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The State of Social Science Research on Gender and IT Entrepreneurship
A Summary of Research Literature on Women's Entrepreneurship in the Information
Technology Field

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Women now own 41 percent of the privately held firms in the United States and 28 percent of the firms providing professional, scientific, and technical services. Yet, women own less than 5 percent of information technology firms. Perhaps because of their small number, little scholarly attention has been paid to women entrepreneurs in IT, even as the overall number of women entrepreneurs and the social science literature about them has increased over the past quarter century. This brief paper describes the state of scholarship related to women's IT entrepreneurship¹ and points to the need for additional research about both the underlying causes for women's underrepresentation and the conditions that promote women's success as IT entrepreneurs.

¹ Our descriptions are based on a literature review that we conducted on behalf of the National Center for Women & Information Technology (NCWIT), supported by the Kauffman Foundation. Our intention was to review the social science research that discusses three inter-related parameters: women, entrepreneurship, and IT. We found, however, that the number of papers focused on all three parameters numbered fewer than ten. Expanding consideration to papers about women, entrepreneurship, and all of high technology turned up no more than 20 or 30 papers. As a result, we modified our parameters to include the social science research literature on pairs of the three parameters: IT and entrepreneurship, women and IT, and women and entrepreneurship. In the end, we carefully examined about 300 articles, scanned abstracts and titles of a much larger number, and wrote four papers that are summarized here.

About one-third of the carefully examined articles offered information useful for understanding gender and IT entrepreneurship. The bulk of the social science literature we found is about women and entrepreneurship, although much of it is not relevant to our investigation. For example, many studies focus on micro-financing of entrepreneurial ventures in developing countries, or home-based start-ups in traditionally female occupations such as hairdressing. There is also much literature on women and IT that tends to focus on children's interest in the field or on women's higher education in computing, with relatively little about the career and the workplace. Finally, the social science research on IT and entrepreneurship is quite small, although expanding from IT to high-tech results in a somewhat larger number of publications. Even so, that literature is not particularly relevant to issues of gender, with two exceptions – it contains some useful but general information about social networks and their impact on access to financial capital, and to a lesser extent, information about education and human capital. In the end we found no more than 100 papers with direct relevance to the issue of women entrepreneurs in IT.

There are some notable trends in the 100 scholarly papers with direct relevance to women entrepreneurs in IT. The earliest literature looked for psychological differences in male and female entrepreneurs. Over time, this line of research broadened to consider issues such as differences in the psychological profiles of corporate managers and entrepreneurs, motivations for entrepreneurship, adolescent predisposition to entrepreneurship, the impact of stereotypes, overconfidence, and optimism. Another genre of early literature (in the 1960s and 1970s) focused on alleged gender discrimination in access to capital for entrepreneurs. Eventually, the discrimination investigations became more nuanced through inclusion of factors such as type of funding sought, differences in the business sectors in which men and women seek funding, gender differences in technical education among entrepreneurs seeking funding, and the relative absence of women in decision-making positions among investors. One early theme was performance comparisons between companies run by men and women, which portrayed men as more successful entrepreneurs because their firms grew more rapidly. As with the other literature, this research has also developed nuances over the years, looking more closely at the empirical data about growth and persistence of firms, and also considering achievement of founder intentions as an alternative measure of success. Finally, recent investigations target social capital and social networks as explanations for both the presence and success of women entrepreneurs.

We summarized the literature in four papers, one each on psychological issues, financial capital, social capital, and growth and persistence of firms. Another major theme – education and human capital – was not covered, primarily because the relevant literature about this theme and women or gender and IT entrepreneurs is so scant. The literature related to the major themes is also thin and it has another potential problem: the relevance of findings for the IT industry is questionable when studies were conducted in other industries.

Research results from other industries may not apply because the IT environment has an unusual set of characteristics. For example, IT relies to a high degree on venture capital, eligibility for that capital rests on a narrow range of entrepreneur qualities especially including technical training and experience, and company failure rates are high. Furthermore, the boom (1999-2002) and bust (2002-2006) cycles experienced by venture-funded IT start-up companies had a heavy impact. IT also has rather intense time pressures, with short deadlines for moving products to market, rapid obsolescence, and a culture of working round-the-clock. These exceptional conditions may interact with gender stereotypes and gender differences to heighten or distort effects on women's entrepreneurship. We therefore encourage researchers to give special and separate treatment to the IT industry.

Our literature reviews lead us to make other recommendations about the direction of future research. There are many unanswered questions related to each of the major themes, and themes that remain largely unexplored. For example, the research on psychological issues has yet to determine whether gender differences in personality characteristics are related to the gender imbalance among IT entrepreneurs. Developing this idea further, it would be useful to know what contextual factors affect business risk-taking by men and women. Other psychological questions worth investigating are whether interventions designed to reduce the negative effects of stereotypes on performance also affect women's intentions to start IT businesses. How do men and women assess the work-life balance implications of

entrepreneurship in different industries? Are there patterns in management and leadership styles across industries, and do they correlate with the level of women's entrepreneurship?

