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# GENDER AND THE US PROFESSIONAL IT WORKFORCE

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## Abstract

In this paper we present findings about the work-related differences among professional women and men information technology (IT) workers in the United States. To better understand these as gender-related differences, we adopt an institutional standpoint and theorize that the organization of the workplace, post-graduate training and education, and family characteristics largely shape the work-related outcomes of men and women in the United States IT workforce. Drawing from interviews with 2823 professional IT workers employed in the United States, we report five findings. First, women are nearly two-and-a-half times as likely as men to leave the professional IT workforce. Second, men and women work similar hours and have similar commute times. Third, no significant differences exist between men's and women's types of post-graduate training and education. Fourth, women take more unpaid leave and for longer periods than do men. Finally, women are paid significantly less than men. We conclude the "pipeline" approach to redress the under-representation of women in information technology fields fails to anticipate the significance of women's experiences once they enter IT jobs.

# GENDER AND THE US PROFESSIONAL IT WORKFORCE[1]

In this paper, we focus on some of the gender-related differences across the professional information technology (IT) workforce in the United States (US). For present purposes, professional IT work includes the creation, design, and testing of IT devices or network systems, as well as the application, configuration and support of IT devises and network systems (National Research Council 2001:48-49). Our interest in better understanding the gender-related differences in professional IT work motivates this research. In particular we engaged in this work to better understand a simple question: if work-related outcomes in IT are, as often depicted, driven by the skills individual workers possess, why do women represent a much smaller percentage of the professional IT workforce than of the US professional workforce in general?

Indeed, the broad measures of the US workforce give rise to this question. In 2005, 47 percent of the total US workforce were women. At the same time, of the entire professional workforce in the US (defined as professional and related), 56 percent were women (US Department of Labor 2005). By contrast, 33-41 percent of the entire IT workforce were women, but only approximately 27 percent of the professional IT workforce were women in 2005 (US Department of Labor 2005). This suggests that women are arguably under-represented in both the general IT workforce, and its professional IT subset, regardless of increasing availability of high-paying and prominent positions. At the aggregate level the number of people entering the IT workforce possessing post-secondary degrees in fields unrelated to IT suggests the under-representation of women in IT may not be explained solely by the declining rates of women obtaining bachelor's degrees in computer science (National Science Foundation 1996; Eliassen 1997; National Research Council 2001). At the professional IT level, however, these

observations offer no direct insight as to how gender might affect work-related outcomes, including opportunities for and the retention of the professional IT workers.

We pursue an answer to the question posed by potential gender differences in work-related outcomes of professional IT workers by focusing on the ways in which men and women, who possess similar formal educational training, proceed through the early, formative, stages of their IT careers. To help understand potential gender differences, we adopt an institutional model of IT work and workers and theorize that work-related outcomes in IT are shaped largely by educational background and training, organization of the workplace, as well as family characteristics. In the rest of this paper, we review the relevant literature and develop our research model, as well as related research questions. Following that, we present and discuss our findings.

## Literature Overview

Most individuals, regardless of their occupation or gender, aspire to employment opportunities leading to specific work-related outcomes, including job tenure, job mobility, job satisfaction, and income. With increasing opportunities in a variety of IT occupations, such as software vendor and IT consultant, a gender 'neutral' playing field is commonly believed to exist due to increased employer interest in knowledge, not brawn, as a substantial constituent of skill (Lopez-Bassols 2002) . This lay-world view of IT contains an implicit human capital model of employment and work, suggesting the skills and professional experiences a worker possesses are directly proportional to the quantity and quality of employment opportunities, or alternatively the lack of opportunities and hence to work-related outcomes (Becker 1962). The human capital model, then, would lead us to think of IT work as an arena that rewards skill acquisition and

where gender does not contribute to significantly different work-related outcomes relative to specific fields of IT work.

