Breaking and Entering the Male Domain.
Women In the IT Industry

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ABSTRACT

Interviews with Australian IT professionals (twenty-two women and two men) working in technical areas are referenced to explore how the masculinity of the IT industry is perceived by women working as IT professionals. The skills the interviewees see as important for success in this industry and which have helped them to pursue a satisfactory and fulfilling career are also discussed. Mentoring is suggested as a means of changing young women's negative perceptions of IT as a career, in order to improve female participation in IT education and the IT industry.

Keywords

IT Skills requirements, women in IT, Australia

1. INTRODUCTION

Statistics on student applications to university and technical education level IT courses in Australia indicate that IT education is unattractive to the majority of high achieving students in general and female students in particular. Prior research into high school and university students' perceptions of IT studies and work indicate not only considerable uncertainty about what the IT work consists of and what skills are needed to succeed as an IT professional, but also that IT work is perceived as difficult, boring and solitary in nature, requiring little interaction with fellow workers or customers [10] [15] [16]. As a result female students in high schools lack interest in IT degree studies, and the number of female IT graduates continues to be low, varying between 14%-20% of all students enrolled in IT degree courses. The situation in Australia is similar to the situation in the USA where the number of female computer science graduates has decreased since 1985. [6] The IT industry figures are equally unsatisfactory. At the end of 1999 women represented just 29 percent of the workforce in the US technology sector, according to a study by the White House Council of Economic Advisers. That is down from 40 percent of the workforce in 1986 [7].

Studies also indicate occupational segregation [2] [9] [18] [19]. Although some companies have put in place initiatives such as the Women's Diversity Task Force at IBM [3] and the Retention and Advancement of Women at Deloitte & Touche [14] to increase the number of women in executive positions women remain rare in top-level positions. According to Korn/Ferry International only one in ten board seats is occupied by a woman [5]. The situation in Australian government boards is better (30.9%) but still below the target figures [17].

Women are also struggling to find executive positions in the new dot-com economy, and some observers fear dot-coms will become even more exclusive to men. Currently, women fill only 3 percent of board positions in new-economy companies, according to the Spencer Stuart study [11]. Numerous factors are being blamed for the lack of women in this industry: the media's image of the dot-com world as a sleep-on-the-office-floor, sacrifice-your-family-time way of life and a bias amongst venture capitalists, the overwhelming majority of whom are men.

What makes the low participation of women in IT education and work a significant problem to study is its contribution to the IT skills shortage. Only by understanding the factors influencing the low participation, can recommendations be made to attract more women into the IT workforce.

Based on interviews among twenty-four IT professionals this paper aims at exploring the way the IT industry is construed so as not to be appealing to women, and how women who have chosen to study and work as IT professionals have not been put off by this. The paper also explores how the skills the interviewees see as important for success in this industry have helped them to pursue a satisfactory and fulfilling career in the IT industry.

2. RESEARCH BASE

A study of female IT practitioners carried out by the first two authors in Australia in 1999 revealed the importance of operating within a male domain, including the extent of outside-work socializing with male colleagues (such as attendance at sporting events) as necessary for career progression [19] [24]. The implication is that while women have been socialized away from IT, the IT field has been constructed as a masculine domain. More specific findings included the under-representation of women in technical positions and in IT management, the lack of formal qualifications in IT, and the need to prioritize work over family commitments in order to succeed in IT.

A follow-up study in 2000 [22] was designed for a deeper exploration of the current position of Australian women working in technical positions in the IT industry. The follow-up study included open-ended interviews by the third author, of twenty IT

professionals representing a range of ages, employment sectors, educational backgrounds, nationalities and regions of Australia.

This paper revisits the interview data discussed in the Trauth et al. paper [22] aiming at exploring the socially constructed male IT domain with respect to the skills that are required for an individual to successfully pursue an IT career. For this paper we also interviewed four new subjects; two women and two men (Sharon, Lorna, Michael and Tim) to provide more details regarding the required skills. These four people are regarded as experts, meta-level observers, who are in a position to discuss gender related skill issues more widely within the IT industry context. The role of 'meta-level observers' in this research and the research discussed in [22] is explained in the next section. The men's comments provided a further point of reference and helped us to position the female comments in the broader context of the Australian IT industry.

This paper has therefore two objectives. The first is to discuss how the masculinity of the IT industry is perceived by women working as IT professionals. Existing research suggests that the way the IT education and work is perceived, together with the characteristics of male dominated workplaces and university degree courses, contribute to the lack of women in the university level IT degree courses [15] [23]. Our second objective is to specifically explore the skills the interviewees see as important for success in this industry and how these have helped them to pursue a satisfactory and fulfilling career in the IT industry.

