

ARE WOMEN AN UNDERSERVED COMMUNITY IN THE INFORMATION TECHNOLOGY PROFESSION?

IT for Underserved Communities

Eileen M. Trauth

College of Information Sciences and
Technology
Pennsylvania State University
etrauth@ist.psu.edu

Jeria L. Quesenberry

College of Information Sciences and
Technology
Pennsylvania State University
jquesenberry@ist.psu.edu

Abstract

The role of women as an underserved community in the world of information technology (IT) is both unique and perplexing. In this paper we consider the question of women as an underserved community in IT, and in particular, their role as producers of IT. In order to better understand the ways in which women do and do not represent a coherent underserved community within the IT profession, the research question motivating this paper is: Do women vary with respect to the factors that help to explain the underrepresentation of women in the IT profession and, if so, how? In order to address this question, we draw on data from a multi-year qualitative investigation of the underrepresentation of women in the U.S. IT profession. In doing so, we investigate gender discourses with respect to: domestic responsibilities, career opportunities and IT as a masculine domain. We also demonstrate the range of responses to these discourses. This research contributes to an understanding of socio-cultural factors that serve as barriers to and facilitators of women's recruitment and retention in the IT profession and to the factors that have enabled some women to overcome these barriers.

Keywords: diversity, gender, women, underserved groups, underrepresented groups, IT profession, IT workforce, qualitative, empirical research, individual differences theory of gender and IT, social construction, essentialism

Introduction

The consideration of women as an underserved community in the world of information technology (IT) is both unique and perplexing. First, unlike other underserved communities, women are not a statistical minority in the populations in which they are underrepresented as either IT consumers or IT producers. In 2004, women accounted for 59.2% of the American population over the age of 16 and for 56% of the American labor force (U.S. Bureau of Labor Statistics 2005). Second, unlike other historically male-dominated fields, the information technology field does not appear to be changing with respect to female presence in it. For example, Kam (2005) explains that the percentage of women in the medical and legal fields was very low prior to the 1970s, but has dramatically increased over the past few decades. For instance, in 1971 women accounted for 9.5% of U.S. lawyers, but climbed to 44.4% by 1996. In contrast, the Information Technology Association of America's (ITAA 2005) Blue Ribbon Diversity Panel revealed that in 2004 women represented only 32.4% of the U.S. IT profession. Further, this statistic has been decreasing over the last decade. In 2002 women accounted for 34.9% of the American IT profession and 41% in 1996 (ITAA 2003). The declining participation of women is further indicated by the fact that men are far more likely than women to return to the IT profession as the market recovers from the dot.com bust. This is evident in the fact that the unemployment rate of skilled men is decreasing much faster than that of skilled women. For example, from 2003 to 2004, the number of unemployed skilled male IT workers dropped 34.4% while the number of unemployed skilled female IT workers dropped only 5.15% (ITAA 2005). Thus, the underrepresentation of women in the IT profession continues to grow and appears to be compounded by differential gender-based reentry patterns

of workers after the dot.com bust. Finally, what complicates the issue even further is the lack of consistent understanding of the degree to which women represent a coherent 'community' of either consumers or producers of IT.

These considerations motivated the development of this paper for the conference theme track on geographically and historically underserved communities with respect to IT. In this paper we consider the question of women as an underserved community in IT. In particular, we focus on women as producers of IT. Thus, we are considering the case of women as historically underrepresented members of the IT profession in America. The investigation is narrowed to American women because although the same observations might be made with respect to women in other countries and, indeed, the first author has conducted gender research in other countries, the data upon which this paper is built comes from research conducted in the United States.

Literature Review

Recent years have seen a sharp increase in discussions about the importance of diversity in the global IT economy for a number of reasons. First, increasing the involvement of underserved groups would help to address IT worker shortages (Roberts 2000; Schenk and Davis 1998; Wilson 2004). Second, it has been argued that a diverse workforce contributes to increased levels of innovation (Florida 2005), economic development (Gravely 2003) and the creation of more diverse products and services (Joshi and Kuhn 2001; Wardle 2004). Finally, a more diverse IT profession would support the move toward increases in social inclusion and social access (ITAA 1998; Office of Technology Policy 1999; Trauth et al. 2006).

In an effort to better understand factors that might help to explain the underrepresentation of women in the IT workforce, some scholarly attention has been directed at examination of discourses about women working within the profession. Foucault defined discourse as the way things are represented or as "the interplay of the rules that make possible the appearance of objects during a given period of time" (1972, p. 33). Rabinow (1984) argues that Foucault's discourse perspective is useful in understanding the relationship between knowledge and power by examining their embedded representation in social practices and institutions.¹ Likewise, feminist researchers argue that gender,² male and female roles, relations, and identities are socially constructed. Hence, this paper builds on Foucault's notion of discourse and knowledge creation in order to investigate discursive relationships between gender and the IT profession. In doing so, we examine discourses at a societal, institutional and individual levels analysis from the perspective of women employed in the American IT workforce.