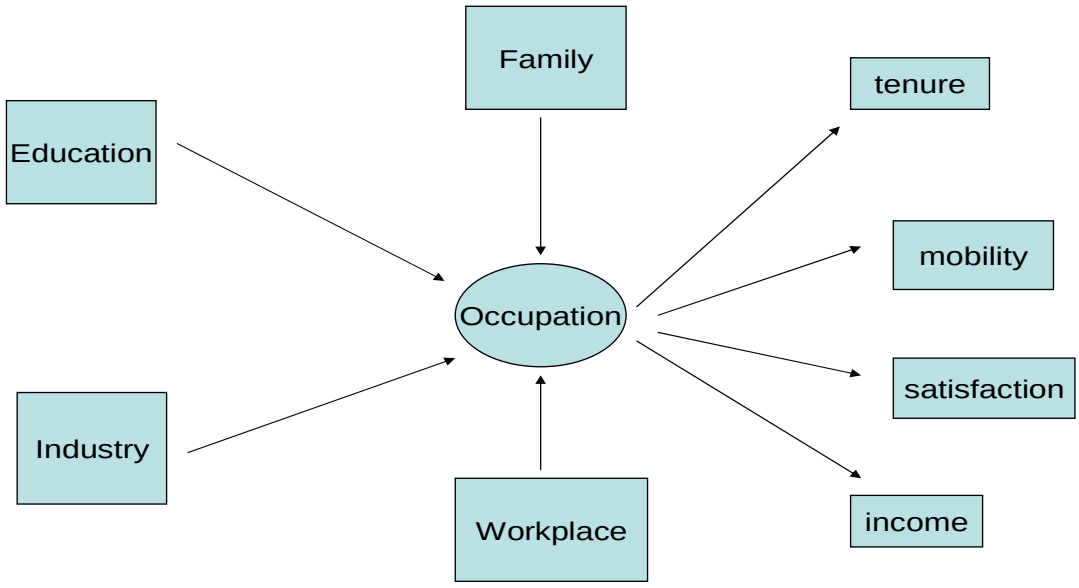
The human capital approach in fact has a broad base of support in the US and informs much of the practical thinking about how to remedy the under-representation of women in science, engineering, and technology fields. For example, the US's National Science Foundation in the 1990s launched the major initiative 'Information Technology Workforce" first to understand why young women do not have sufficient interests in information technology fields and second to introduce new pedagogical schemes in primary schools as well as colleges to peak their interests in the subjects. This "pipeline" approach rests predominantly on attracting women into information technology fields. This approach implies the root of the matter for the under-representation of women primarily lies within women, or their socialization. In doing so, the pipeline approach overlooks the importance of the social relations in various IT fields.

If the pipeline standpoint identified the sole reasons for the under-representation of women in information technology fields, we could be less concerned about what happens to women once they launch their careers in one of the IT-related fields. However, sufficient evidence exists to suggest that women and men generally are segregated into different types of work fields, and ultimately experience different work-related outcomes (Reskin & Roos 1990; Acker 1992; Steiger & Wardell 1995). For example, women exit science, engineering, and law fields at higher rates than men (Kay 1997; Annenberg Public Policy Center 2001; Preston 2004). Hence, the pipeline approach accounts for the under-representation of women in IT fields only so far as the work organizations within those fields do not contain barriers to advancement and other obstacles mitigating the probabilities of women attaining outcomes similar to men. To the

degree the later scenario characterizes IT workplaces in the US, women might be more prone to turn over or to dropping out of the IT workforce entirely.

We adopt an institutional perspective to frame our thinking on this issue.[2] This means that we view the institutional contexts in which work takes place as specifying not only how workers' skills will be used, developed, and rewarded, but also how workers will view their own opportunities and appraise their priorities (Kanter 1977; Krecker 1994; Kalleberg et al. 1996). Hence, we theorize that institutional contexts, such as education, family, industry, and the organization of the workplace contain factors that frame differently the patterns of work-related outcomes for women and men in the professional IT workforce in the US. Specifically, we theorize that careers are social-historical processes involving unanticipated and often conflicting experiences because of a contradictory relation between work and family. Rare in today's world would be a situation where a person could devote simultaneously her/his full effort to matters related to both work and family. More typically, matters related to work and family are separated in time and space. (See Figure 1.)

