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Charles L. Geigner
*Center for Information Systems Technology (InfoTech), Illinois State University*

Galen B. Crow
*Extended University, Illinois State University*

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**Charles L. Geigner**

Center for Information Systems Technology (InfoTech), Illinois State University, 205 N. Main, Ste. 300, Bloomington, IL 61701
(309) 557-0600  Fax:  (309) 557-0887; clgeign@ilstu.edu


**Galen B. Crow**

Extended University, Illinois State University, Campus Box 4090, Normal, IL   61790-4090
(309) 438-5288  Fax:  (309) 438-5069; gbcrow@ilstu.edu

## ABSTRACT

*Despite the economic slowdown of the early 2000s, Information Technology (IT) workers are likely to remain in high demand in the U.S. for the next decade.  One of the problems faced in meeting this demand is the gender discrepancy in choosing IT employment; men are far more likely to engage in IT careers than women.  Although there are many potential reasons for this discrepancy, satisfaction in one's job is likely to be an influence in career choice.  This study compares the satisfaction of women in a professional computing career to those in a more traditionally female career—elementary school teachers.*

**Keywords:**  Women in computing, vocational choice, job satisfaction

## INTRODUCTION

Even with the recent slowdown in the U.S. demand for Information Technology workers (ITAA, 2002), the Department of Labor still projects computing occupations to be among the fastest growing and most well paid employment opportunities.  In 1998, there were approximately 400,000 unfilled IT positions (ITAA, 1998).   Although in 2001-2002 the need for these workers dropped dramatically, the long-term outlook remained bright.  The U.S. government estimates that the need for IT workers will double between 2000 and 2010, which would mean an additional 1.1 million new IT employees (ITAA, 2002).  Unfortunately, institutions of higher education are only producing 40,000 graduates per year who are skilled in related disciplines (ITAA, 1998).

One of the structural reasons for continued shortages in the IT field is the lack of females who choose IT careers. Although women are more than half the population, they are a significantly underrepresented percentage of the population earning computing degrees

and hold, at most, only 31 percent of computer programmer/analyst jobs (U.S. Department of Commerce, 1998). There has been a 51 percent decrease in computing degrees awarded to women in the past decade (Hill, 1997), and women make up only 6.5 percent of the tenure track U. S. computer science faculty (Shashaani, 1993). Also, among high school students taking the ACT college entrance exams, three times more males than females indicated an interest in computing-related disciplines (ACT, 1998).

The fact that women are not entering the computing profession has been well documented. Why they have avoided this profession has, however, not been as well documented or understood. Women and occupational choice was not a topic of research prior to the 1960s. The woman's' rights movement of the 1960s coupled with the technological race of the "cold war" era did promote a movement of women into the "hard sciences," and, where few women were once found in the professions of medicine, astrophysics, mathematics, and other traditional male occupations, more and more women began to enter these fields.

Theory and research on occupational choice began with the industrial revolution. Finding the "right man" to do the job was critical to job efficiency as defined by Frederick Taylor (1911). Although much of the research during the early part of the Twentieth Century dealt with the workplace environment, psychological and sociological theory began to look at the individual and the work group, rather than the workplace, for answers to the question of occupational choice.

Even so, for the first 40 years of occupational choice research, most studies of occupational choice have examined the distinctive characteristics of individuals in different occupations (usually professionals) and experiences and situations that influence their career choices (Mottern, 1980). Few studies looked at the tasks associated with the jobs, or at the perceived sex-roles associated with different jobs. In addition, up until 1980, very few of the studies focused on the occupational choices of women. A review of some of that research as it relates to computing reveals the following.

Some researchers (Wilder, Mackie, & Cooper, 1985; Kiesler, Sproull & Eccles, 1985) have suggested that women have a less positive attitude towards computers than do men, which could dissuade some women from entering the field. The general environment and culture of computing and the way computing is presented in the educational system is sometimes cited as possible explanations why young women do not consider computing careers (Balcita, Carver, & Soffa, 2002). Others (Geigner, 2001) have attributed the low participation rate to a perception of a "geek-like" aura that surrounds the profession of computer programming.