Financial capital research no longer looks to discrimination as an explanation for women obtaining smaller loans, paying higher interest rates, having to post higher collateral, experiencing a higher incidence of unmet credit needs, and expressing lower satisfaction with the bank loan process. Nevertheless, it would be useful to document whether gender discrimination colors the investment decisions of venture capitalists. Research also should examine how men and women differ in their access to venture capital after controlling for competing explanatory factors, such as technical education, experience, industry type, and venture capital firms sought. Several other questions arise from the literature on financial capital. There is a general understanding that venture capital funding was reserved for companies with high-risk, high-growth strategies, but there is almost no literature on how gender of either the entrepreneur or the venture capitalist fits into the system. In addition, women in the IT field have received a proportionally greater percentage of their funding from angel investors than have male IT entrepreneurs, but the research on angel investment is just beginning. Research should examine how women's relative lack of venture capital sources might subsequently affect their entrepreneurial endeavors (e.g., firm size, firm growth). Finally, a worthy avenue of investigation would be the role that technical education and experience plays in access to financial capital in IT. This aspect of human capital might also elucidate whether certain gender differences in education and experience contribute to the gender gap in IT entrepreneurship.

Thus far, the literature on social capital and entrepreneurship reaches no consensus about findings of gendered network effects. It may be that even past findings of gender differences no longer hold true, or hold true only in certain industries. Future research on networking and access to social capital should determine whether gender differences in social networking exist in IT and demonstrate any links with different outcomes for male and female entrepreneurs. In addition, researchers should consider ways that social networks might affect access to venture capital.

Evidence now tends to contradict earlier findings of differences in size, growth, and persistence of firms founded by men and women. In addition, more recent literature questions the early assumptions about the meaning of entrepreneurial success, instead arguing that success should be measured according to founder intention. With this new definition, women's entrepreneurship may be as successful as men's, although the reasons for gender differences in founder intentions are not yet clear. Future research should examine a wide range of success measures, including for example, employee satisfaction, customer satisfaction, and contributions to the community in which the firms operate. Furthermore, given inconsistent findings across studies, research could inform the literature on firm success by identifying differences or similarities in the characteristics, market sector, and target audience of high-growth, women-founded companies as compared to men-founded companies.²

² See the September 2007 report from the SBA Office of Advocacy for a very recent step in this direction.

So far, this briefing paper has only considered entrepreneurship in the traditional sense of starting a company. There is, however, a broader way of looking at this issue – by including the creation of intellectual capital, whether embodied in research papers and patents, or transferred into products and services that are sold. Investigations in this area are only beginning; even differences in the numbers and percentages of IT research papers are not yet known and only one recent report describes patenting in the IT field by women and men (the NCWIT report, *Who Invents IT? An Analysis of Women’s Participation in Information Technology Patenting*). The underlying influences remain unexplored. For example, are women less likely than men to move back and forth between academia and industry during their careers, a practice that appears to effectively transfer ideas into marketable technologies? Are academic women less likely than their male colleagues to have social networks that give them access to the contacts and know-how to start a business? Are academic women busier than academic men with their service duties at work and their family responsibilities, leaving insufficient time for starting a business? Are they likely to feel greater responsibility than academic men to their teaching and service commitments so that women have less time for research and entrepreneurship? Are women likely to have different attitudes than men about personal ownership and public-domain ideas in situations where their research was funded by the government?

Our review of the literature for explanations of the severe gender imbalance in IT entrepreneurship makes it clear that scholarship specific to this issue is rare. Even the strongest findings related to the broader topic of gender and entrepreneurial behavior have yet to be tested in the IT industry. This oversight might be of little concern except for the enormous influence IT exerts over the economy and almost every aspect of how we live our lives.

Research must focus on this topic if we are to understand the conditions affecting women’s engagement in shaping the future. We recommend that the highest priority be given to investigations of the following issues:

1. Founder goals: How achievable are different founder goals in the IT industry? Are there gender differences in founder goals related to IT innovation? Are there consequences from founder goals that can be seen in employee turnover, or social or environmental impact of IT products? What factors or conditions affect gender differences in founder goals?
2. Social capital: How do gender differences in social capital affect achievement of founder-defined success in IT companies? How do the social networks of men and women in academia influence their chances of IT entrepreneurship?
3. Human and financial capital: How do gender differences in technical education and experience affect access to financial capital for, and outcomes from, IT entrepreneurship?

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