**Figure 1: Research Model**




For now, we primarily focus on two institutions having the most immediate influences on work-related outcomes of professional IT workers: the workplace and the family. The organization of the workplace contains the administrative scheme by which workers efforts are distributed and evaluated, plus the various technologies directly and indirectly involved in performing their assigned jobs. Increasingly, both the administrative and technological aspects of the workplace are thought to be gendered having consequences for (Kanter 1977; Wajcman 1991; Britton 200; Panteli et al. 2001). The more informal the retention and promotion practices, for instance, the more likely subjective judgments will favor candidates who look like the managers doing the recruiting and promoting (Cockburn 1991). Reskin and McBrier (2000) specifically noted that a supervisor's gender makes a significant difference in advancement opportunities, as well as in personnel evaluations and initial earnings. Their results clearly indicate that men are more likely

than women to be promoted when their supervisor is a man. Furthermore, gender segregation in general has been shown consistently to be a major factor in differential rewards and career advancement of women (Reskin & Roos 1990; Cassirer & Reskin 2000). We also look at other workplace factors such, as size of the organization and work/life balance issues that may affect work outcomes differently for professional men and women in the IT workforce.

As an institution, the family has a great influence during childhood and adulthood as families and family life shape the career aspirations and work orientations of individuals. Likewise, characteristics of IT workers' immediate family are highly likely to play a major role in determining workforce participation. Most significant among these characteristics are presence of and support from a partner, employment status and occupation of a partner, and number of children under 18 (Roxburgh 1999; Perry-Smith et al. 2000). As families pass through various stages, the adults implement strategies for integrating work and family responsibilities. These strategies, however, most often involve women making more adjustments in their work schedules and career paths than men (Moen 2003, *passim*). Numerous employers, including some in IT fields (Nash 2000), have come to recognize the value of work practices that enable workers (particularly women) to balance responsibilities between family and employer without having to leave the workforce (Galinsky et al. 1991; Glass & Estes 1997; Waldfogel 1999).

Two implications can be gleaned from this overview. First, if women and men had similar training and skill sets when they entered the IT workforce in the US and still have different work-related outcomes, we would need to investigate potential influences of the work organization itself, such as traditional bureaucratic vs. high performance work environments, and other employer characteristics such as size, type and support for HR policies, in particular

family-friendly policies. Second, we also would need to investigate other immediate institutions such as the family and related characteristics, including the number of children and total family income.

In this study, we look only at those men and women who have earned at least a baccalaureate degree in a computing or IT-related discipline, such as computer science, electrical engineering, and information systems, to see if gender-related outcomes extend beyond educational backgrounds. We chose to look at men and women who have earned a baccalaureate degree because it is increasingly the prerequisite for entry into high-skill, high-wage professional IT occupations in the US.

## Research Approach

We conducted telephone-based interviews of recent graduates who had earned at least a bachelors of art or science degree (BA or BS) in an IT-relevant major. Some of the graduates had earned masters of art or science (MA or MS) degrees. The interview schedule consisted of approximately 120 questions relating to education and training, current as well as past job skills, employer characteristics and practices for each job held since receiving their degree, work/family benefits and attitudes associated with each employer, and demographic information such as household characteristics, age, race, number of children, and income. Our sampling frame consisted of approximately 10,000 individuals who graduated between 1988 and 2001. This sampling frame enabled us to concentrate on significant career identifying moments associated with the first one-third of a professional career, namely first marriage, first house purchase, first child, and first job change after marriage (need life course cite).

The sampling frame was provided by five US universities. Two are private and three are public institutions. Four of these are research institutions and one is a liberal arts institution.

The universities are located in the Mid-Atlantic and West Coast regions of the US. We selected these two areas since they comprise similar labor markets relative to IT work. Additionally, the five universities whose alumni form the basis of our sample represent a pool of institutions in these two areas that have extensive IT-relevant college majors.

Interviews were conducted by the Center for Survey Research at VA Tech using a computer-assisted telephone interviewing (CATI) system. The interview schedule was developed through iterative testing, including several pre-tests and a lengthy pilot-testing effort. The resulting interview took from 25 to 45 minutes to complete and was administered by staff at the Center for Survey Research who had been trained in telephone interviewing and how to use our particular interview schedule. Interviews began in September 2003 and were completed by April 2004. We completed a total of 2823 interviews, for an effective response rate of 46 percent.

