies, risk-taking measures identified the subset of business alumni more likely to start a business. Only one study of women entrepreneurs is cited on the issue of risk-taking. Sexton and Kent (1981) found that female executive and female entrepreneurs both identified themselves as moderate risk-takers, with no significant difference between the two.

On the issue of women entrepreneurs showing masculine or feminine traits, the evidence was not decisive but leaned in favor of heightened masculine traits. One study using the Bem Sex Role Inventory (BSRI) showed that women entrepreneurs scored higher on masculine traits than secretaries but not higher than female managers. Another study showed that high masculine scores on the BSRI were a better predictor than sex in explaining aspirations for a career in management. Other studies showed high marks for women entrepreneurs on autonomy, aggression, independence, and leadership (regarded as masculine traits) and low on valuing family over career, wanting support from others, benevolence, and conformity (regarded as feminine traits).

<sup>2</sup> In addition to personality differences, there may be differences in value systems (Fagenson, 1993). Fagenson studied 255 men and women entrepreneurs and managers from Connecticut, New Jersey, and New York. She used Rokeach's Personal Value Survey in which individuals were asked to rank order 15 desired end states: a comfortable life, an exciting life, a sense of accomplishment, a world at peace, equality, family security, freedom, happiness, inner harmony, pleasure, salvation, self-respect, social recognition, true friendship, and wisdom. They were also asked to rank order 15 methods used by individuals to achieve the desired end states: ambitious, capable, cheerful, clean, courageous, forgiving, helpful, honest, imaginative, independent, logical, loving, responsible, and self-controlled. These had been found in previous research to be predictive of attitudes and behavior. There was only significant difference between men and women on two of these thirty variables: women valued equality more than men, while men valued family security more than women; and the high-level finding was one of little difference between men and women. Fagenson found much greater differences between managers and entrepreneurs. Entrepreneurs valued more highly than managers (in order of strength of result) the end states: self-respect, freedom, a sense of accomplishment, and an exciting life; entrepreneurs also valued more highly the following methods to achieve these end states: being honest, ambitious, capable, independent, courageous, imaginative, and logical. Managers, in turn, gave more weight to the end states of true friendship, wisdom, salvation, and pleasure; and the means to achieve these: being loving, compassionate, forgiving, helpful, and self-controlled.

Risk-taking propensity seems to be characteristic of entrepreneurs more than managers, and perhaps of men entrepreneurs more than women entrepreneurs. Within-sex comparisons of women in technology show that entrepreneurs are more likely than managers to take risks (Foo, Wai, and Lang, 2006 and Carland & Carland, 1991). Foo, Wai, and Lang (2006) compared 19 women technical entrepreneurs and 70 women technical managers in Singapore to find differences in the way these women think, their emotional energy levels, and a slight difference in risk-taking. The women technology entrepreneurs were more reflective (analytical, evaluative, and logical), more abstract and future-oriented in their thinking, and have greater emotional energy (responsive, intuitive, intense) than the women technology managers. The authors of this study were surprised that the difference in risk-taking between these two groups of women was only slight.

A more typical finding about entrepreneur and manager risk-taking was obtained by Carland and Carland (1991). Using the Jackson Personality Inventory, the Personality Research Form, and the Myers-Brigg Type Indicator, they showed that a convenience sample of 32 women entrepreneurs scored higher than 88 of their manager sisters on risk-taking proclivities, as well as innovation preferences, and need for achievement. The women entrepreneurs in this study were also more extroverted and more intuitive (focus on a whole idea and may overlook details) than women managers. The men who were studied exhibited a similar manager-entrepreneur split in traits. When Carland and Carland compared their male and female entrepreneurs, the only significant differences were that the women entrepreneurs were more strongly intuitive (focused on the big picture, in contrast to directly perceived reality) and less “thinking” oriented (logical or rational, in contrast to people oriented). There was no significant difference in risk-taking propensity between the men and women entrepreneurs in this study, although there was such a difference between the men and women managers – men scored higher.

