JOB CHARACTERISTICS AND QUALITY OF WORKING LIFE IN THE IT WORKFORCE: THE ROLE OF GENDER

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ABSTRACT

Women are largely underrepresented in the Information Technology (IT) workforce. Our research examines the factors related to the work environment that may contribute to the high turnover of women in the IT workforce. There is substantial research providing support for the relationship between job and organizational factors, on one hand, and quality of working life (QWL) (e.g., low job satisfaction and high job strain), on the other hand. In this paper, we conduct secondary data analysis of questionnaire survey collected from a sample of 1,278 employees of a single organization. We examine the impact of gender and job type (i.e. IT job versus non-IT job) on various indicators of quality of working life, as well as on the relationship between job and organizational factors (i.e. feedback, autonomy, skill variety, task significance, task identity and work pressure) and QWL. Results show that IT workers reported higher job satisfaction and lower job strain than non-IT workers. Gender had no impact on QWL. Feedback and autonomy were consistently related to job satisfaction, and work pressure was consistently related to job strain, irrespective of gender and type of job. On the other hand, women IT workers’ job satisfaction was affected by work pressure, and women IT workers’ job strain was affected by task significance. Women IT workers’ job strain was not affected by autonomy, whereas job strain experienced by non-IT workers was affected by autonomy.

CATEGORIES AND SUBJECT DESCRIPTORS

J.4 [Social and Behavioral Sciences]: Economics, Psychology
General Terms: Economics, Human Factors
Keywords: IT Workforce, Turnover, Job Characteristics, Quality of Working Life, Gender

1. INTRODUCTION

Our project on “Paths to Retention and Turnover in the IT Workforce: Understanding the Relationships Between Gender, Minority Status, Job and Organizational Factors” is funded by the NSF-ITWF program. The aim of this project is to examine the relationship between job and organizational factors, on one hand, and quality of working life (QWL) and turnover intention among IT workers on the other hand, and the role of gender and minority status in this relationship. The main data source for examining these research questions is a web-based survey of IT workers in selected companies. This data collection will take place during the year 2003. In this paper, we describe results of a secondary analysis of an existing database. This secondary analysis allowed us to examine the role of gender in the relationship between job and organizational factors, and QWL.

2. BACKGROUND

There is substantial evidence for a critical shortage of skilled IT workers in the United States (Freeman & Aspray, 1999; Information Technology Association of America (ITAA), 1998; Office of Technology Policy (OTP), 1997), and a large subset of this problem is the underrepresentation of women and minorities in the IT workforce. Underrepresentation may be caused by insufficient women and minorities entering the IT workforce as well as too many of them leaving the IT workforce. Female scientists and engineers in industry are more likely to leave their technical occupations and the workforce altogether than women in other fields. Attrition data on female scientists and engineers show that their exit rates are not only double those of men (25% versus 12%), but they are also much higher than those of women in other employment sectors (CAWMSSET, 2000). Some preliminary work has been done to identify the key barriers to the entrance and retention of women and underrepresented minorities in the IT workforce (CAWMSSET, 2000; Information Technology Association of America (ITAA), 2000). Barriers include lack of role models and mentors, exclusion from informal networks, stereotyping and discrimination, unequal pay scales and inadequate work/family balance (CAWMSSET, 2000; Information Technology Association of America (ITAA), 2000).

There is an exceptionally high degree of job turnover in the IT workforce (Igbaria & Siegel, 1992; Network, 2000). The recent “job churning” seems to be related to several factors associated...
with the digital revolution. Namely, information technologies have short life cycles, requiring continuous hiring of new workers with new skills, as opposed to the more time consuming approach of training current organizational employees (Network, 2000). The demand for MIS employees, for example, is extremely high and MIS professionals have historically displayed very high rates of turnover (Igbaria & Siegel, 1992). Determining the causes of turnover within the IT workforce and controlling it through human resource practices is imperative for organizations (Igbaria & Siegel, 1992).

Igbaria and Greenhaus (1992) tested a model of turnover intentions among 464 management information systems (MIS) employees using employee questionnaires. The model consisted of five sets of variables: 1) demographic variables; 2) role stressors; 3) career experiences; 4) work-related attitudes; and 5) turnover intentions. Results indicated that two work-related attitudes, job satisfaction and organizational commitment, had the strongest and most direct influence on turnover intentions, and the impact of other variables on turnover intentions was primarily mediated by these two variables. Education was the only demographic variable that had a direct effect on turnover intentions. Higher educated employees had higher turnover intentions and lower levels of job and career satisfaction. Employees with low salaries and those who perceived limited career advancement opportunities tended to hold stronger turnover intentions than those with higher salaries and more career advancement opportunities, through both direct and indirect effects. Role stressors had a positive, indirect effect on turnover intentions through low job and career satisfaction and organization commitment. Organizational commitment had a strong, negative effect on turnover intentions, but inconsistent with prior research, job satisfaction had stronger effects than organizational commitment on turnover intentions (Igbaria & Greenhaus, 1992). This study confirms that a range of job and organizational factors can influence attitudes which, in turn, can influence turnover intention.