3. METHOD OF INVESTIGATION

The open-ended interviews were recorded and were approximately 90 minutes in duration. Four main areas were covered. The first area concerned demographic information: the respondent's age, education, the type of work and current position, organisation and what type of skills were needed to do the work. The second area covered the respondent's personal history: educational experiences, work history, career progression and experiences, significant influences in life (e.g. events, people). The next area included more general questions about gender and IT. Respondents gave their views on the notion of IT as being a male domain and what that means for their career in IT. They also talked about social influences and barriers to women in IT. Finally, respondents were asked to offer recommendations regarding how society, the IT profession and educational institutions might address the gender imbalance in IT.

The respondents were *IT practitioners* (thirteen women and two men) working in a range of levels at a range of industries in various parts of Australia and *academics* (nine women) in IT faculties. The respondents drew upon their own experiences to offer insights about the themes, which were explored in this study. The female subjects offered two perspectives on the topic; their experiences of entering and progressing in the IT field, and helping other women enter and succeed in IT.

Eight of the respondents - six women and the two men – can also be categorized as 'meta-level observers' who were 'Informants who are especially sensitive to the area of concern.' (See reference to [8]: 285 in [12]: 116). They contributed to the emergent interpretations of the interviewer.[1] They were placed in this category by virtue of their position with respect to IT. Three of these respondents (Patricia, Kathleen, Lorna) had, themselves, conducted research on gender and IT and thus were 'naturally reflective and objective persons in the field' (Ibid.) similar to the two respondents (Margaret, Sharon) who worked in IT human resources. The sixth respondent (Clair) was an IT practitioner who had, in addition to her technical IT career, started working with a professional organisation to develop initiatives to promote women in IT. She is 'in transition from one position to another where the tensions of new experience are vivid.' (Ibid.) The remaining two meta-level observers were men; Tim who is working as a software engineer and Michael, an internet and e-commerce consultant. They were perceptive observers of the industry including its work practices, its skills and its values regarding women.

4. IT AS A MALE DOMAIN
4.1. Perception of masculinity

The commonly held perception of IT is its 'maleness'. Even the language of IT is very masculine. Lorna, an IT academic, recommends reinventing some of the terms to get rid of "the very male notion, this very male or gendered terminology for different concepts in IT."

With women forming a minority in IT education and work, instances of patronising and offensive behaviour have been well documented. The women in this study confirmed these problems but they did not cause them to consider leaving the industry. Various methods of coping with this behaviour have also been documented. One interviewee noted that one woman professor who is expected to have a "shining career" seemed to deliberately align herself with the "sexist males".

Not all of the women in our study agreed that IT was particularly a male activity. Jeanette who moved to IT consulting from accounting said that "it [IT] is pretty much the same environment as I had been working in before." "It doesn't have any difference if you are male or female." She is "quite shocked" at the idea that IT is a particularly male activity.

However, when Jeanette was attending university in the UK in 1992, she never even dreamt of doing IT. Engineering and maths were pushed at her co-educational private school, especially for the male students, but IT was not. Eileen, another IT consultant, sees the consequence is that not many women are in technical areas of IT, and those who are tend to come from countries where technical education for women is common. "In each country there are different messages about what is important and the thing to study and an important field to go into. IT is high status and paid well in Singapore and Malaysia in comparison to what it is in Australia," said Eileen.

Tim works as a software engineer in a company that produces IT for toll roads to capture financial and traffic information. He has no female colleagues. "We have females in the organisation but not in the software [section]." Michael's experience was similar. The few females, about a quarter of all staff were not in software development but in customer service working at the help desk.

In a non-technical area, such as IT sales there is one female as opposed to maybe ten males, according to Martha, a recent IT graduate working in a large software company. She suggested that it is because the clients (executives buying IT products and services) are mostly men who would feel more comfortable with a male selling to them. However, she also felt that selling is "a big ego thing" and not suited to women as it involves a lot of "pushing and prodding and sometimes lying."

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[1] This respondent category was employed by Trauth in socio-cultural studies carried out in other countries [20] [21].

During his career in the IT industry Tim has had only one female colleague. However, she had a serious disagreement with another, very powerful manager who emphasized the importance of sales - his background - to the detriment of the software engineering side of the business. She left the firm voluntarily because of him. A couple of months later the male manager was fired, suggesting that the company management eventually realized that his approach was threatening the business success. As far as Tim was concerned it was a sad state of affairs and the company lost a good manager with a very strong, 'look after your people' management style. "Although she could be reasonably hard-nosed, because she had to be when she was dealing with men, but she really was ... when she spoke to you, she had concern for your feelings and asked what you thought about this and she was very good from that point of view." She also had a programming background and a good understanding of the technical aspects of the projects.