Contrary to Carland and Carland’s (1991) findings of no gender difference in entrepreneurs’ risk-taking tendencies, a recent study employing a random sample of 517 men and 156 women owners of small and medium-sized businesses in Western Australia found that men and women entrepreneurs differ significantly on only one of seven characteristics typically ascribed to entrepreneurs – risk-taking propensity (Watson & Newby, 2005). This finding of male entrepreneurs’ greater risk-taking propensity corroborates the results obtained with a convenience sample of men and women entrepreneurs in the United States. (Sexton & Bowman-Upton, 1990). The Australian study also found no gender difference in need for achievement, need for power, or internal locus of control. Both men and women entrepreneurs exhibited masculine traits to the same degree, but women more than men exhibited feminine traits. The authors – Watson and Newby – believe that their findings point to the need for studying both masculine and feminine traits in entrepreneurs, rather than traits of men and women entrepreneurs. They argue further that because men and women entrepreneurs are increasingly similar with respect to masculine traits, research that continues to focus on traits associated with masculinity will overlook possible performance effects from feminine traits and result in findings of no differences by biological sex. They recommend that researchers replace the typical masculine traits studied with the “Big Five” personality characteristics – the five major categories of personality traits (described below in relation to the Zhao and Siebert study).

The effect of risk-taking propensity on MBA students’ intention to become entrepreneurs is mediated by their confidence in their “ability to successfully perform entrepreneurial roles and tasks” (Zhao, Siebert, and Hills, 2005, p. 1265). In other words, even if risk-taking propensity is high, students who lack this type of confidence, or self-efficacy, are unlikely to intend to become entrepreneurs. By surveying 265 MBA students at the beginning and end of their formal education at five U.S. universities, Zhao, Seibert, and Hills found that male and female students are equally likely to have entrepreneurial self-efficacy. Nevertheless, women reported lower intentions to embark on an entrepreneurial career than men. These results imply that factors other than entrepreneurial self-efficacy account for women’s underrepresentation among entrepreneurs.

Taken together, these studies clearly indicate that risk-taking propensity distinguishes between managers and entrepreneurs. It is less clear whether this distinction helps explain women’s underrepresentation among

entrepreneurs. To explain the gender imbalances among entrepreneurs, women's generally lower risk-taking tendencies as well as patterns in risk-taking tendencies among men and women entrepreneurs would need to be better documented than they are.

Other recently investigated entrepreneurial traits include need to achieve, locus of control, autonomy, and the "Big Five" personality traits. There is little evidence, however, that they contribute to gender imbalance among entrepreneurs.

Managers and entrepreneurs differ on four of the "Big Five" personality traits (Zhao and Siebert, 2006). According to Zhao and Siebert's recent meta-analysis of 23 studies, entrepreneurs score higher than managers on both conscientiousness (which measures one's organization, persistence, hard work, and need to achieve) and to a lesser extent on openness to experience (which measures intellectual curiosity and preference for new experiences and ideas). Entrepreneurs score lower than managers on both neuroticism (which measures emotional adjustment and stability) and agreeableness (which measures how trusting, forgiving, caring, altruistic and gullible one is). The meta-analysis found no difference between entrepreneurs and managers with respect to extraversion (which measures assertiveness, dominance, energetic, talkativeness, and enthusiasm). These results imply that conscientiousness, perhaps particularly with respect to achievement motivation, and openness to experience may be key personality components for entrepreneurs (Zhao and Siebert, 2006). No inference is drawn regarding gender differences in entrepreneurial activity.

An element of conscientiousness – need for achievement – is widely thought to predict entrepreneurial behavior.<sup>3</sup> A longitudinal study by Hansemark (2003), however, found no relationship between young Swedish adults' (average age 22 years, 48 men, 43 women) need for achievement and their subsequent actual entrepreneurial activity over an 11-year period. Regardless of psychological test results about expectations of being better or faster than anybody else at something, the postsecondary students in this study subsequently showed no link between their need for achievement and whether they actually became entrepreneurs. The same study also investigated locus of control, which has to do with attribution of success or failure to one's self or external forces. The results showed that locus of control predicts starting a business for men, but not for women.