Hirdman (1988) (but quoted in Webster 1996) developed the concept of a *gender system* to explain the segregation, disadvantaging and devaluing of women in all areas of social life. The gender system interacts in a variety of ways at varying societal levels including cultural, institutional and individual. The cultural level includes the culturally constructed meanings of male and female. The institutional level includes conceptions of gender in various societal institutions. And the individual level includes the conceptions that regulate interactions among individuals.

At a societal level, the underrepresentation of women in the IT profession is not an isolated career stratification issue and can also be found in other male dominated industries (Steiger and Wardell 1995). Cockburn and Ormrod (1993) explain that this gender stratification is not static, but rather is constantly constructed and reconstructed through individual and collective action. Furthermore, Taylor (2003) explains that society maintains different normative roles for women and men, and hence requires different responsibilities and careers. Wajcman (1991) adds that "qualities associated with manliness are almost everywhere more highly regarded than those thought of as womanly" (p. 9).

At an institutional level, Wilson (2004) explains there is a tendency to associate certain skills and knowledge as typically male or female. With regard to the IT profession, Wilson adds that masculinity is generally associated with intellect, logic, scientific, hard technical skills, whereas femininity is associated with intuition, emotion, social, soft technical skills. These gendered spheres mutually construct views of skills and technology, including allocation of skill labels, status, prestige, skill rewards and organization of work.

¹ A detailed analysis of global and organization discourse about IT can be found in Wynn et al. 2002.

² 'Sex' refers to the biologically-based distinction between male and female. 'Gender,' on the other hand, refers to a division between distinct and opposing categories of humans and social practices (Beasley 2005).

At an individual level, Giddens (1991) argues that the formation of identity is a continuous process in which self-image is constantly constructed and reconstructed according to the values that exist in society. Taylor (2003) explains that ideology messages about gender are embedded in society, and men and women use these messages to make judgments about themselves and others. Voman and Dam (1998) argue that different cultural and socio-economic groups favor different images of masculinity and femininity and contradictory discourses often exist even within such groups. The authors add that this is the context in which men and women develop their identities and come to terms with images, which are often contradictory, of what a woman or a man is or should be. These impressions must be negotiated into a more or less consistent personal identity. Hence, men and women “have to accommodate the fact that gender is an important structuring category in society, produced and maintained in various ways in everyday life” (p. 530).

Schiebinger (1999) explains that more diverse comparisons are necessary to examine a range of social, economic, institutional, cultural, and political factors and their role in encouraging or discouraging women from participating in the sciences. Kvasny (forthcoming) and Kvasny et al. (2005) also stress the importance of research that investigates underserved groups as an independent category for analysis, rather than in comparison to dominant groups (e.g. male, American, white, middle-class, managers) or between biological sexes. Kvasny adds that research should focus on solidarity among woman, but at the same time acknowledge diverse gender identities. Hence, the purpose of this paper is to investigate the influence of gender discourses at the social, institutional and individual levels on the formulation of female identity with respect to the IT profession.

An essentialist explanation for the underrepresentation of women in the IT field assumes the existence of fixed, unified and opposed female and male natures (Wajcman 1991 p. 9). Marini (1990) points out that the existence of biological difference between the sexes has led some to assume that other observed differences between men and women are due to biological determinates as well. When applied to the topic of gender and IT, the essentialist theory presumes the existence of relevant *inherent differences* between women and men with respect to information technology. It uses the observed differences in the participation of women and men in the IT field as evidence of this view. Thus, the causes of gender underrepresentation in IT are attributed to biology. It turns to observed differences in men’s and women’s behavior for explanations of what are believed to be inherent, fixed, group-level differences that are based upon bio-psychological characteristics.

In contrast, a social construction explanation attributes the underrepresentation of women in IT to the fundamental incompatibility that has arisen between the social construction of female and male identities. The literatures of gender and technology in general (e.g. Cockburn 1988, 1983; Cockburn and Ormrod 1993; Wajcman 1991) and that of gender and information technology, in particular (e.g. Adam et al. 1994; Balka and Smith 2000; Eriksson et al. 1991; Lovegrove and Segal 1991; Slyke et al. 2002; Spender 1995; Star 1995; Webster 1996) look to social construction theory (Berger and Luckmann 1966) rather than biological and psychological theories. According to this view, the social shaping of information technology as “men’s work” places IT careers outside the domain of women.