## Data Analysis

In this paper, we present a descriptive overview of several main findings. Toward that end, our analysis includes descriptive statistics such as frequencies and means, and t-tests, to determine if statistically significant differences existed between women and men for particular results.

Table 1 indicates that our sample contains a smaller percentage of women than reported for the US professional IT workforce. While women comprise 27 percent of the professional IT positions in the US, they comprise 16 percent in our sample. One possible reason for this low representation of women could be the variety of entry points into professional IT work besides formal baccalaureate and master degree programs. Historically, on-the-job training played a major role in the career advancement of most, if not all, IT professionals. This suggests that our sample does not over-represent women relative to the professional IT workforce in the US.

In Table 2 we report the age distribution of the US IT workforce. Because our sample was deliberately restricted to college graduates who had earned their degrees between1988 and 2001, the age distribution of our sample is not representative of the US IT workforce. Rather, it is more representative of professional workers generally who are in the early stages of their careers. The early-career stages are very problematic in shaping a life-time career since the ages between 25 and 38 (the age range for the majority of our sample) involve many first-time decisions and events related to work and family. The average ages of the men and women in our sample are 33.3 years and 33.5 years respectively.

**Table 1: Percent of US Professional IT Workers by Gender**

| | **All U.S. IT workers in 2002** | **U.S. Professional IT workers in 2002** | **Sample** |
|---|---|---|---|
| **Women** | 35 | 27 | 16 (304) |
| **Men** | 65 | 73 | 84 (1641) |

Source: U.S. Department of Labor 2005, columns 1 and 2; Women in IT; Howe Level the Field?, Column 3; number of respondents in parentheses.

**Table 2: IT Workers by Age Group**

| | **16-19** | **20-24** | **25-34** | **35-44** | **45-54** | **55-64** | **65+** |
|---|---|---|---|---|---|---|---|
| **U.S. IT Workforce** | 1.2% | 7.6% | 32.1% | 29.7% | 21.0% | 7.4% | 1.0% |

Source: U.S. Department of Labor 2004.

In Table 3 we report the current work status of the individuals in our sample. Of the 2823 people interviewed, 2369 (or 83 percent) had held at least one IT job, or 16 percent of the total sample never held an IT job after graduation, with similar percentages for women and men.[3]

Of those who held an IT job after graduation, 86 percent of the men and 66 percent of the women were currently employed in IT at the time of the interviews. In other words, 14 percent of the men in the sample had dropped out of the IT workforce, while 34 percent of the women had dropped out, before we interviewed them. This means women with similar college preparations as men are leaving the IT workforce at a rate of nearly two-and-one-half (2.5) times that of men within the first 14 years past their baccalaureate or master's degree. From this point forward, our analysis concentrates on those individuals in the sample who held an IT job at the time we interviewed them.

We specifically queried respondents about whether they had an internship or cooperative work time in IT as undergraduates because these experiences often are heralded as a key to entry and success in an IT field. Only a small portion of the respondents had an internship-type experience, but a slightly larger proportion of women than men reported having these experiences (see Table 3).

## Table 3: Percent IT Workers by Work Experience and Gender

| | **Men** | **Women** | **Total** |
|---|---|---|---|
| **Interviewed** | 81<br>(2276) | 19<br>(547) | 2823 |
| **Had an IT job** | 84<br>(1911) | 84<br>(458) | 84<br>(2369) |
| **Currently in T job** | 86<br>(1641) | 66<br>(304) | 82<br>(1945) |
| **Had an internship-type experience** | 5<br>(82) | 7<br>(22) | 5<br>(104) |

In Table 4 we report the household characteristics of the IT workers in our sample. Similar percentages of men and women were married and living with a partner. However, no statistically significant difference exists between men and women and the number of children living at home. Nor does a statistically significant difference exist for the total number of people living in the households of men and women.