Similar findings were reported in [14]; women tend to leave a company if they find the male dominating culture dissatisfying, and losing these women represented a lost opportunity to the firm.

Although in our study many of the women did not see IT as an inherently male domain, they did report instances of being reminded of their difference. At school, this takes the form of not being encouraged to do maths and engineering. At work, women are challenged about their roles. When Donna started her job at the steel works, she was asked questions such as "When are you going to get married and have children?" Donna who is now an engineering manager in the defense sector herself regarded having children as a "constraint". Jeanette also expected that if she had children, it would require her to change work patterns and she would drop back to part-time work. Women with children are viewed as a "risk" in senior management positions. Men with children are also expected to work long hours but "their wives looked after the kids" according to Sue, an IT academic, whereas Donna has a supportive partner who stayed at home with their children who "wanted to work, but he *allowed* me to do that".

The non-IT staff expected the IT staff to do long hours as "that is the nature of IT work". This was the comment Michael received from his non-IT boss when complaining that a hastily proposed change to a system would cause an enormous (unnecessary) amount of system maintenance and testing to avoid fatal errors. Regardless of the gender, employees who are responsible for dependent children or adults may find this unbearable. One of Michael's colleagues had to resign from his IT position because he was not able to arrange time to look after his sick wife.

These attitudes are not unique to the IT industry, but several of the women referred to a situation which Sue called the "coke and pizza culture" where staff were "locked up" and had fast food delivered, in order to complete projects. Combined with the "narrow focus" of many of the male staff, this culture is regarded as unappealing to most women as well as to many men. As noted earlier in this paper some observers fear that a similar culture that is prevalent in dot-coms serves only to make them more exclusive to men.

Many of the women in this study saw themselves as different from their female contemporaries as well. They were more competitive and disregarded the messages received from the media and school about traditional female roles. Donna herself expected to break that "mother image."

4.2. Perception of technical areas as not suited to women

The women interviewed reported a general perception that technical areas are not well suited to women, even though this technical knowledge is important for a comprehensive understanding of the software development process and its management.

According to Tim's experience women don't appear to like programming. The 7 or 8 women out of the total of some 20 students who studied programming subjects with Tim did not do well in these subjects. His explanation was that to like programming and to do well in it you have to have a natural affinity for programming. He thought women, on the other hand, tended to be mostly 'concept' people and more interested in the overall view and the wider implications of software and systems in operation.

Patricia, a professor in IT, saw the explanation for low enrollments in such subjects from a different perspective. Her explanation for the drop out rate amongst female students was that "they couldn't find other girls to work with and to relate to." Many of these women were actively discouraged from studying technical subjects. Patricia herself was advised that "she wouldn't be able to because of the maths." Technical subjects were categorized as "boys' stuff." Eileen's comment on this matter earlier in this paper was similar. Although many of the women were given positive role models through attending all girls schools, this was often a disadvantage in terms of the lack of "boys' subjects" available for them to study.

The interviewees' attempts to distinguish male and female talents are somewhat contradictory. Women are seen as being less attracted to programming because they prefer to take a broad view, but at the same time they are better than men at "paying attention to detail." Margaret, an engineering and human resource manager in the defense sector, observed that men may be "better at looking at the narrow approach". However, according to Tim the lack of that overall view can actually be a problem for programmers.

Mostly the interviewees see these different aptitudes and skills as resulting from socialization rather than as inherent male/female characteristics. Individual men and women are able to resist these messages and operate differently from the norm. For the women interviewed, attendance at an all girls school and having supportive parents (with one or more parents working in a technical area) seem to be the key factors in enabling them to challenge this male domain. As Clair, a programmer, says "there's male in all of us, but I get the feeling that women aren't comfortable saying that" ... "maybe they got threatened."

5. MAKING IT FEMALE

5.1. Perception of technical skills for career advancement

A strong theme in the research so far is that girls underestimate their technical abilities while boys show more confidence. [23] Patricia asked her students "how do you think you are going to do at the end of the year [exams] and the girls always underestimate it and the boys always overestimate it. That comes back to the confidence thing and the perception about what they are good at, not the reality."

The predominance of men studying and working in the technical areas may contribute to some women's unease and even to them dropping out of technical studies. Martha felt more comfortable around women, whereas being around men in the more technical

assignments she felt very insecure. She noticed that the few women in technical areas in her organisation are "quite assertive". This suggests a mechanism for coping similar to the one that was developed by the female professor who deliberately aligned herself with the "sexist males".