The role of theory in this endeavor is critical in that it provides the gender frame that is used to interpret the data on women. However, a criticism of gender and IT research is that the topic of gender and IT is currently under theorized (Adam et al. 2004, 2001). As Trauth (2006) explains, this under theorization takes on several different forms. First, there are cases in which there is no theory in evidence to guide the conceptualization of the research project or to inform the data collection and analysis. Rather, the focus is typically on compiling and representing statistical data regarding the differences between men and women with respect to technology adoption, use or involvement in the IT profession. She labels this form of under theorization *pre-theoretical research*. Second, other research, while not explicitly articulating a particular theory, nevertheless, is guided by a theory-in-use. For example, quite often a theory of inherent differences between males’ and females’ relationships to IT is used implicitly to guide data collection and analysis. She labels this form of under theorization *implicit-theoretical research*. This approach is considered to be a type of under theorization in that the lack of explicit discussion of a theory-in-use makes it difficult for others to discuss, challenge or extend the research. Finally, the body of research that reflects explicit theory has been shown to have gaps in the theoretical landscape. That is, Trauth has argued that current theories about gender and IT do not fully account for the variation in men’s and women’s relationships to information technology and the IT field (Trauth 2002). She labels this form of under theorization *insufficient-theoretical research*. Thus, there is a need for greater theorization about gender variation and IT to guide our effort to understand the underrepresentation of women in the IT profession.

Research Questions and Methodology

In an effort to shed more light on gender variation and IT, the research question motivating this paper is the following:

Do women vary with respect to the factors that help to explain the underrepresentation of women in the IT profession and, if so, how?

In order to address this question we draw on data from a multi-year investigation of the underrepresentation of women in the U.S. IT profession. The objective of this research is to develop a better understanding of those socio-cultural factors that serve as barriers to and facilitators of women's recruitment and retention in the IT field. This research also aims to develop a better understanding of factors that have enabled some women to overcome these barriers.

Open-ended, in-depth interviews, lasting, on average, 90 minutes in length, were carried out by the first author between 2002 and 2006 with 92 female practitioners in the American IT workforce.³ The interviewees were assigned pseudonyms to guarantee confidentiality. During the interviews each woman was asked to describe her introduction to IT, her educational experiences, her decision to enter the IT profession, her experiences as a woman working in a male-dominated profession, and people and events who influenced her personal and professional development. Purposive sampling techniques were used in order to recruit women who represent a range of geographical locations, ages, demographic backgrounds, educational backgrounds, levels of management and job classifications, relationship statuses and family compositions.

The women live and work in three different geographical regions of the U.S.: the Northeast (greater Boston area of Massachusetts), the Southeast (Research Triangle/Charlotte, North Carolina) and the Mid Atlantic (central Pennsylvania). Thirty-two of these interviews were conducted in Massachusetts 30 in North Carolina, and 30 in Pennsylvania. The women range in age from 21 to 58 with the median age being 42 years old. Sixty-one of the women are married, 6 are unmarried but in committed relationships, 17 are single and 8 are divorced/not remarried. The racial/ethnic identity of the participants includes European Americans, African Americans, Asian Americans, Hispanics/Latinas and Middle Eastern women. The degree concentrations range from traditional IT related majors (e.g. MIS, CS and engineering) to liberal arts, psychology, and nursing. In addition, job titles include CIO and vice president of IT, programmer/project manager, systems integrator, software architect/engineer, quality assurance engineers, IT administrators, Web developers, consultant and small business owner.

Transcripts of the tape-recorded interviews were coded using a coding scheme developed in an open coding fashion based, in part, on the interview guide.⁴ Interview data are supplemented by data from participant observation and from published materials about the geographic regions in the study.

Findings

In this section we examine three gender discourses and the participants' responses to them. Our analysis is multi-layered; it includes examination of: 1) the gender discourses American women encounter throughout their personal and professional development; 2) the participants' individual responses to these discourses; and 3) the different influences on the women that help to explain the variation in responses. These gender discourses are about domestic responsibilities, career opportunities, and IT as a masculine profession. For each discourse a variety of responses were identified, as were influences on the women that shed light on this variation.

Domestic Responsibility

One discourse that the women in this study frequently reflected on is the gendered nature of domestic responsibilities. The women articulated messages they have received throughout their lives, which suggest that they should sacrifice their careers for domestic responsibilities. The message is that women are responsible for domestic and family caring roles, whereas their husbands are responsible for professional income-earning roles. The societal

³ The 92 interviews with female practitioners represent a subset of the research project. This paper does not report on the additional 31 interviews with female academics also included in the study.

⁴ Additional details about the coding scheme can be found in Trauth et al. 2004.

message assumes that women are heterosexual, married and have children. Francie, a 26-year-old software engineer, explained:

Typically, [the societal message is that]⁵ the family obligations take precedence over the professional obligation....I think typically [the societal view] is that when the woman has a child she should stay home and take care of them. The male would be the financial supporter. [Francie]

Nancy, a 48-year-old Web consultant, echoed Francie's remarks:

[The societal message is that] a woman's place is to make the home and raise the kids and cook the meals and clean, and all that kind of thing. It really was very clearly what I saw happening in our house [growing up], and what I saw happening on TV. [Nancy]

Response: Independence and Equality

Despite the common experience of the discourse about female domestic responsibilities across the participants, the women in this study revealed a variety of responses and influences that might explain these differences. A prevalent example centers on how women in this study interpret independence and equality in their personal and professional lives. For instance, Sheryl, a 31 year-old instructional designer, explained that she and her husband agree that if they have children it will be a "fifty-fifty" split on domestic responsibilities. In addition, when asked about her views of power dynamics in marriage, Samantha, a 32-year-old instructional designer, explained:

By the time I reached high school, I was very independent. I really did not see a need for a man to take care of me. I thought my parents were very silly in trying to push me into marriage. [Samantha]

Another response was about being the breadwinner in a dual income family. Pamela, a 27-year-old UNIX administrator, was raised in an environment in which women were expected to be taken care of by a man. She spoke in detail about how her father was willing to pay for her brother's college tuition but not hers because "he was going to be a breadwinner someday." Nevertheless, Pamela did not want to be in a position where she would have to depend on somebody else. Leah, a 57-year-old executive vice president of technology, discussed her marital situation as a primary breadwinner in her family. She described the satisfaction she derives from making significant contributions to the family's financial wellbeing. One factor influencing this variation in responses is the economy of the region in which a woman lives and works. Many of the women who describe themselves as the primary breadwinner typically live in a region with a high cost of living that requires a dual-income family.

Response: Childrearing

A different kind of response to the discourse about female domestic responsibilities centers on role of childrearing.⁶ Thirty-nine of the women in this study have children; 53 do not. Hence, a large percentage of the women interviewed did not conform to the motherhood discourse. The women in this study who do not have children range in age from 21 to 54. In addition, 18 women are single or divorced, but not remarried, and 21 women are married or in a committed relationship. For those women who chose to have children, their domestic arrangements differ greatly. Some of the women maintain careers in the IT profession while raising their children. These working mothers are typically motivated by both financial responsibilities and professional aspirations. For instance, Candace, a 41 year-old programmer analyst, is a single mother whose financial situation requires her to maintain a career while raising a son. She explained that she is raising her son "with no custody sharing, no child support or anything." Staying home with her son is a luxury she cannot afford. In addition to financial explanations, some women also spoke about professional desires. Donna, a 39-year-old quality assurance analyst, was asked why she works while raising her daughter:

⁵ In this paper we adopt the common convention of placing words in brackets that have been inserted by the authors to clarify the meaning of an interview excerpt.

⁶ A detailed discussion of parenthood and career choices of women in the IT profession can be found Quesenberry et al. 2006.

[Having a career] is very important for me....It is important to keep my mind active, to keep challenged, and to like what I do. When I stop having fun at this job that's probably when I will decide it is time to move on. [Donna]

Other influences on the decision to maintain jobs while raising children come from the women's parents, supportive partners and family support structures. Many of these women came from households where their mothers or grandmothers also worked outside of the home. For instance, Teri, a 42-year-old president and CEO of a technology company, remembered her mother working during her childhood. She explained that having a working mother was "rather different at the time," but she did not see it as unusual. Many of the women also noted how their partners and spouses share an active role in child rearing, domestic responsibilities, and community volunteer activities. For instance, Jada, a 36-year-old development manager, explained:

[My husband, who also works in IT] understands the pressures and the demands. We work more closely dealing with situations [about childcare]. Dealing with a child being sick, he takes half a day off, I take half a day off. We work around our schedules. We understand the demands of work. [Jada]

The women also spoke about the importance of support from parents and in-laws and their influence on the ability to maintain a career while working. For example, Karen, a 33-year-old systems engineering manager, explained that in the Indian culture when having children "the mom's side of the family offers a lot more support" than in a traditional American family.

The domestic arrangements of working mothers differ greatly. Although the majority of women in this study who have children did so while simultaneously having a career, a few women discussed an alternative form of childrearing. For a variety of reasons these women took time away from their careers (in excess of several years) to raise children and then later returned to the IT profession. The women did so because they felt it was "the right thing to do," an attitude which more closely corresponds to the discourse about motherhood and careers. For instance, Sue, a 53 year-old IT coordinator, left the IT profession for an extended period of time because she felt she was supposed to follow the path in life of "going to school, getting married and then staying home with kids." All of the women who took an extend leave from the workforce were in committed relationships during their employment break, so that the main source of income came from their partner or spouse.

Female Career Opportunity

Another discourse that the women discussed is the gendered nature of career options that put limitations on college and occupational aspirations. The majority of women who spoke about these limitations tended to be over the age of 45. They spoke about pressure they felt to enter traditionally female occupations when making career choices. For instance, when asked about acceptable careers for women, Alice Lyn, a 55-year-old project manager, replied that when she was growing up a woman could be a "teacher, or a nurse, or a nun." However, it is also important to note that the message varied, depending upon social class and race. For example, women from lower socio-economic backgrounds felt that the types of "acceptable" careers were limited to administrative assistants or retail occupations. Likewise, several non-white women felt that their career options were limited to low skill occupations or military service. For instance, Joanne, a 32-year-old software developer, who is African-American explained:

I had a 4.0 [grade point average] coming out of high school, but I was not directed toward one of the mainstream universities. I think there are a lot of factors affecting that, race being one of them. That [message was consistent] because a lot of my [African American] friends were not directed towards [college either]. They were told they could not do well, or they were told they should go into the military. [Joanne]