A trait not obviously included in the "Big Five," but still considered in the literature on personality differences is autonomy (rebellious to restraint or restrictions, enjoys being unattached and free, not tied to people). Men and women entrepreneurs may differ on this trait, with women entrepreneurs being the more autonomous (Sexton and Bowman-Upton, 1990). According to results from the Jackson Personality Inventory, there were slightly more similarities than differences between 105 female entrepreneurs from the Houston area and an equal number of male entrepreneurs from the Columbus, Ohio area. The differences observed were that women scored significantly lower than men on energy level (active, reserves of strength, does not tire easily, capable of intense work) and risk-taking; and higher than men on autonomy and change (likes new and different experiences, dislikes and avoids routine, may readily change values and opinions, adapts readily to the environment). Among only women, entrepreneurs' need for autonomy was greater than managers' (Brodsky (1993), according to Langan-Fox, 2005). Brodsky's (1993) study of 47 female entrepreneurs and 41 female corporate managers found that women managers were more trusting and required less control than women entrepreneurs. The entrepreneurs wanted to define their own work parameters.

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<sup>3</sup> Langan-Fox (2005) conducted a literature review concerning achievement, motivation, and leadership of women entrepreneurs. One main finding concerns the Need to Achieve variable, which has been found in numerous studies set in many different countries to be particularly characteristic of entrepreneurs. People with a high Need to Achieve often "avoid routine, and seek out information to find better ways of doing things; they excel at moderately challenging tasks; they like to take responsibility for their own performance; and they also prefer working in environments where feedback is given." (Langan-Fox, 2005) Langan-Fox argues that the Need to Achieve trait is essential in the start-up phase of a new business, during the first couple of years, but a managerial personality, which has different personality characteristics from those of entrepreneurs, is needed for the ongoing operation of the business.

In sum, the literature on personality as an explanation for entrepreneurial activity has yet to reach much consensus. It appears that entrepreneurs more than managers are prone to risk-taking. Other differences are either less well-documented or probably unimportant because they fail to predict entrepreneurial activity. Whether the risk-taking difference is important to gender differences in entrepreneurship remains an open question.

## 2. Motivations

What motivates men and women to have entrepreneurial careers?<sup>4</sup> A persistent theme in the literature on motivation for entrepreneurship is that desire for balance between family and career prompts women to become entrepreneurs. In addition to the attraction of a balanced life, recent studies indicate that the desire for fair treatment and improved compensation motivates movement from management to entrepreneurship (Hardesty and Jacobs, 1986, as reported in Powell and Mainiero, 1992). Examples of research focusing specifically on women's shift from manager to entrepreneur include: Daily, Certo, and Dalton, 1999; Alvarez and Mayer, 1998; Moore and Buttner, 1997; Cromie, 1987. For a review of the literature and a suggested typology of motivations for entrepreneurship, see Moore (2004).

An earlier typology of motivations looks at what motivates achievement, rather than entry into entrepreneurship. It was based on self-reports from 60 Australian women entrepreneurs, and groups women entrepreneurs according to psychological types (Langan-Fox and Roth, 1995). The managerial entrepreneur had a low Need to Achieve score but high scores on locus of control, job satisfaction, and activism or planning for career. The pragmatic entrepreneur had moderate scores on all the personality traits and seemed the most motivated by family concerns such as passing on the business to their children or earning more money through self-employment. The Need achiever entrepreneur was high on the Need to Achieve trait and scored lowest on job satisfaction, activism, ability to influence or have power, and need for influence. Langan-Fox and Roth found that 81% of women entrepreneurs had a moderate to high Need to Achieve trait, but a majority of these women entrepreneurs also had many of the management traits as well. The business ventures of their "pragmatic entrepreneurs" were more successful than the ventures of women whose traits skewed strongly to either of the other two motivation groups. This finding makes it clear that women entrepreneurs, whether or not they differ from men, also differ from each other.