There also exists a general societal perception that some professions, of which the IT profession may be one, are "masculine" in nature, whereas a profession like teaching is "feminine" in nature. Sex-role identity (Bem, 1974; Block, 1973; Spence, Helmrich & Stapp, 1975, Wolfe & Betz, 1981) has been linked as a factor in choice of occupation. A person's sex-role identity, both "masculine-typed" males and females, and "feminine-typed" males and females, has been related highly to choice of career. Females who are more masculine-typed are significantly more likely to select nontraditional female

occupations than are feminine-typed females (Strange & Rea, 1983; Yankico, B. J., Hardin, S. I., & McLaughlin, K. B. & Kent, B., 1978). Likewise, men who are employed in more female-dominated occupations tend to adhere less to traditional sex-role expectations as defined as masculine (Lamkau, 1985). As a rule of thumb, an occupation in which 70% or more of the incumbents are male is classified as a traditional male occupation. At the same time, such an occupation would also be classified as a nontraditional female occupation, since less than 30% of the incumbents are women.

Yet another factor in the selection of a career is that of achievement-related benefits and task value. Eccles' (1994) model "links achievement-related beliefs, outcomes, and goals to interpretative systems like casual attributions, to the input of socializers (primarily parents and teachers), to gender role beliefs, to self-perceptions and self-concept and to one's perceptions of the task itself" (p. 587). The extent to which task value plays a role with the interpretative system of perceived job satisfaction and the resultant connection to occupational choice is unknown.

In the mid to late 1970s, a number of theories emerged that looked to self-esteem and self-concept as a mediator of career choice. Although many variations of these theories found their way into the literature, chief among these was the work conducted by Bandura.

Bandura's work on self-efficacy (1977, 1982, 1986) stated that behavior and behavioral changes are affected by self-efficacy expectations. These are beliefs that one can successfully perform a given task or behavior. The theory stated that initiation of a behavior, the level of effort expended in that behavior, and the degree of persistence of the behavior in the face of obstacles are all determined by an individual's self-efficacy expectations. Someone with low self-efficacy expectations about a behavior will likely avoid that behavior, and someone with higher levels of self-efficacy will approach that behavior.

> Self-efficacy has been neatly subdivided into efficacy expectations and efficacy aspirations. The results of a longitudinal study conducted by Mottern (1980) identified a significant difference between expectations and aspirations. Her data showed that only 28.8% of the women surveyed in 1965 who had aspired to a specific career had attained that career in 1979. At the same time, 45.3% of the women surveyed in 1965 had attained their "expected" career by 1979. These data also "suggest that most women's' career attainments fall into a general category consistent with their earlier aspirations and expectations (traditional vs. nontraditional); however, attainments are not consistent with the specific occupations these women aspired to or expected to attain" (Mottern, 1980, p. 86).

The literature has clearly shown that women who select nontraditional female jobs exhibit certain characteristics that are not present in women who have selected more traditional female jobs. Such things as their perceived gender-role, their demographics, and their occupational activity self-efficacy are different than their more traditional counterparts.

Coupled to this is the set of attitudes that they exhibit. If Bandura was correct, attitude affects self-efficacy, and women have consistently demonstrated a level of comfort that is less than that of men. If this is so, how does this comfort level affect self-efficacy? The literature is not clear on this, but it seems as though computer anxiety, which is more prevalent in women, does reduce self-efficacy. Further, the initial experience with computers does affect the level of anxiety. How, then, do women who enter the field of computing differ from those who do not? How do they overcome this anxiety if it is present, or if it is not, why not? Once again, the literature is not clear on these points.

Regardless of what leads women to the IT workforce, the experience of those incumbents in information technology professions would seemingly have a strong influence on whether other women would find those professions to be appealing. In particular, job satisfaction would be a critical variable in how women perceive computing careers (Balcita, et al. 2002). The ambient message that is received by outsiders from job incumbents regarding their satisfaction with their careers must provide some fodder for those considering the choice of a career. To what extent do the male-dominated jobs in computing provide a satisfying career for women? How would job satisfaction differ from women in a more traditional female occupation like teaching? One would suspect that since more women choose teaching, and since teaching is a more traditional female occupation, that teachers would be more satisfied with there profession than those in computing jobs. If job satisfaction plays little or no role in the selection of a career, then there should be little or no difference between the two groups.

## METHODOLOGY

This paper is the partial result of a Ph.D. dissertation study completed at Illinois State University in 2001. The overall objective of that study was to provide insight into why women did not tend to choose computing occupations, and ultimately how could that trend be altered. Specifically, the study provided a wide comparison of women in a computing profession to women in a more traditional female occupation.