**Table 4: Household Characteristics**

| | **Men** | **Women** |
|---|---|---|
| **Percent married w/partner @ home** | 64 (1052) | 63 (190) |
| **Number of children less than 18 living at home** | 0.97 (1337) | 0.84 (253) |
| **Number of people living in the household** | 2.80 (1615) | 2.74 (299) |

***Characteristics of the Workplace and Work***

The data in Table 5 suggest that both men and women are likely to work full time. Indeed, 85 percent or more of the professional IT workers work full time regardless of gender. Men are slightly more likely than women to work in the private sector, but women are clearly more likely to work for employers with more employees. The median size of the employer organization where women work is three times the median employer size where men work. One explanation for this latter difference might be that, compared to smaller job sites, larger job sites have more well-developed and more pro-active equal opportunity and affirmative action programs that would be attractive to and supportive of women.

**Table 5: Job Characteristics**

| | Men | Women |
|---|---|---|
| **Percent full-time work** | 86 (1415) | 85 (258) |
| **Percent private employer** | 84 (1366) | 81 (243) |
| **Median size of job site** | 1100* | 3000 |

*p < .005

Concerned by reports about extensive turnover of IT workers, we asked about the number of IT jobs respondents had held. The data in Table 6 make clear that a full one-third of all currently employed respondents had held only one position and another 30 percent had held only two positions in the first 14 years of their working careers. The data reported in Table 7 highlight one additional point: Women in our sample on average held slightly fewer positions in their early IT careers than men. While turnover in general among professional IT workers might not be as sizeable as portrayed in the public media, women appear significantly less prone to turnover than men, an important finding relative to the gender differences regarding drop outs.

**Table 6: Number of Professional IT Jobs Held**

| IT jobs held | Frequency | Percent |
|---|---|---|
| 1 | 738 | 38 |
| 2 | 564 | 30 |
| 3 | 339 | 18 |
| 4 | 154 | 8 |
| 5 | 82 | 4 |
| 6 | 33 | 2 |
| 7 or more (max is 10) | 15 | .3 |
| Total | 1925 | 100 |

**Table 7: Number of Professional IT Jobs Held**

| Gender | N | Mean* | S. D. |
|---|---|---|---|
| **Men** | 1641 | 2.27 | 1.35 |
| **Women** | 304 | 2.03 | 1.25 |
| *p.<.005 | | | |

As reported in Table 8, currently employed men appear to work a few more face-time hours than do currently employed women, but the difference is not significant. While the majority of men and women do little or no job-related work at home, more women report doing job-related work at home than men. We further note that both men and women have similar amounts of commute time each day. This means that both men and women on average add at least another 5.0 hours to their work weeks because of their commutes to and from work.

**Table 8: Weekly Hours Worked and Commuted**

| | Men (1641) | Women (304) |
|---|---|---|
| **Mean hours worked per week** | 45.7 | 42.0 |
| **None or very little work done at home** | 82 | 77 |
| **One-way commute time in minutes** | 35 | 37 |

***Post-Graduate Training***

In Tables 9, 10 and 11 we report post-graduate training experience for our sample. We focus on post-graduate training for two reasons. First, the policy rhetoric and empirical findings suggest

that continued learning and training is important for employee success and for IT workers especially. Second, much of the rhetoric around computing suggests the IT industry is fast-changing and highly competitive and requires continued employee training and skill upgrading for employer success as well.

Women in our sample were more likely to report having had a post-graduate training experience, yet a sizeable number of men and women appear not to be obtaining additional formal education and skill upgrading. For those individuals still in the professional IT workforce at the time of our interview, 40 percent of the men and 50 percent of the women had engaged in post-graduate training and education; most pursued formal degrees at four year colleges or universities.

**Table 9: Post-Graduate Training**

| | **Men** | **Women** |
|---|---|---|
| **Percent enrolled in a course (Y/N)** | 40<br>(660) | 50<br>(154) |
| **Average number of courses** | 1.70 | 1.65 |

**Table 10: Percent Women and Men by Type of Post-Graduate Training Program**

| | **Men** | **Women** |
|---|---|---|
| **Formal degree** | 63<br>(416) | 63<br>(97) |
| **Certificate program** | 25<br>(163) | 27<br>(41) |
| **Seminar/Workshop** | 10<br>(68) | 8<br>(13) |
| **Other** | 2<br>(13) | 2<br>(3) |
| **Total** | 40<br>(660) | 50<br>(154) |

Of those individuals who had taken post-graduate training programs, men were more likely than women to receive training in an IT area. Furthermore, for the majority of these men and women, their employers paid for their education and training, but women were somewhat less likely than men to have their costs covered by their employers (see Table 11).