The psychology of job-changing may offer insights into the shift from manager to entrepreneur (Sullivan, 1999). For example, people who closely monitor role expectations and social cues are more likely to change jobs than those who do not (Kildruff and Day, 1994). And individuals with "cosmopolitan" personalities are more likely to switch jobs while those with "local" personalities are more likely to politick (although the definitions of "cosmopolitan" and "local" are not so clear!) (Larwood, et al. 1998). There seems to be a pattern to job-changing behavior, in that individuals are more likely to leave an organization if they had often left jobs in the

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<sup>4</sup> Powell and Mainiero (1992) review the early career development literature related to motivation. The literature of the 1970s has a number of studies that treat the male experience as the norm and "typically have viewed women's anomalies over the life-course as 'developmental deficiencies' that require added explanation." Powell and Mainiero also identify various efforts in the 1980s that spoke to the need for and in some cases offered models of development for adult women. Some of these are tied strictly to biological differences such as pregnancy and lactation, some to differential socialization experiences of men and women. They point to literature questioning the simple, linear models of career development. They also point to a study by Hardesty and Jacobs (1986) that studied complications in women's careers: "Many of their sample of successful women professionals reported frustration, emptiness, exhaustion, disillusionment, and a sense of personal failure when they realized the personal and interpersonal costs of professional success. For these women, power, title, success, and money were not enough. They wanted fair treatment, improved compensation, *and* a more balanced life. Not finding this, they made career shifts, reassessed their career and life priorities, and in many cases turned to self-employment." Powell and Mainiero argue that many women focus more on how they are feeling about their careers than about how the career is actually going.

past (Judge and Watanabe, 1995). These general job changing behaviors may be influenced by the same psychological factors that motivate transitions from manager to entrepreneur.

We close this section with a discussion of two studies on motivations for entrepreneurship. The first, Buttner and Moore (1997), suffers from methodological problems evidenced by many other studies – their sampling procedures raise doubts about the generalizability of their results (Burt, 2000). The second study, by DeMartino and Barbato (2003), is strong methodologically and found results similar to those of Buttner and Moore.

Buttner and Moore (1997) studied 129 women from twelve U.S. cities for their motivations for leaving large organizations to start their own companies and their measures of success. They found that these women's highest motivation was desire for challenge and self-determination, followed by balancing family and career and frustration about career blocks in their prior employment. The women's highest measures of success were self-fulfillment and achievement of goals, followed by profit and growth. Balancing family and career and achieving social goals were low-rated measures of success.

In a large study of twenty years of graduates from a leading U.S. MBA program, DeMartino and Barbato (2003) explored gender differences in motivations for an entrepreneurial career. Because their study population had similar educational backgrounds, comparisons were more meaningful. The authors found that women were more likely to be motivated to pursue an entrepreneurial career as a means to balance family and career, while men were more likely to be motivated by wealth accumulation and career advancement. These gender differences were amplified in cases where the women married and had dependent children. For example, women with dependents ranked the following factors significantly higher than men with dependents – the importance of family friendly policies, family obligations, and spouse/co-career employment issues. Neither marriage nor dependent children had a significant effect on the motivations of males to pursue an entrepreneurial career. The authors pointed out that their findings are consistent with other studies, such as Caputo and Kolinsky (1998), which found that women were much more likely to choose self-employment if there were small children at home; and Bailyn (1993), who found that male entrepreneurs had goals focused outside the home, while female entrepreneurs had goals structured more closely around their personal life.

Together, these studies about entrepreneurship suggest that men and women have some different motivations for becoming entrepreneurs. The differences seem to center on the role of personal life as a motivation.