Most of the women interviewed did not regard the technical aspects of IT work as a barrier, although many of them had moved away from technical work to management positions. Karen, a computer science professor, describes herself as girl who was a tomboy and interested in "tinkering". Several of the interviewees had an aptitude and a liking for mathematics and/or science subjects at school. This led to them being encouraged by their parents and teachers. However, they see themselves as "unusual" and different from other women (Donna) in this regard, being more assertive and competitive. For example, women in technical areas of IT are not always ready to share what they know. "I'm not telling you because that is my knowledge and I'm not going to tell you that" was a response Eileen got from a female technical consultant when she wanted to know why something was not working correctly.

Cynthia who works as a senior systems engineer sees the difference between men and women working in technical areas as a matter of approach, rather than competence or aptitude. "My way of work is quite different from the male colleagues... They try to start work immediately... I like to draw the procedure first and then work backwards." She likens this approach to the way that she and her husband use maps. "I will check the map first and I will try to find the place... but my husband tries to start the car first. He tries to go." Having women as well as men on a project team allows them "to compensate [for] each other... we combine points together and we get more complete."

Donna sees it as important to be competent technically. "Once I've shown them, look I can do this job and I've installed software and I was giving them the system they wanted. They didn't ask questions. No problems about me being female."

5.2. A skills mix for career advancement

Tim saw the lack of interest in the overall view as a problem for programmers, which could in fact limit their option for career advancement. Some people are naturally good at seeing the whole picture, and Tim feels that universities should teach IT graduates to become aware of the fact that they may have limitations in this area.

However, this is a problem of IT workforce management, as Clair pointed out. "We need to get more people in management positions that truly have management skills, that can manage a project, and not the technical person who's ready just to do something else, ... and they think, oh well, they're the most competent person we have so let's make them a project manager." (Clair).

Previous research has indicated that being able to develop IT business skills is important for career development in IT, as is the ability to switch between IT and business skills [24]. Women IT professionals see the mix of skills as one of the challenges of IT. "I enjoy the mix of technology with communication skills." and "I enjoy solving problems and I enjoy talking to people and the fact that things are changing all the time" said Barbara, a software engineer in a telecommunication company.

The women interviewed for this paper had acquired the unique combination of skills that has advanced their IT careers into higher managerial and technical positions in a number of different ways over varying periods of time. Several of those who had chosen technical studies at the beginning or early in their careers still did not originally imagine IT as a career. They were encouraged to study 'hard' subjects at school and university but were not aware or certain of IT as a career path.

The women had developed ways to cope with the male dominating and unappealing image of IT as a career. In fact many of the women interviewed saw being female as an advantage despite the instances of harassment and inappropriate attitudes of male (and occasionally female) colleagues. Karen felt that gender has advantaged her in a number of different ways. For example, the requirement for equal opportunity involves women in more committee work. Although it can be time consuming to participate in so many meetings, that exposure has given her a great feeling of confidence. Existing research among female IT students indicates preference for collaboratory practices [15]. In industry the interest in collaborative and interdisciplinary activities could help determine where to expend energy to maximize results. For Karen it has meant that she was not seen just as a computer scientist but as a more rounded person who gets to know the people she works with and whom she needs to do things, with office staff or the key people in the organisation.

6. CONCLUSIONS

The women in this study have satisfying careers in the IT industry. They provide a contrast to the 'computer-reticent' young women identified in previous research who are ignorant about IT career options (see the references to Sherry Turkle in [1] and [4]). The problem is how to communicate their knowledge, attitudes and confidence to young women at the point when they are considering their careers. IT career options are not as well promoted in high schools as other 'technical' areas such as science, engineering and mathematics. However, the school's influence is crucial. As Eileen put it: "You sort of base that [what degree/what job] on what your teachers tell you at school and what sort of career you are looking at."

One recommendation to rectify this situation is to expand industry/high school interaction by using tertiary level IT education as a facilitator. This could be done by introducing an IT focused mentoring program for female high school students before they make the decision on tertiary education. This may also be an effective way of encouraging more females to enter IT tertiary education, to improve the current problems of occupational segregation and concentration of women at lower level jobs in the IT industry. There is a diverse range of models of mentoring programs operating successfully in Australian schools ([13]: 93), but there are no examples of mentoring students specifically on IT career choices.

Such a program could introduce the high school students not only to the variety of IT career options and what is good about the IT industry but also provide female role models and realistic advice on how to make the most of this exciting industry. Most importantly such a program would highlight what is good about being a woman in IT.

7. ACKNOWLEDGMENTS

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