Many factors influence an employee’s commitment to the organization and satisfaction with his or her job. One particular powerful factor that prior research has repeatedly shown to be significantly correlated to the job attitudes of interest (namely organizational commitment, job satisfaction and turnover intention) is work exhaustion, or job burnout (Moore & Burke, 2002; Moore, 2000). The research literature in IT and the popular press suggest that technology professionals are particularly vulnerable to work exhaustion and stress (Kalimo & Toppinen, 1995; McGee, 1996).

Our research examines the role of the work environment and how employers can better design the culture and environment of the IT workplace to accommodate the needs of underrepresented groups. An Information Week salary survey showed that IT workers ranked “challenge” of their job, “responsibility” and “job atmosphere” as more important than their base salary. QWL, job stability and learning opportunities through job assignments dominated the responses (Meares & Sargent, 1999). Job/organizational design has been suggested as an important solution component.

QWL has been defined by many researchers in a variety of ways, such as quality of work (Attewell & Rule, 1984) and employment quality (Kraut, Dumais, & Koch, 1989). Davis (1983) has defined QWL as “the quality of the relationship between employees and the total working environment, with human dimensions added to the usual technical and economic considerations” (p.80). Using this definition, we examine a range of indicators of QWL: job satisfaction, organizational commitment (i.e. organizational involvement and organizational identification) and job strain. The Sociotechnical Systems Theory (SST) (Trist, 1981), the Organizational Health Model (Sauter, Lim, & Murphy, 1996) and the Balance Theory (Smith & Carayon-Sainfort, 1989) provide theoretical perspectives for examining work systems. The SST emphasizes the interrelatedness of the social and technical systems within an organization and integrates job and organizational design perspectives, through linking the job design theories of human relations, job enrichment and participation. The Organizational Health Model asserts that organizational characteristics (e.g., management practices, organizational values) directly influence organizational health (i.e., performance outcomes and satisfaction outcomes) (Sauter et al., 1996). The Balance Theory is a theoretical framework that examines job and organizational design characteristics within each component of the work system that interact to influence the “stress load” upon an individual (Smith & Carayon-Sainfort, 1989). It identifies sources of occupational stress (stressors or psychosocial work factors) that can influence stress, attitudes and behaviors (e.g., turnover intention).

The organizational/job design and job stress literature highlights the importance of a variety of job and organizational factors as predictors of QWL and turnover (Carayon & Smith, 2000). Some of the most important job and organizational factors identified in this literature are: job demands, job control, job content, and feedback (Carayon & Smith, 2000; Cooper & Marshall, 1976; Karasek, 1979; Theorell & Karasek, 1996). In this study, we used the five job factors of the Job Characteristics Theory of Hackman and Oldham (1975) and a measure of work pressure to evaluate job/organizational design (see Figure 1).

### 3. RESEARCH QUESTIONS

In this paper, we explored the following research questions:

- **Do women in IT jobs report poorer quality of working life than men in IT jobs or women and men in non-IT jobs?**
- **Are there different job and organizational factors that predict QWL in women IT workers as compared to men IT workers and men and women in non-IT jobs?**

The first research question will examine the QWL experienced by women in IT jobs in a particular company to men in IT jobs in that same company, as well as men and women in non-IT jobs in that same company. The second research question will examine whether the relationship between job/organizational factors and QWL varies between men and women and IT and non-IT workers. One objective of our larger NSF project is to examine whether men and women in IT jobs ‘react’ differently to different job and organizational factors (Carayon, Haims, &Kraemer, 2001). The database available to us allows us to start exploring this research question. We will examine the relationship between, on one hand, job and organizational factors, and, on the other hand, quality of working life, and see whether gender and job type have an impact on that relationship. Figure 1 represents the conceptual framework tested in this study.
4. METHODOLOGY

In order to begin to identify the role of gender in job and organizational factors and QWL in the IT workforce, we decided to re-analyze data gathered in a survey conducted by the University of Wisconsin-Madison Center for Quality and Productivity Improvement (CQPI). This survey involved the collection of questionnaire data from a Midwestern state agency. Data was collected on a yearly basis in 1999, 2000 and 2001. In this paper, we report preliminary results of statistical analyses performed only on the 1999 data. The purpose of this study was to examine the impact of Total Quality Management (TQM) in a public sector organization (Hoonakker, McEniry, Carayon, Korunka, & Sainfort, 2000). Questionnaire survey data was collected at different stages of the TQM program implementation. The questionnaire was developed to collect data on employee perceptions of the TQM program, as well as data on job and organizational factors, and various indicators of QWL.