### 3. Leadership and Management Style

Many studies find psychological differences in leadership and management style between men and women. Literature from the 1980s finds that women's style is based on values of cooperation, support, and concern (Marshall, 1984). More often than men, women's leadership is participatory (Jago and Vroom, 1982; Neider, 1987; Brush, 1992 and 1997). It also has been described as more interactive and dependent on consensus building, and involving greater willingness to share information and power than men's leadership (Rosener, 1990 and 1995; Eagley and Johnson, 1990; Grant, 1988; Helgeson, 1990; and Loden, 1985). Women entrepreneurs engage in a collaborative and inclusive management process, according to Bancroft (1995), and in women-owned businesses, women employees put more value on warmth, helpfulness, and awareness of others' feelings than do women employees in male-owned businesses (Fagenson and Marcus, 1991). Together, these studies from the 1980s and 1990s tell a consistent story of gender difference in leadership and management style.

More recent research raises some questions about the long-standing conclusion that men and women differ in their leadership and management style. An interesting study of the high-tech industry (Perelman, 2001) found few gender differences, contradicting a long body of earlier literature that was not focused primarily on high-tech entrepreneurship. According to Langan-Fox (2005), this study calls into question the relevance of much of the earlier research, although it is inappropriate to dismiss all earlier results on the basis of only Perelman's

study. For example, Langan-Fox also points to a study of 228 American entrepreneurs by Leahy (1997), which found that female entrepreneurs were better at task focus and male entrepreneurs were better at processing information about their business. It seems that the weight of evidence points toward some gender differences in leadership and management style, but what they are and how context affects gender differences remains uncertain.

Another recent study identifies a management style common to women entrepreneurs. Buttner (2001) qualitatively analyzed female entrepreneurs' management style based on self-reports from 129 women entrepreneurs in twelve U.S. cities. The results show that women entrepreneurs used a relational approach to employees and clients to manage their business. These included *preservation*, taking responsibility for the success of the organization, its employees, and its clients in a way that is similar to the way in which the leader might take responsibility for the well-being of her family and for its individual members; *mutual empowerment*, developing other people and enabling and giving them the freedom to do their job, learning from others, and supporting the employee in learning by taking risks and doing things; *achieving*, using relational skills to be successful in their personal and business lives, and to help their employees achieve success; and *creating a team sensibility* in the workplace, including collaborative decision-making and a shared vision of the goals and operating style of the firm. These relational activities, such as taking responsibility for tasks not covered by others, learning from employees, and promoting a collaborative team structure often go unrewarded in traditional firms. (Jacques, 1993 and Fletcher and Jacques, 1998, as cited in Buttner, 2001) Given the lack of a comparison group, it is hard to know how different these management traits are from those of male entrepreneurs, although the findings echo gender differences reported in the literature.

In sum, there is considerable consensus that men and women exhibit different leadership and management styles. Only recently have questions been raised about whether this apparent gender difference is real or if it extends to all industries.

#### 4. Adolescent Predisposition to Entrepreneurship

Some researchers argue that adolescent personality traits, and the parenting styles one experiences, predispose to entrepreneurial careers. We illustrate this line of research with two studies, one from East Germany and the other from the United States.

Schmidt-Rodermund (2004) found no relationship between gender and East German students' entrepreneurial skill or interest. She did find, however, that early entrepreneurial competence has a moderately strong positive effect on entrepreneurial interest, which in turn contributes to entrepreneurial career prospects. Both nature and nurture play a role in early entrepreneurial competence, according to this study. Nature contributes in the form of an inborn entrepreneurial personality. Nurture contributes in the form of authoritarian parenting.

The 320 adolescents in Schmidt-Rodermund's study were identified as having entrepreneurial competence when they spoke of "encouraging others to get something done," expressed self-confidence, or mentioned their "fighting spirit." These self-descriptions were more common among students with an entrepreneurial personality, as defined with the following Norman's Big Five personality traits (as discussed in section 2 of this review): low agreeableness (cranky rather than good-natured), low neuroticism (robust rather than vulnerable), high extroversion (talkative rather than uncommunicative), high openness (conventional rather than inventive), and high conscientiousness (diligent rather than lazy). The 132 business founders also interviewed for the study were similar to the students in that their entrepreneurial personality was linked with early entrepreneurial competence. In their case, competence was further linked (although weakly) with plans for self-employment.