In order to provide a comparison of IT professional women to those of a more traditionally female occupation, two sets of data were needed. One population identified was the female IT professionals in a large mid-western insurance company. The other identified population was female elementary school teachers in a mid-western school district. Based upon Bureau of Labor Statistics data, "elementary teacher" has been identified as a more traditional female occupation than those of middle or secondary teachers (U.S. Department of Labor, 2002).

A survey was developed that was similar for both groups of subjects. The survey was made up of several separate instruments, one of which was a demographic questionnaire that asked questions about career selection influencers and job satisfaction. Each subject was asked to rate a list of items that may or may not have influenced her selection of a career. These items included salary, self-ability, enjoyment, prestige, societal norms, opportunity, growth, working conditions, family, industry appeal, perks (vacation, etc.), geography, and other. Another section of the survey dealt with job title, tenure, and staying power in career as measured by number of years in same career, the relationship

of the subject's current career to any prior careers, and level of satisfaction with her current career. Finally, a different section asked the subjects to identify people, including parents, friends, role models, and peers, who had the most influence on the selection of their career.

The focus of this paper is on the items of this study related to job satisfaction. To measure job satisfaction, respondents were asked to answer the following question: How satisfied are you on your choice of your current career? To rate their level of satisfaction respondents were given five choices: 1 – Very Dissatisfied, 2 – Somewhat Dissatisfied, 3 – Somewhat Satisfied, 4 – Satisfied, 5 –Very Satisfied. This scale was used to reduce the effects of central tendency that typically would have responses hover around a midpoint of neither satisfied nor dissatisfied.

The population of IT professional women examined was the professional female workers in the Information Systems (IS) department of a mid-western insurance company. At the time that this research was conducted (Spring, 2001), the IS department of the corporation employed over 5,000 people, approximately 1,780 of whom were women in information technology jobs. From the population of 1,780 women, a sample of 202 was randomly chosen.

An elementary school district in central Illinois was chosen as the population from which to select the sample of teachers. The district was comprised of six elementary schools, a middle school and a high school. In order to produce a sample of the most traditional female jobholders, the elementary schools and the teachers employed there were targeted. A total of 191 surveys were distributed.

## DEMOGRAPHICS OF RESPONDENTS

Two hundred two women from the corporation returned surveys. Of the 202, 108 respondents qualified as women in computing, according to the definition set forth in the dissertation. Table 1 shows the responses of corporate women in computing by job title.

**Table 1:  Response Rate of Women in Computing by Job Title**

| Department | Surveys Returned |
|---|---|
| Accounting Technician | 2 |
| Acquisitions Analyst | 1 |
| Analyst | 33 |
| Assistant Vice President | 2 |
| Business Analyst | 5 |

| | |
|---|---|
| Data Base Administrator | 2 |
| Data Center Technician | 2 |
| Development Manager | 2 |
| Director | 1 |
| Data Processing Specialist | 3 |
| Financial Business Analyst | 14 |
| Forms Designer | 2 |
| Hardware Project Specialist | 1 |
| Project Manager | 5 |
| Senior Analyst | 17 |
| Systems Manager | 2 |
| Systems Specialist | 4 |
| Technical Analyst | 6 |
| Total | 108 |

Fifty-seven (52.8%) of the computing women stated that they had stayed in the same career they had begun their adult work.  Of the 51 women who reported otherwise, 14 (15.1%) indicated that their prior career was related to their current one.  The mean age of the respondents was 37.98 ($\underline{SD}$ = 7.13) and 97 (89.8%) of the respondents identified themselves as Caucasian.  Nearly 90% of the women in computing sample had completed college or had done graduate or professional work after college.

The elementary school teachers returned 118 useable surveys, but not all teachers responded to every item on the survey.  As a result, the N varied by item. Table 2 shows the surveys returned by job title for the teachers.