Because the database includes only a small number of minority employees, we focus this paper on the role of gender.

The participating organization is divided into several divisions. First, we needed to identify IT jobs within the different divisions. We used a list of IT job titles that was built specifically for our NSF-ITWF project. Our definition of the IT workforce is based on Freeman and Aspray (1999) that propose four distinct categories of IT work: conceptualizers, developers, modifiers/extenders and supporters/tenders. This definition was expanded to include new emerging high-end IT jobs, such as web designers and Internet solutions experts. Once the IT job titles were defined, we then classified the various respondents to the survey in two categories: (1) IT jobs, and (2) non-IT jobs. The non-IT jobs included a variety of jobs at different levels within the organization: clerical workers, technical jobs (e.g., auditing, claims processing), professional jobs (e.g., lawyers), supervisors and managers. Table 1 shows basic characteristics of the sample.

<table>
<thead>
<tr>
<th>Number of employees</th>
<th>Number of Respondents</th>
<th>Response rate</th>
<th>Women as percentage of total sample</th>
<th>Number of IT-workers</th>
<th>IT-workers as percentage of the total sample</th>
<th>Female IT-workers as percentage of the sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800</td>
<td>1278</td>
<td>70%</td>
<td>58%</td>
<td>191</td>
<td>15%</td>
<td>9%</td>
</tr>
</tbody>
</table>

We used the Hackman and Oldham’s well-known Job Diagnostic Survey to measure various job and organizational characteristics (Hackman & Oldham, 1975): feedback, autonomy, skill variety, task significance and task identity. Additionally, a short scale measuring work pressure was included (Caplan, Cobb, French, Harrison, & Pinneau, 1975). Four measures of QWL were available in the questionnaire: job satisfaction (Quinn et al., 1971), job strain (Reeder, Schrama, & Dirken, 1973), organizational identification (Cook & Wall, 1980), and organizational involvement (Cook & Wall, 1980).
Statistical analyses have been performed to examine the impact of gender and job type (IT versus non-IT job) on job and organizational factors, and QWL. In order to examine the first research question, we considered the various measures of QWL as dependent variables and the variables of gender and job type, and the interaction between gender and job type as independent variables. We would expect to find lower QWL among women IT workers as compared to men IT workers and men and women in non-IT jobs. The second research question relies on a series of regression analyses where the measures of QWL are dependent variables and the measures of job and organizational factors are independent variables. These regression analyses are performed for each of the following four categories: (1) women in IT jobs, (2) men in IT jobs, (3) women in non-IT jobs, and (4) men in non-IT jobs. These regression analyses shed light on whether different job and organizational factors influence QWL in women IT workers versus men IT workers or non-IT workers.

Table 2 – Relationship between job and organizational factors and job satisfaction (Beta-coefficients, R and R²)

<table>
<thead>
<tr>
<th></th>
<th>Female IT-workers (N=116)</th>
<th>Female non-IT workers (N=569)</th>
<th>Male IT-workers (N=74)</th>
<th>Male non-IT workers (N=426)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback</td>
<td>.358**</td>
<td>.391**</td>
<td>.506**</td>
<td>.248**</td>
</tr>
<tr>
<td>Autonomy</td>
<td>.185</td>
<td>.167**</td>
<td>.271*</td>
<td>.246**</td>
</tr>
<tr>
<td>Skill variety</td>
<td>-.032</td>
<td>.175**</td>
<td>-.133</td>
<td>.205**</td>
</tr>
<tr>
<td>Task significance</td>
<td>-.007</td>
<td>.011</td>
<td>.235*</td>
<td>.223**</td>
</tr>
<tr>
<td>Task identity</td>
<td>.185</td>
<td>-.010</td>
<td>.023</td>
<td>.066</td>
</tr>
<tr>
<td>Work pressure</td>
<td>-.245*</td>
<td>-.294**</td>
<td>-.174</td>
<td>-.206**</td>
</tr>
<tr>
<td>R</td>
<td>.580</td>
<td>.605</td>
<td>.711</td>
<td>.647</td>
</tr>
<tr>
<td>R²</td>
<td>.605</td>
<td>.366</td>
<td>.505</td>
<td>.419</td>
</tr>
</tbody>
</table>

* significant at 0.05 level, ** significant at 0.01 level

Across all four groups, the most consistent predictor of job satisfaction is feedback. Autonomy has also a strong relation with job satisfaction across all four groups, although the p-value of the beta-coefficient of autonomy is 0.075 in the regression analysis for women IT workers. Skill variety is a predictor of job satisfaction only for non-IT workers. Task significance has an impact on job satisfaction only for men. Work pressure has a negative impact on job satisfaction for non-IT workers, and female IT workers.