**Table 11: Percent Women and Men by Select Characteristics of Post-Graduate Training**

| | | **Men** | **Women** |
|---|---|---|---|
| **Taken IT programs** | | 74<br>(485) | 66<br>(102) |
| **Type of Institution** | **community college** | 2 | 5 |
| | **4-yr. inst.** | 68 | 70 |
| **Who pays?** | **employer** | 58 | 54 |
| | **employee** | 22 | 25 |

***Unpaid Leaves***

Data in Table 12 indicate that professional women in the US IT workforce are nearly five times as likely to take unpaid leave as are professional men in the IT workforce. And, women IT workers who take unpaid leave take twice as much time away from paid work as are the men.

**Table 12: Days of Unpaid Leave by Gender**

| | N | Mean* | S. D. |
|---|---|---|---|
| **All** | 181 | 96.5 | 180.5 |
| **Men** | 97 (6%) | 68.6 | 172.9 |
| **Women** | 84 (28%) | 128.7 | 184.8 |

*p < .001

***Income***

Wage disparities between men and women exist, as indicated by the fact that women IT professionals are paid significantly less than men IT professionals (see Table 13). This difference is empirically challenging to a human capital explanation of compensation as a work-related outcome, as well as to others that use the individual as the unit of analysis for wage outcomes. Controlling for similarity in educational background, as we have done, further underscores the importance of this finding. Moreover, the top wage-earning men in our sample earned as much as $900,000 per year compared to the top income of $600,000 for women. The data also make clear that this significant difference is not necessarily driven by skill disparities between these men and women. Nor do we believe that the extra 60 days of unpaid leave, which women take relative to men, alone are likely to lead to a $15,000 difference in median salary between men and women who work in IT.

**Table 13: Personal Income by Gender**

| Gender | N | Median | Mean* | S.D. |
|---|---|---|---|---|
| **All** | 959 | $75K | $83.5K | $59.2K |
| **Men** | 804 | $80K | $86.0K | $60.3K |
| **Women** | 155 | $65K | $70.9K | $51.2K |

*p < .005

## Discussion

Our descriptive analysis provides an incomplete picture of gender differences in the professional IT workforce in the US. Nor do we engage here a multivariate analysis to assess direct and indirect relationships among the variables, as our intent has been to illustrate the gender differences among those US professional IT workers with similar educational preparation. The current analysis suggests there exists a very uneven playing field for women in that workforce. Five specific findings need additional discussion.

First, women are nearly 250% as likely as men to leave the IT workforce. Second, men and women work comparable hours and have similar commutes times. Third, no difference exists between men's and women's undergraduate education or their post-graduate type of training, although women are more likely than men to have had post-graduate education or training. Fourth, more women, in percentage and absolute terms, take unpaid leave and for significantly longer periods than men. Finally, women are paid less than men. In this section we discuss these highlights and their implications relative to women's work-related outcomes in the professional IT workforce in the US.

***Women are nearly 2.5 times as likely as men to leave the IT workforce.***

This finding suggests that larger numbers of women, relative to men, who have succeeded in gaining the necessary skills to enter the US professional IT workforce, find their work situations less satisfactory than expected. This finding is particularly poignant in light of the fact that women's job turnover appears significantly lower than men's. That said, the women's higher drop out rate might result from one or more forces.

The organization of the workplace, for example, could lead to a less pleasing or a less welcoming work environment for women. After all, many studies have demonstrated the masculine character of computer hardware and software technologies, as well as of IT educational environments, where individual rather than group accomplishments are rewarded (e.g. Panteli et al. 1999; Panteli, Stack and Ramsey 2001). Plus, we know that environments such as these occasionally can be hostile places for women to work (Cockburn 1991). To a certain degree then, the organization of IT work probably discourages women from continuing in an IT career.