Authoritative parenting, characterized as providing support and rules while still giving the child some autonomy, also correlated with adolescent entrepreneurial competence (Schmidt-Rodermund, 2004). Adolescent entrepreneurial competence, in turn, was linked to greater entrepreneurial interest as an adolescent, and a stronger likelihood that a youth would report that he or she expected to own a business or be a business

executive at age 40. As with the inborn entrepreneurial personality, authoritative parenting had a similar effect on the early competence of the business founders studied. Those who recalled having adolescent traits of entrepreneurial competence were likely to have started their first business at an earlier age. In addition, within this group of business owners, entrepreneurial success – as measured by years in business, gross income, subjective career satisfaction, and business survival – was positively correlated with early business start-up and also with the Big Five personality traits.

While interesting, Schmidt-Rodermund's study has some methodological problems that may make it inappropriate to apply findings to women IT entrepreneurs in the United States. The study was conducted in East Germany during the transition from socialism to capitalism, and it used cross sectional rather than longitudinal data. As a result, the findings remain more suggestive, rather than conclusive, until corroborated by other studies.

Further evidence about the influence of early entrepreneurial traits comes from a similar study conducted in the United States by Wilson, Marlino, and Kickul (2004). They analyzed a large data set from 1971 U.S. teenagers in 29 middle and high schools. They found that girls were significantly less interested in an entrepreneurial career than boys; and African American and Latina girls were more interested in an entrepreneurial career than Caucasian girls. The study found a gender difference in the reasons for interest in an entrepreneurial career, with girls more likely to cite doing something of social value and relational factors such as working with others, having good relationships, and earning respect; while boys were more likely to cite reasons of autonomy such as being my own boss, being in charge of other people, or working by myself. Financial gain was a strong motivation for an entrepreneurial career for all boys and for girls of color, but not for Caucasian girls. Considering leadership skills, girls rated themselves higher than boys, except on their ability to handle money. Again, there was no longitudinal data to compare adolescent attitudes and motivations to adult entrepreneurial experiences.

Several findings from the Wilson, Marlino, and Kickul study are consistent with results from other studies. For example, Kourilsky and Walsh (1998) found both that boys show more interest than girls in an entrepreneurial career, and that “both girls and boys self-reported a comparable low level of knowledge specific to entrepreneurship, [but] girls were more aware of their lack of knowledge.” Marlino and Wilson (2003) found that “girls overall rate themselves lower than do boys in certain skill areas they associate with success in business, including managing money, working with numbers, problem solving and decision making.” (Quotes from Wilson, Marlino, and Kickul, 2004) Note that these are self-reported perceptions, which may have more to do with self-efficacy than actual skill levels.

Together, these two recent studies suggest that the seeds of entrepreneurship are present before adulthood, and that conditions can cultivate them. Both studies, however, have methodological limitations that prevent associating early traits with actual subsequent careers. In light of the lack of support from the Swedish longitudinal study cited above (Hansemark, 2003), it seems premature to conclude that such a relationship exists.

## 5. Stereotypes

Gender stereotypes are persistent and pervasive (Hosada and Stone, as reported in Baron, Markman, and Hirska, 2001), and there is evidence that they disadvantage women in careers as managers and entrepreneurs. For example, women are regarded as less qualified for managerial-level jobs because of stereotypes (Van Vianen and Willemsen, 1992). Similarly, entrepreneurs are stereotyped as masculine – more assertive, achievement oriented, and risk-taking than managers (Baron, 1999), which suggests that stereotypes would work even more harshly against women trying to be entrepreneurs than women trying to be managers.