Table 3 – Relationship between job and organizational factors and job strain (Beta-coefficients, R and R²)

<table>
<thead>
<tr>
<th></th>
<th>Female IT-workers (N=116)</th>
<th>Female non-IT workers (N=569)</th>
<th>Male IT-workers (N=74)</th>
<th>Male non-IT workers (N=426)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback</td>
<td>-.146</td>
<td>-.127**</td>
<td>-.178</td>
<td>-.053</td>
</tr>
<tr>
<td>Autonomy</td>
<td>-.106</td>
<td>-.223**</td>
<td>-.210</td>
<td>-.126*</td>
</tr>
<tr>
<td>Skill variety</td>
<td>.142</td>
<td>-.080</td>
<td>.295*</td>
<td>.062</td>
</tr>
<tr>
<td>Task significance</td>
<td>.243**</td>
<td>.035</td>
<td>-.118</td>
<td>-.069</td>
</tr>
<tr>
<td>Task identity</td>
<td>.005</td>
<td>.087*</td>
<td>-.170</td>
<td>.006</td>
</tr>
<tr>
<td>Work pressure</td>
<td>.561**</td>
<td>.560**</td>
<td>.482**</td>
<td>.516**</td>
</tr>
<tr>
<td>R</td>
<td>.707</td>
<td>.656</td>
<td>.752</td>
<td>.547</td>
</tr>
<tr>
<td>R²</td>
<td>.500</td>
<td>.430</td>
<td>.565</td>
<td>.299</td>
</tr>
</tbody>
</table>

* significant at 0.05 level, ** significant at 0.01 level

Feedback and task identity are predictors of job strain for women non-IT workers only. Autonomy is a predictor of job strain for non-IT workers. High skill variety is related to high job satisfaction, but only for male IT workers.

Task significance is a predictor of job strain only for women IT workers. Work pressure is a consistent predictor of job strain for both women and men, and for both types of jobs.

5. RESULTS

There was no statistically significant effect of gender and job type on the measures of organizational involvement and organizational identification. Therefore, we decided to drop these two variables from subsequent statistical analyses. On the other hand, we found a strong effect of job type for job satisfaction and job strain. IT workers reported more job satisfaction and less job strain than non-IT workers. There was no effect of gender on job satisfaction and job strain, and there was no interaction effect of gender and job type on job satisfaction and job strain.

In order to examine our second research question, we conducted regression analyses with job and organizational characteristics (feedback, autonomy, skill variety, task significance, task identity and work pressure) as predictors and job satisfaction as a dependent variable for each of the 4 different categories (women IT workers, men IT workers, women non-IT workers, and men non-IT workers) (see Table 2). The same kind of analysis was conducted with job strain as a dependent variable (see Table 3).

6. DISCUSSION

Based on the literature, we expected that women in IT jobs would report poorer QWL than men in IT jobs, or men and women in non-IT jobs. However, our results show that job satisfaction among IT workers in this particular organization was higher than job satisfaction among non-IT workers. In addition, there is no impact of gender on job satisfaction. Similar results were obtained for job strain. Job strain for IT workers was lower than job strain among non-IT workers. There is no effect of gender on job strain.

Further analyses need to be performed in order to better understand the lack of difference between IT jobs and non-IT jobs in this particular sample of public sector employees. The non-IT jobs could be broken down in categories, such as clerical-
administrative jobs, non-IT professional jobs, and managerial jobs.

Our second research question relates to the possibility that different job and organizational factors predict QWL in women IT workers as compared to men IT workers and men and women in non-IT jobs. Our data shows that there are some job and organizational factors that influence job satisfaction and job strain irrespective of gender and type of job. For instance, feedback and autonomy are positively related to job satisfaction for both women and men and for both job types. High work pressure is consistently related to high job strain. On the other hand, the data shows that there are unique job and organizational characteristics that affect job satisfaction and job strain of women IT workers. Among IT workers, high work pressure is related to low job satisfaction for women, but not for men. On the other hand, women IT workers who report high levels of task significance also report high job strain. This relationship between task significance and job strain is unique to women IT workers.

One major limitation of the preliminary data analyses is the cross-sectional nature of the data. Therefore, further statistical analyses need to include the data collected in all three years of the study (1999, 2000 and 2001) in order to examine the longitudinal relationships between job characteristics and QWL. Another limitation of this study is that it was not designed to look into the relation between job characteristics, QWL and turnover. We used an existing database to perform secondary analyses in order to look at gender differences in precursors to QWL. Another study limitation included different sample sizes for the various groups. Last but not least, this study was conducted in an organization in the public sector. The dynamics of public sector organizations may be completely different from those in private industry. Our main NSF-ITWF study, which we will conduct this year, will take these limitations into account.

### 7. ACKNOWLEDGEMENTS

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### 8. REFERENCES