However, women tend to work for larger employer organizations. This observation suggests two additional insights about why women might exit at a higher rate than men. Firstly, professional IT women might be more likely to exit smaller IT employer settings than larger employer settings. Prior research has documented that larger organizations are more likely to have human resource practices that accommodate affirmative action and work-family needs than smaller organizations (Kalleberg et al. 1996). The absence of these workplace characteristics in smaller employer settings, especially in the vendor environment, might encourage professional IT women to leave the IT workforce entirely. Secondly and related, while men and women in our sample had relatively similar home-related obligations in terms of number of children and individuals living in the home, the presence of children, even a single child, has more

complicated implications for women's continued workforce involvement than does a single child for a man (Presser 2003). Most likely some combination of family and employer characteristics produces hurdles that mitigate women's chances of successfully raising children while successfully maintaining a full-time professional career in IT. Regardless of the precise nature of that combination, an interaction effect between work and family probably contributes to women dropping out of the professional IT workforce at a higher rate than men.

***Men and women work similar hours per week and have similar commute times.***

The fact that the men and women in our sample appear to spend similar amounts of time at their job sites and in their commutes suggests that any disparity between men and women relative to work-related outcomes is more complicated than pointing to hours dedicated to their work. Add to this that women are more likely than men to engage in job-related work while at home, and the overall pattern suggests that women in the US professional IT workforce indeed are pulling second shifts in more ways than one (Hochschild 1989).

***The differences between men's and women's education, as well as post-graduate training, probably do not contribute in an obvious way to different employment outcomes.***

From the outset, IT professionals in our sample had the requisite skill levels to enter the high-end of the IT workforce. To maintain their competitive edge, we thought they might seek additional training whether technical or managerial. Our findings indicate women by a 5 to 4 margin are more likely to seek additional training than men. Moreover, employers are willing to pay for this additional training, but here men hold a slight advantage over women.

Two implications result from these observations. While post-graduate training definitely has added value to the skills of the IT workforce, we cannot claim it reaches the level of a prescription for career gains in the professional IT workforce. If post-baccalaureate training is

not the overwhelming venue for additional training, on-the-job and informal opportunities probably continue to play a significant role. This form of 'requisite' training quite possibly contributes to disadvantaging women in masculine-dominated work environments, certainly a likely possibility given Cockburn's (1991) and Panteli's (2001) research.

***Women take more unpaid leave and for longer periods than do men.***

Our findings regarding differences in the amount and time taken in unpaid leave decisively indicate that women take more unpaid leave and for more days than men. Unpaid leave, while a federally entitled opportunity in the US under the Family and Medical Leave Act of 1993, in general has not been a popular way for workers to address family and medical needs. We should not, therefore, expect professional IT workers to be significantly different from the norm. Indeed, if anything, they might be less likely to take advantage of the federally mandated opportunity because of the product-cycle of their work assignments. From this perspective, unpaid leave represents a double negative for women; to take advantage of it jeopardizes tangible outcomes of women's near-term careers and to not take advantage of it adds significant challenges to their efforts to successfully integrate their work and family obligations.

***Women are paid less than men.***

The women in our sample earned an averaged of 82 percent of what men's earnings.[4] Importantly, this difference in income exists in light of similar undergraduate educations and internship-experiences while in college, as well as similar hours worked and commute times. Nor does post-graduate education and training seem to benefit women's income, even though they are slightly more likely to enroll in these programs. More likely, the substantial and statistically significant difference between the incomes that professional men and women IT

workers receive is related to the types of positions women hold, the use of unpaid leave, the presence of children in the

home, and the informal mentoring and training that occurs in the IT workplace. The difference in incomes clearly is gendered in nature.

## Conclusions

Through this descriptive analysis we have presented evidence indicating that employment outcomes for men and women in the professional IT workforce in the US cannot be explained solely by the accounts commonly offered. Our sample was strategically chosen to control for formal educational experiences and regional labor markets. Moreover, it included professionals who, in contrast to those at the low-wage, low-skill end of the IT job spectrum, maintain a personal as well as professional identity with their work (Meiksin and Whalley 2003). Admittedly, we have not teased out all the nuances of the relationships among educational background, organization of the workplace, family structure and work-related outcomes for the men and women in our sample.