An interesting anomaly emerged from the part of the interviews that considered this topic. While many women described limitations on their college and career aspirations, other women spoke about receiving messages of empowerment to the effect that they could have whatever career they wanted. These women did not internalized any barriers to female career opportunities, rather they believed women can go to any college, select any major and work in any occupation they choose. The majority of women who did not internalize limitations tended to be younger than 45. Teri highlighted this message by explaining:

My parents both always told me "you can be anything you want as long as you work hard and you are smart." And so it was my responsibility, nobody else's. I knew that I had some choices and

some opportunities and I would have some work along the way. So that was kind of ingrained in me. [Teri]

Response: IT Profession Career Choice

Despite the societal discourse about limited career aspirations, the women in this study, nevertheless, chose careers in the IT profession. A number of factors consistently arose to explain the influences that helped these women overcome that message. First and foremost, is the importance of parents and family in their choice of an IT career. Debra, a 51-year-old consultant, explained that during her childhood she thought that women would be teachers or secretaries. However, her parents felt otherwise. Debra explained that while her parents were very “traditional” they wanted their children to be well educated. As a result she was able to attend college in the 1970s, where she became involved in the women’s movement and learned how to assert herself. Eventually, her journey through self-actualization lead her to an IT career. Some women noted that their parents specifically encouraged them to enter the IT profession. For instance, Cynthia, 21-year-old software developer, explained:

When I was in high school a lot of my parents’ friends were in computing. So my mother kind of tried to push me in that direction since she saw that it was a quickly developing field. And I think largely because of the monetary aspects. She actually encouraged me to take a programming class in high school. So I did in my senior year. I was actually planning on majoring in music. And she was definitely trying to steer me away from that. But I really liked the programming class so I contacted some of my parents’ friends that worked at Intel and IBM and went on some industry visits with them, shadowed them, saw what they did. And then I said, “Okay, maybe I will look into this some more.” After looking at the different programs, I decided that I was going to major in computer science. [Cynthia]

A number of women mentioned male role models, such as fathers, uncles and brothers, who were a strong influence on their IT career choice. Many of these male role models worked in the IT profession, and as a result, the participants were familiar with the type of work and were able to seek guidance on the steps to obtain such a career. Danielle, a 28-year-old project analyst, felt her father “pushed me towards math and science” because he had a degree in it. Likewise, several women spoke about the importance of female role models, such as mothers, sisters, and grandmothers. Leah explained how strong female role models in her family influenced her career choice:

[My family experience was] different certainly for the time and certainly whatever there was about the high school itself encouraging identity. But statistically it was very unusual. ... There was a matriarchal aspect to my mother’s family. There were five women cousins that she had and two sisters. One of her sisters went to college, so that was unusual at the time. ... There were a lot of women who though not working necessarily outside of the home, were leaders in the community, and were active in their own self identity. [Leah]

Another influence on the women’s ability to challenge the prevailing discourse that would have limited them was education, itself. Women who were raised in environments that valued education felt that they were more prepared or able to obtain careers in the IT profession. Several Jewish women explained that their families strongly value education and the attainment of successful professional careers. Linda, a 51-year-old software architect, explained that “education is pretty central to Jewish society.” In a related vein, a number of women who chose IT careers attended all-girl schools during elementary and/or high school. The women who attended these schools frequently spoke about the opportunities and encouragement they received to study math and science. This coupled with an open learning environment lead to their increased confidence. Andrea, a 50-year-old project manager, explained that at her all-girls school “there were never comments made as to whether you were smart or not.” Likewise, Vanessa, a 36-year-old director of operations, felt that in an all-girl school “girls are the world.”

Exposure to and opportunities with technology also help to explain female choices of IT careers. Many women in this study spoke in detail about their first experiences with technology and how this exposure shaped their future career choice. For example, Betty, a 37-year-old systems integrator, is convinced that the reason she entered the IT profession is that she was fascinated with the Apollo Space Program footage on the television as a child. She was “completely captivated by the whole space program,” which helped her to discover her passion for technology. Amy, a 38-year-old software developer, first became interested in an IT career when a skills placement exam in high school suggested she would excel at a career with computers. Other examples of exposure to technology are more serendipitous in nature. Several of the women originally began their professional careers in occupations outside of

the IT profession. Over time they availed themselves of opportunities to move into the IT profession. Elise, a 47-year-old Web site manager, described such an opportunity. While working as a corporate trainer within her organization a systems development project began in Germany. The project was quickly staffing employees and required employees with firm-specific knowledge and who were bilingual in German in English. Given Elise's German background, she jumped on the opportunity:

I arrived there for the software development project, knowing nothing basically; when I looked back I knew nothing. ...I was the only one who spoke German, but there were 25 of us....I read a book on [software] testing, and the next thing I know I was the head of [software] testing. [Elsie]