Counter to the inference that stereotypes have more negative effects on women entrepreneurs than managers, some researchers argue that stereotypes work in favor of women entrepreneurs. Attributional augmenting –

favorable influence from identification as someone who overcame high barriers to occupy a role – may cause negative stereotypes concerning women in business to be less severe for women entrepreneurs than for women in large companies (Baron, Markman, and Hirska, 2001).<sup>5</sup> Support for this hypothesis came from three experiments. People viewed head-and-shoulder photographs and were told that the individuals were either managers or entrepreneurs; then they were asked to rate the individuals portrayed for career seriousness, decisiveness, assertiveness, ambitiousness, sincerity, manipulativeness, masculinity-femininity, and attractiveness. In the first two experiments, all the photos were of women; in the third experiment, both men and women were portrayed. In the first two experiments, there were statistically significant findings that the women portrayed were more decisive, more serious about their career, had their success attributed less to luck and more to specific skills (and in particular to social skills), and were regarded as less feminine when the respondents were told the women portrayed were entrepreneurs. (In fact, all the women portrayed in studies 1 and 2 were actually entrepreneurs.) In experiment 3, men did not receive significantly different ratings when the respondents were told they were entrepreneurs compared to when they were told they were managers; but there was a significant difference with respect to the rating of the women, similar to in the first two studies.

The authors conclude that attributional augmenting was at play here and that “by becoming entrepreneurs, women may reduce the tendency of others to view them through the lens of negative gender stereotypes, which exert adverse effects on women’s success in many different contexts” (Baron et al., 2001, p 928). These authors believe that this is an important finding because perceptions of women as entrepreneurs can affect the decisions made by venture capitalists, potential customers, and potential employees. It should be noted, however, that no traits (except social skills) showed female entrepreneurs rated higher than male entrepreneurs.

The final study in this section considers people’s perceptions of themselves as entrepreneurs. Verheul, Uhlaner, and Thurik (2004) surveyed a non-random sample of somewhat older (average age 50 years) MBA students at a large Midwestern U.S. university, who had taken an entrepreneurship class, or who were identified as CEO or president of a company listed in a Dun and Bradstreet database. They found that entrepreneurial self-image was positively linked with people who founded companies or ran small to medium-sized companies, but not with people who worked within large corporate organizations, even if they created new innovations or business units. Women were less likely than men to have an entrepreneurial self-image, but this statistically significant difference was moderated somewhat in cases where the women had experience in small business.

In sum, the research on stereotypes and women entrepreneurs in IT has not yet been conducted. Related studies tend to find that women do not fit the stereotype of entrepreneur and do not see themselves as entrepreneurs, but aspects of the impact from this poor fit are disputed.

## 6. Positive Illusions, Especially Overconfidence

Positive illusions may help with establishing one’s own business (Ottesen and Gronhaug, 2005, drawing heavily on Bazerman, 1998). Unrealistically positive view of oneself, unrealistic optimism, an illusion of having control, or self-serving attribution such as crediting successes to one’s abilities and failures to some external condition or bad luck can create a go-ahead spirit and encourage an entrepreneur to work and save extra hard (also see Manove, 2000); be less likely to follow his or her peers and instead explore the environment more carefully to gain extra information that enhances the company’s competitiveness (Bernardo and Welch, 2001); and signal high ability to customers and bankers (Parker, 2006). On the other hand, they also could have negative consequences because one might experience significant loss, for example, by investing in a business that has no chance of success. (See, for example, de Meza and Southey, 1996.)

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<sup>5</sup> In their analysis, Baron et al. postulate that the inhibiting factors are lack of access to capital as well as these gender stereotypes that show entrepreneurs to have masculine traits, while the facilitating factors are individual characteristics of the entrepreneurs such as motivation, ability, and desire for achievement.

Research has yet to say much about gender differences in positive illusions, but there may well be such differences in IT entrepreneurship, given the gendered differences in self-confidence that many scholars have noted. According to Ottesen and Gronhaug (2005), “individuals can erroneously believe that members of their group are better in a number of areas than individuals who do not belong to the group, which creates fruitful ground for group thinking. ... Our own observations at such gatherings [of networks of entrepreneurs] show that such meetings can be very useful in a number of ways (for example, discussions of experiences of different production technologies) but also that the actors who meet look very positively on their own and their group’s abilities and future prospects. And importantly, there are few critical voices – and those who are critical are met with skepticism and soon forgotten.” Women’s scarcity at these kinds of meetings or networks of entrepreneurs may diminish the perception of women as capable entrepreneurs in the eyes of established entrepreneurs. This issue is worthy of further examination.