**Table 2:  Response Rate of Elementary Teachers by Job Title**

| Job Title | Surveys Returned |
|---|---|
| Art Teacher | 2 |

| | |
|---|---|
| Guidance counselor | 3 |
| Librarian | 2 |
| Media specialist | 2 |
| Music teacher | 2 |
| P.E. teacher | 2 |
| Special education teacher | 6 |
| Social worker | 2 |
| Speech teacher | 3 |
| Classroom teacher | 93 |
| Total | 117 |

Of the 118 teachers who responded, 104 (88.1%) teachers stated that they had stayed in the same career they began their adult work. Of the 13 women who reported otherwise, 9 (7.6%) indicated that their prior career was related to their current one. The mean age of the respondents was 46.28 ($\underline{SD}$ = 10.33) and 109 (92.4%) of the respondents identified themselves as Caucasian. Over 71% of the teachers have attended graduate or professional school.

## RESULTS

Of the 202 surveys distributed to the women in computing jobs, 108 were returned resulting in a response rate of 53 percent. Of the 191 surveys distributed to elementary teachers, 118 useable surveys were returned resulting in response rate of 62 percent.

Table 3 summarizes the satisfaction level of both groups of women. Both groups expressed general satisfaction with their career choice. Eighty eight percent of the IS professionals and 97 percent of elementary teachers reported that they were either somewhat satisfied, satisfied, or very satisfied with their choice of current career. However, the elementary school (ES) teachers were clearly more satisfied than were the IS professionals. Elementary school reported that 89 percent were either satisfied or very satisfied, whereas only 69 percent of IT professionals reported such levels.

A standardized $\underline{t}$-test was used to measure significance in the difference of satisfaction between the two groups. Results of the $\underline{t}$-test indicate the elementary school teachers were significantly more satisfied with their career choice than were the IS professionals ($\underline{t}$

$= 3.596$, $\underline{df} = 223$, $\underline{p} < .003$).

**Table 3:  Job Satisfaction Levels Among**

**Information Systems Professionals and Elementary School Teachers**

| Level of Satisfaction | Information Systems Professionals | | Elementary School Teachers | |
|---|---|---|---|---|
| | N | % | N | % |
| Very dissatisfied | 9 | 8.4 | 3 | 2.6 |
| Somewhat dissatisfied | 4 | 3.7 | 1 | 0.8 |
| Somewhat satisfied | 20 | 18.7 | 9 | 7.7 |
| Satisfied | 38 | 35.5 | 48 | 41.0 |
| Very satisfied | 36 | 33.6 | 56 | 47.9 |
| Total | 107 | 100.0 | 117 | 100.0 |

# CONCLUSIONS AND DISCUSSION

Based upon the results of this study, both women in IT careers and women in a more traditional female occupation, elementary school teacher, were generally satisfied with their career choice, at least with this sample and population.  However, as hypothesized, the elementary school teachers were significantly more satisfied with their career choice than were the IS professionals surveyed in the study.  This finding would suggest that job satisfaction might play a role in the reluctance of women to enter the computing profession.  Obviously with all other variables remaining equal, one would assume that one would choose a profession that provides more satisfaction.   However, the IT professionals were not dissatisfied with their career choice, and of course, all other variables are not equal.  Other obvious variables when choosing a profession include salary and benefits, family, geography, working conditions, opportunity, prestige, self-efficacy, and task value among others.

This study must be considered to be preliminary at best in the search for reasons why women do not choose IT careers.  The population and sample were limited to a midwestern community of about 100,000 in population.  The women were chosen from

one corporation and one school district. The operationalization of the traditional female occupation was limited to elementary school teachers. Teachers may be an unusually satisfied group. In any case, additional research will be needed to conclusively argue generally that job satisfaction plays a major role in the lack of women in the computing professions.

The implications from this study may be applied both to the workforce as well as to the institutions of higher education. First, young women need to have a clearer vision of what the profession is and what incumbents do. Although it is not clear when people make decisions about careers, it is safe to assume that the earlier the exposure the better. By providing a clearer understanding of the nature of the work and its tasks, organizations will reduce if not not remove the effects of at least one variable that may reduce female entry into the field.

A second implication is providing information to the public that encourages young women to consider the field of computing. A number of organizations already do this by promoting role models such as Grace Hopper. Role models play an important role in providing the first stages of self-efficacy construction, especially with nontraditional jobs. By encouraging young women to consider the field of IT, both institutions of higher education and organizations that hire IT professionals will benefit from increased gender representation of workers, and that will increase diversity as well as provide more women with greater employment opportunities. Clearly if the U.S. is to keep up with the likely demand for IT workers over the next decade, we must find ways to encourage women to enter the occupation.

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