Socio-economic class is also an influence on choice of IT careers. Many of the women from upper or middle socio-economic backgrounds spoke about college as a given. In this sense they felt that there was no question – they were absolutely expected to attend college. As Brooke, a 40-year-old software developer, explained it “was assumed that I would go to college.” Given this privilege, the women described themselves as more easily able to obtain careers in the IT profession. On the other hand, women from lower socio-economic backgrounds spoke about college much differently. Ivanna, a 40-year-old user administrator, said that her parents only expected her to “finish high school.” As a result she did not know anything about the option of college because she was not exposed to it. Likewise, Angela, a 53-year-old chief information officer, was not encouraged to attend post-secondary education. Her parents could not afford the expense and did not see the value in a degree. Hence they did not support her – financially or emotionally – in attending college. Yet, other women explained that given their own lack of opportunity, their families placed high value on attending college. College was not seen as a given, but rather as a goal that brought both sacrifice and the opportunity to improve one's socio-economic status. Brandy, a 24-year-old software engineer, and her parents believed that college and a career in the IT profession was a way to escape from the traditional career that was dominant in her region: working in the coal mining industry. Likewise, Wendy, a 51-year-old technology center director, explained that her view of college was that it was a way to move up:

I think [my mother's] attitude was that an education is the way out for you. You need to be able to support yourself. In order to do that, you need a good solid education. I think she wanted me not to be in the position that she was in. I think I knew from a very young age that one way or another I was going to college. It was not negotiable it was just known. [Wendy]

IT as a Masculine Profession

The final discourse considered in this paper is about the IT profession as a male domain, that women are unsuited for the IT profession because they are not men. As Debbie, a 28-year-old technical support engineer, explained:

It is hard [to fix the perception of IT work because] girls are hearing all kinds of crappy things all the time. [We need someone] who can make us see that IT is not this horrifying ocean of geekdom. It is not that bad. There are lots of really cool women in IT. It is not all freaks. That is the biggest concern of high school girls. Put yourself [in their shoes], what were you like in high school when you were sixteen?...It is not cute to be associated with geeks. [In my high school] the only people who were into computers were those creepy guys. There were like two or three creepy, unwashed, acne-filled [guys]. Nobody wanted to have anything to do with them. [Debbie].

Once again, this discourse varied by race. In terms of demographic representation, the American IT workforce is primarily comprised of Caucasian workers. For instance, in 2004 Caucasians represented 78 percent of the workforce, whereas African Americans represent a much smaller group: only 8.3 percent (ITAA, 2005). A few of the African-American women in this study acknowledged that the IT profession is typically perceived as a male domain, but that this stereotype does not apply to African-American men. This finding is consistent with the research of Kvasny (2002). For instance, June, a 34-year-old desktop consultant, who is African-American, feels that the masculine depiction of the IT profession typically does not apply to African-American men. As a result, June feels that African-American men are less likely to perceive the IT profession as a viable career option than African-American women.

Response: IT Profession Fit

The women demonstrated a number of responses to this issue of female fit with the profession. Many women acknowledged that the IT profession is a male dominated occupation, but they still felt a sense of belonging. Some

of the women who felt this way described themselves as “tomboys” growing up or as women more interested in traditionally male activities. For example, Julie, a 38-year-old network specialist, explained:

[Growing up I was] the only girl who came back playing with the boys. I would come back all muddy from head to toe and my mother would just shake her head. [Julie]

However, another group of women described themselves as “girlie-girls” or women more interested in traditionally female activities. For instance, Miranda, a 55-year-old senior staff consultant, explains that she enjoys her IT career, but also likes her female traits like “nail polish, jewelry and tailored suits.” Despite their self perceptions, members of both groups felt at home in the IT profession. Several influencing factors were given by the women to explain how they came to feel that they belonged despite being a gender minority. A recurring explanation was feeling comfortable when surrounded by members of the opposite sex. Many women explained that they feel at ease being the only (or one of the few) woman in the office. This feeling was typically attributed to close relationships with fathers, brothers, or other male figures in their personal lives. For instance, Yvonne, a 48-year-old chief executive officer of a software firm, explained:

My brother was two years older [and] we were very close and hung out a lot ...We were pals. He would have a lot of his friends over to the house, and I became pals with them. ...The brother influence probably is one thing that made me very comfortable with having guys as friends. [Yvonne]

Other influencing factors are passion for the IT profession and competitiveness. For instance, Cathy, a 38-year-old director of systems services, always had a passion for technical objects. She shared stories of her childhood during which she would tinker with machinery and technical objects for fun. Today she is responsible for all UNIX and NT server infrastructures in her company. Many women also spoke about their internal drive to accomplish difficult tasks and to prove others wrong who think they cannot succeed. Wendy described her need to learn new things and prove her intelligence. When asked why she chose a career in the IT profession she explained:

I guess because it seemed worth doing. If everything else was easy then this was something that I had to learn, I had to conquer. [Wendy]