Two outcomes do appear painfully clear. Women in professional IT jobs earn significantly less than men in professional IT jobs in the US, and they exit the professional IT workforce at a significantly higher rate than men. From the present analysis, these differences appear in part to result from women taking more days of unpaid leave than men. Puzzling about other factors that might explain the wage and exit differentials, two additional key organizational influences come to mind.

First, a masculine nature to IT work has been widely cited and informal mentoring would be a common part of that environment (Kanter 1977; Cockburn 1991). Through informal networking, opportunities in addition to skill acquisition for projects and promotion clearly are

present. If women are discouraged, for whatever reason, from informal associations with their male co-workers, their employment outcomes probably would be different from men's.

Second, the industrial setting within which IT work is organized and performed most likely plays a role in work-related outcomes for women and men. In the present case, we can theoretically divide the industrial sectors for IT work into vendors, consultants, and applicators (National Research Council 2001), where the latter tend to be characterized by large employers who hire IT support to maintain back office functions. Bureaucratic control structures characterize these environments in which individuals are paid for face-time rather than performance, as their IT skills are used to adapt packaged software to their employers' specific needs. This workload is perceived as less demanding than software and hardware development, i.e. vendor, settings because deadlines are more flexible and the knowledge/skill base is more stable. Effectively, the application sector represents the secondary market of a dual-labor market for professional IT workers where wages typically are lower than in either the vendor or consultant industrial sectors.[5] Moreover, because employers in the application sector tend to be larger than vendor employers, they should have more established HR practices, including health insurance, conforming to federal employment laws.

Women in professional IT might be attracted to these workplaces because of the routine work schedule, the availability of reasonably good health insurance and possibly other benefits related to work and family integration. According to Meiksin and Whalley (2003), women are attracted to these work settings out of accommodation to their second-shift duties more so than because they lack skill or motivation to work in the more highly intense vendor environment. Indeed, women in our sample tended to be employed in significantly larger firms than the men, suggesting they might be more likely to work in an application environment, plus they had held

fewer jobs than men, suggesting they might work in a more stable economic environment, such as the application industry.

The overall generalization from this research would be that pipeline approaches to addressing the under-representation of women in the professional IT workforce miss a major part of the "women in IT" story. The human capital perspective which informs the pipeline approach focuses analyses on individuals and cannot capture the ongoing social and economic processes surrounding individuals as they encounter new and conflicting experiences. Major institutional factors involved in those new experiences shape the career paths of most women differently from most men, especially in the early stages of their professional careers. Educational opportunities establish baseline skills, social networks, and career aspirations, and we know women and men experience these opportunities differently (Creamer et al. 2006). The organization and obligations associated with paid employment also shape informal opportunities for skills acquisition as well as human resource practices, and from this research we suspect women and men experience these opportunities differently. Finally, family structure and resources constitute a tandem of limitations and obligations associated with the nonpaid labor of individual workers, and from this research we also suspect women and men experience this environment differently. We should not, then, be surprised to learn that women professional IT workers in the U.S. earn less money than, or have different career paths from, the men in professional IT work. Nor should we be surprised to learn that they exit the professional IT workforce at higher a rate than men. The task at hand is to investigate the processes by which these institutional factors shape opportunities differently for the women and men in the professional IT workforce.

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## End Notes

[1] The current project titled 'Women in the IT Workforce: How Level is the Playing Field?' was sponsored by the National Science Foundation initiative Information Technology Workforce Program through the Computer and Information Systems Engineering Division, grant #0204253.

[2] For an overview of five theoretical perspectives found in current discussions related to women in IT, see Wardell et al. (2006).

[3] Note that we allowed the respondents to decide if their work activity qualified as an IT job, a method used by the U.S. Bureau of Labor Statistics when conducting its numerous workforce inventories.

[4] Nationally, full-time working women in 2003 earned approximately 75.5 percent of what full-time working men earned throughout the US workforce (see Infoplease).

[5] The existence of a dual-labor market in IT work in general has been documented (Trauth, Wardell and Yeo 2004), but this is the first evidence of a dual-labor market presence within the professional IT workforce.