Optimism and overconfidence are two slightly different concepts that scholars do not necessarily differentiate. According to Parker (2006), the literature indicates that optimism is correlated to both wealth accumulation and forming new businesses. It also shows that people, on average, overrate their own personal characteristics, and there is strong evidence that this trait is widespread among entrepreneurs (Camerer and Lovo, 1999; Busenitz and Barney, 1997; Cooper, Woo, and Dunkelberg, 1988; Pinfeld, 2001; Arabsheibani et al., 2000; Astebro, 2003; Puri and Robinson, 2005; Wright et al., 1997). Other studies show the correlation in entrepreneurs between optimism and other cognitive biases, including a lower likelihood to engage in counterfactual thinking and a greater likelihood to generalize from small samples (Baron, 1998; Simon et al., 2000). Other scholars have discussed so-called signaling problems, such as an overconfident entrepreneur presenting a highly ambitious business plan to signal that his skills are better than the typical person presenting to the venture capitalist. (See Wortman and Linsenmeier, 1977; Baumeister, 1998; following on the Nobel Prize winning economic work of Spence, 1974.) Manove and Padilla (1999) show that realistic banks tend to over-lend when they do not have good information about which entrepreneurs seeking loans are overly optimistic. In light of this finding, one recent study offers an economic model of strategic interaction when players have incomplete information and may have misperceptions, in particular, overestimating their own abilities or situation (Squintani, 2006). This literature does not generally consider gender differences, but it is possible that there are gendered differences in over-confidence, in the same manner we suggest for positive illusions.

Although positive illusions may be gendered, their gendered effect on entrepreneurship in IT has yet to be studied.

## 7. Stress

Male and female entrepreneurs may experience different stresses. According to Kephart and Schumacher (2005), the literature suggests that this gender difference could stem from stereotypes about what entrepreneurs are supposed to be like (masculine); expectations that women, more than men, take responsibility for family life as well as career; fewer women role models and mentors; and a smaller support network. These factors stress women in particular, in addition to the normal business stresses that both male and female entrepreneurs experience. The normal business stresses can come from: “task design (i.e., long hours, little sense of control, heavy work loads), management style (i.e., inadequate communication and a lack of employees’ participation in decision-making), and personal relationships (i.e., little or no support from coworkers/supervisors, and inferior social environment), according to a 1999 National Institute for Occupational Safety and Health study to identify potential sources of stress (as noted in Kephart and Schumacher, 2005). Increased stress has also been associated with work roles (i.e., uncertain or conflicting job expectations), career concerns (i.e., job insecurity, lack of growth opportunities or internal advancement), and environmental conditions (i.e., dangerous or unpleasant physical surroundings)” (as quoted in Kephart and Schumacher,

2005). This and other studies of entrepreneurial stress<sup>6</sup> offer no conclusions about the role that stress plays in the gender imbalance among entrepreneurs. Additional study seems warranted.

## SUMMARY

Our review has identified an extensive psychological literature on gender and entrepreneurship. For the most part, this literature does not yet extend to an Information Technology context. As it is, we are most confident with the following conclusions:

- Risk-taking propensity is the psychological trait most likely to distinguish between men and women who become entrepreneurs and those who do not.
- Stereotypes about women and about entrepreneurs have little overlap, and women's self image seldom includes entrepreneurship.
- When motivated to become an entrepreneur, women are more likely than men to do it out of desire for work-life balance.
- When women become entrepreneurs, their management and leadership styles are likely to differ somewhat from men's by being more consensual and empowering.

Further research is needed to determine whether any or all of these conclusions extend to the IT domain. Even if they do, their implications for the gender imbalance among IT entrepreneurs require amplification.

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<sup>6</sup> Hellstrom, Hellstrom, and Berglund (2002) discuss cognitive strategies that technological innovators use to cope with stress in the innovation process. Karasek and Theorell (1990) study differences in stress levels between managers and lower-level workers. Beatty (1996) discusses stress more generally in male-dominated occupational fields.

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