In contrast to the women who felt a sense of belonging in the IT profession, were the women who reacted to the discourse of IT as a masculine domain by feeling like outsiders who do not fit in.⁷ Several reasons were given by the participants to explain their feelings. Ivanna shared her experience of exclusion by her male co-workers:

Even in server management, the guys just tend to close up. They do not want to share information. Let's say for example, something new comes out. The guys huddle together right away and they start messing with it and they do not include you. So you are on your own, you are like, “Oh well, whatever.” That is how I feel. [Ivanna]

Do they do extracurricular, you know, like outside of work type of things? [Interviewer]

Sure. [Ivanna]

So there is a lot of bonding? [Interviewer]

I am sure they do. [Ivanna]

You're not included in that? [Interviewer]

Absolutely not. [Ivanna]

Personal characteristics also played a role in feelings of not belonging in the IT profession. Nancy felt that she did not belong because of her introverted personality. Even though she considers herself to be both a “tomboy” and a “techie,” Nancy never felt at home in the industry.

I am pretty reserved emotionally, I think up until the age of 27 or 28, I did not think I had any emotions. I really did not. ...People tell me that it is hard to get [to know me]. It is the anticipation of meeting people that makes me nervous [and] anxious. [Nancy]

⁷ A detailed discussion of social networks of women in the IT profession can be found in Morgan et al. 2004.

As a result of these feelings, Nancy left her IT job and began her own Website management company from her home. She is able to stay involved with IT, but no longer works directly with others in the industry. Several women also cited racial differences for their sense of not belonging in the IT profession. For instance, Rose, a 47-year-old director of IT research, spoke about the difficulties of being a “minority twofold” – as a woman *and* as a Japanese American. As a result she finds it challenging to reconcile whether she feels like an outsider because of her gender, her race or both:

Well I think [being a female and racial minority] is a double whammy. I am not only a woman, but I am also Japanese American. So there are those double factors going on in this environment. In fact I have started to bring those forward in a women’s group [at my organization]. Because the women are talking about things and then I explain to them this is what I see. This is the processes I need to go through, which is very different than most of [what] the other Caucasian women need to go through. [Rose]

Response: Female Assertiveness in the IT Profession

One interesting dimension of the discourse about IT as a masculine domain was the response of women about assertiveness. The women generally reflected a societal perception that assertiveness is unfeminine. Given this perception, many women felt that it was difficult to assert themselves in their professional lives. The participants frequently felt that when they were asserting themselves it was being perceived by others as aggressive and abrasive behavior. For instance, Jeria, a 46-year-old manager of applications development, felt that in most IT environments her male counterparts are “intimated” by assertive women. She felt that was especially problematic as women climb the corporate ladder and must become more assertive in managerial roles.

The women in this study represent a number of different responses to this situation. Some of them describe themselves as lacking assertiveness and, hence, adopt a passive posture. Others spoke about feeling uncomfortable expressing themselves in a work environment mainly because they feared the response they may receive from coworkers. Likewise, some women admitted to easily backing down in order to avoid conflict. As a result, these women typically depended upon recognition of their contributions by others – rather than self promotion – as a vehicle for career progression. For example, Miranda explained:

I was brought up to be very quiet. My dad used to be proud of my sister and me and he would say “I could bring you two little girls anywhere. You are such good girls. You sit there and don’t talk.” If anything that has been the biggest obstacle that I have had in my life and career is to speak up and not be overshadowed by men who want to be larger than life. They talk about these things they have done when I have done things that are much more credible. Tooting my own horn has always been a problem. [Miranda]

When asked if she felt that being more assertive would be beneficial in her career, Miranda explained that if a woman in the IT profession does not show assertiveness then she will be “overshadowed and perceived as not having the leadership qualities necessary to have that next step in your career.” Likewise, Faith, a 33-year-old information architect, also spoke about the difficulties she faces with assertiveness:

I struggle with [not being assertive and] I worry for myself. I do not manage anybody, I never have...I think it is because I am not aggressive enough. I think it is because I do not force my thoughts on other people. I do not speak up in meetings....That is disturbing and it does bother me, but I just cannot make myself be that person. [Faith]

On the other hand, those women who described themselves as assertive find it a constant challenge to avoid being perceived as aggressive or abrasive. The women spoke about the need to express their thoughts without unnecessarily angering others. Hanna, a 42-year-old vice president of development, explained that being a strong, assertive woman was “just a part of me.” She cites her strong mother and father as giving her the idea that women can and should be assertive. In terms of how being assertive is important to a career in the IT profession, Allison, a 45 year-old project manager, explained:

In order for me to manage [my team] of men I have got to be aggressive. I have to. When I come [to work] in the morning, I put on my office persona, which is being aggressive. I mean we hang out a lot and I am constantly saying, “Come on let’s go have a drink.” But at the same time I have to be firm as to what I want and when I want it done. [Allison]

It is important to note, here, the influence of demographic differences. Women in this study discussed how their identities as African-American women or lesbians complicate notions of female assertiveness, particularly in the IT profession. For instance, Megan, a 34 year-old application analyst, explained that it is more acceptable for her to be assertive given that she is an African-American woman. She feels that African-American women are more empowered than African-American men to be assertive. When asked why she felt this way, she explained:

If you look at society, the two out of the White male and the Black male, the White female and the Black female, I think the two [groups of people] that society reacts the most to are White males and Black females....I think that is probably because [in] today's society the Black female has been the core of the Black family. [Megan]

Several lesbians also spoke about the differences in acceptability of female assertiveness based on sexual orientation. Ava, a 54-year-old managing director of a consulting firm, felt that homosexual women were expected to be “strong, assertive, [and] independent” whereas heterosexual women were not. Sol, a 40-year-old a chief information officer, elaborated on this topic and explained how being a lesbian has affected her ability to be assertive in the IT profession. She felt that in many ways the stereotypes about lesbians and assertiveness are prevalent in the workplace. When asked if it is easier for lesbians to be assertive, she replied:

Yes and no. I mean yes because you can be more masculine. [This can be beneficial in an entry level position where things are] more in the rank and file level. You are taking apart computers, you are programming – these things are considered to be very male things to do....You have to use the tools and do all these things. It is much more acceptable for you if you are a stronger woman. [Yet It is harder] at my level [in management where things are] very different. You are not doing those kinds of things anymore. [Sol]

Discussion

Three observations can be made about this investigation of discourses regarding gender and IT and the varied individual responses to them. First, during the interviews the women tended not to be conscious of the societal influence until a question was asked that required them to bring this into consciousness. For example, it was not until the interviewer asked a question such as the following that the women would comment on gender discourses.

Please tell me what you thought about your future while you were in high school. Did you think you would be supporting yourself or you would be a home maker with a man supporting you?

However, once the women began to reflect on these discourses they responded with considerable variation *and volume*. On numerous occasions the interviews went well beyond the 90 minute timeframe – sometimes running 90 minutes longer – of the participant's own accord. Second, we noted the mitigating role of significant persons in the women's lives (e.g. partners, parents, teachers, guidance counselors). In the absence of these individuals who might help the women to interpret the message differently, or to ignore it altogether, the women tended to internalize the gender discourses. Finally, and unfortunately, the majority of the discourses the women discussed were not empowering. As one respondent observed:

Because I work with girls in high school now I understand the messages that a lot of them get ...I know now from work that most of [the societal messages] are not positive. [Yvonne]

In this paper we have considered some common discourses that women have encountered with respect to: domestic responsibilities, career opportunities, and IT as a masculine domain. We have also demonstrated the range of responses to them. With respect to the research question motivating this paper, because these findings reveal evidence of common experience of gender discourses that can help to explain their underrepresentation in the IT profession women can be considered as an underserved community in the field. However, our findings also show that while women can be viewed as an underserved community, the women, nevertheless, vary considerably with respect to the role that those common messages play in helping to explain the underrepresentation of women in the IT profession. What we have found is a highly complex situation in which both group and individual effects are in evidence. The women's reflections on their career development culminating in their position as a gender minority in the IT profession reveal exposure to common discourses by groups of women. These discourses are not unilateral, however. They vary by a woman's nationality, culture, race, age, sexual orientation and other demographic characteristics. Further variation is evidenced by the women's responses to them.

These findings reinforce the need for greater exploration of the variation in women's experiences of and reactions to gender discourses in order to fully understand cultural, institutional and individual factors that help to account for the position of women as an underserved community in the IT profession. Indeed, this paper is part of a stream of papers that are focused on better theorization of the space in which individual characteristics and societal influences co-exist (Trauth 2006, 2002; Trauth et al. 2004; Trauth and Quesenberry 2007, 2005). This work joins the efforts of others who are engaged in problematizing the interrelationship between individual agency and societal influences (Barnett and Rivers 2004; Cerulo 1997; Collins 2000; Gerson 1985; Skeggs 1997; Tulloch et al. 2003).

Conclusion

In this paper we investigated the ways women vary with respect to factors that help to explain the underrepresentation of women in the IT profession. More specifically, we investigated socio-cultural factors that serve as barriers to and facilitators of women's recruitment and retention in the IT profession and factors that have enabled some women to overcome these barriers. We did this by examining common discourses that women have received with respect to: domestic responsibilities, career opportunities and IT as a masculine domain. Our examination reveals a range of diverse influences that affect the ways in which individual women react to these messages. These influences include socio-economic backgrounds, demographic differences, family dynamics and expectations, and differences in support structures. These findings reinforce the importance of considering both societal influences *and* individual agency in conducting gender and IT research. This, in turn, can facilitate more nuanced studies of gender that explore the multiple identities of women – for example, nationality and gender, race and gender, sexual orientation and gender, or age and gender – and their relationships with IT and IT careers. The data presented in this paper make a strong case for considering women as an underserved community within the IT field while also highlighting the need to explore the wide variation within that community in the search for ways to address this situation.

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