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## **RETAINING TALENT: ASSESSING JOB SATISFACTION FACETS MOST SIGNIFICANTLY RELATED TO SOFTWARE DEVELOPER TURNOVER INTENTIONS**

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### **ABSTRACT**

Retaining information technology employees has been a problem in many organizations for decades. When key software developers quit, they depart with critical knowledge of business processes and systems that are essential for maintaining a competitive advantage. The primary aim of this study was to assess facets of job satisfaction that are most significantly correlated with software developer turnover intentions. Surveys were collected from a sample of software developers across the United States. Correlations were assessed through multiple linear regression and parametric measures of association. The results indicated a significant predicting relationship between the software developers' turnover intentions and nine facets of job satisfaction. Also found was a significant negative relationship between satisfaction with the nature of work and turnover intentions when controlling for the effects of the other independent variables. Implications of these findings are discussed along with recommendations for IT professionals and researchers.

**Keywords:** employee retention, job satisfaction, software developer, turnover intentions.

### **INTRODUCTION**

Information technology (IT) drives our 21<sup>st</sup> century digital economy. Companies rely on their IT talent to create new products and services, solve problems, and maintain a competitive advantage. Although tech-savvy employees are recognized as vital assets, many firms struggle to retain them.

IT employee retention has been a problem in many organizations for several decades. Employees possessing technological skills in high demand IT areas have shown more loyalty to their own careers and personal development than to their organizations [10]. According to Ramlall [30, p. 52], "In today's highly competitive labor

market, there is extensive evidence that organizations, regardless of size, technological advances, market focus and other factors, are facing retention challenges."

Witaker [39] estimated that up to 20% of IT workers turnover each year. Jiang and Klein [16] reported an information systems (IS) employee turnover rate of 25 to 35% in Fortune 500 firms. A survey of 1,000 full-time workers commissioned by the online recruitment firm Headhunter.net revealed that 78% of the respondents would take a new position if the right opportunity came along. Forty-eight percent of those employed were still actively looking for new jobs [27]. Sixty percent of the 462 IT workers recently surveyed by the Computing Technology Industry Association were searching for new jobs while employed. [20].

Employee turnover has been costly to organizations. Recruiting, selecting, and training expenses are obvious costs. Pekala [27] reported that firms in the U.S pay more than \$140 billion annually in recruiting, training, and administrative expenses to replace employees who leave. Holtom, Mitchell, and Lee [12] add to that list of variables ones not as obvious. These include: (a) diminished customer service ability, (b) the lack of continuity on key projects, and (c) the loss of future leadership talent. Messmer [21, p. 11] points out how it is far more expensive to replace valued employees than it is to just retain them. “When you factor in lost productivity, company knowledge, recruitment costs, the expense of finding, hiring, and training, a new staff member can easily add up to thousands, even tens of thousands of dollars.”

When key personnel leave an organization, they depart with critical knowledge of business processes and systems that are essential to maintaining a competitive advantage [26]. Former employees walk out the door with much more than when they arrived. Why? They leave with critical knowledge of who they know. According to Parise, Cross, and Davenport [25], this can significantly alter both internal and external organizational relationships.

When IS development teams lose assets before project completion, there is even more cause for concern. Not only does that loss of key IS personnel leave the project team inadequately staffed; it can leave the team with insufficient knowledge, greatly increasing the risk of project failure [17]. A potential major loss, considering the financial damage from failed IS projects in the United States, was estimated at \$100 billion annually [24].

But there is more than just the financial loss. Parker and Skitmore [26] found that turnover disrupts and negatively affects project team performance. So much so that it could negate an organization’s competitive advantage. Parker and Skitmore also found that project management turnover occurs predominately during the execution phase of the project life cycle. The main causes are related to career and personal development, and dissatisfaction with organizational culture and the project management role.

## PURPOSE OF THE STUDY

Given the critical role of IT job retention to organizational performance, the purpose of this study was to identify which facets of software developer job satisfaction are most significantly related to turnover intentions. To satisfy this objective, this investigation posed the following research question:

Which facets of job satisfaction, if any, have the greatest influence on turnover intentions among software developers – contingent rewards, promotion, supervision, pay, operating conditions, coworkers, benefits, communication, or the nature of work?

Westlund [38] conducted a study of 496 software developers across the United States to assess relationships among project leadership styles, software developer job satisfaction, and turnover intentions. The primary objective of the research was to determine whether satisfaction with supervision or overall job satisfaction was more significantly related to software developer turnover intentions. The result – overall job satisfaction had the greater influence. In fact, the investigation revealed a significant negative relationship between overall job satisfaction and turnover intentions when controlling for the effect of satisfaction with supervision. However, the negative relationship between satisfaction with supervision and turnover intentions was not found to be significant when controlling for the effect of overall job satisfaction.

The integrated process model of job turnover [15], Spector’s [34] nine facets of job satisfaction, and Westlund’s [38] findings provided the theoretical basis for this research. A fixed design was employed, requiring a substantial amount of pre-specification about what would be done and how it would be accomplished. The conceptual framework used in this study is illustrated in Figure 1. The independent job satisfaction variables were: (a) contingent rewards, (b) promotion, (c) supervision, (d) pay, (e) operating conditions, (f) coworkers, (g) benefits, and (h) communication, and (i) the nature of work. The dependent variable, turnover intentions, reflected combined scales of thoughts of quitting and intent to leave.

## EARLIER RETENTION/TURNOVER RESEARCH

Tietjen and Myers [37] argued that instilling satisfaction within workers is a crucial task of management since satisfaction creates confidence, loyalty, and ultimately improves quality in the output of the employed. Jiang and Klein [16] reported that IS professionals find more satisfaction with their career when supervisor support is prominent and an adequate range of opportunities that satisfy their career desires exist within the organization.

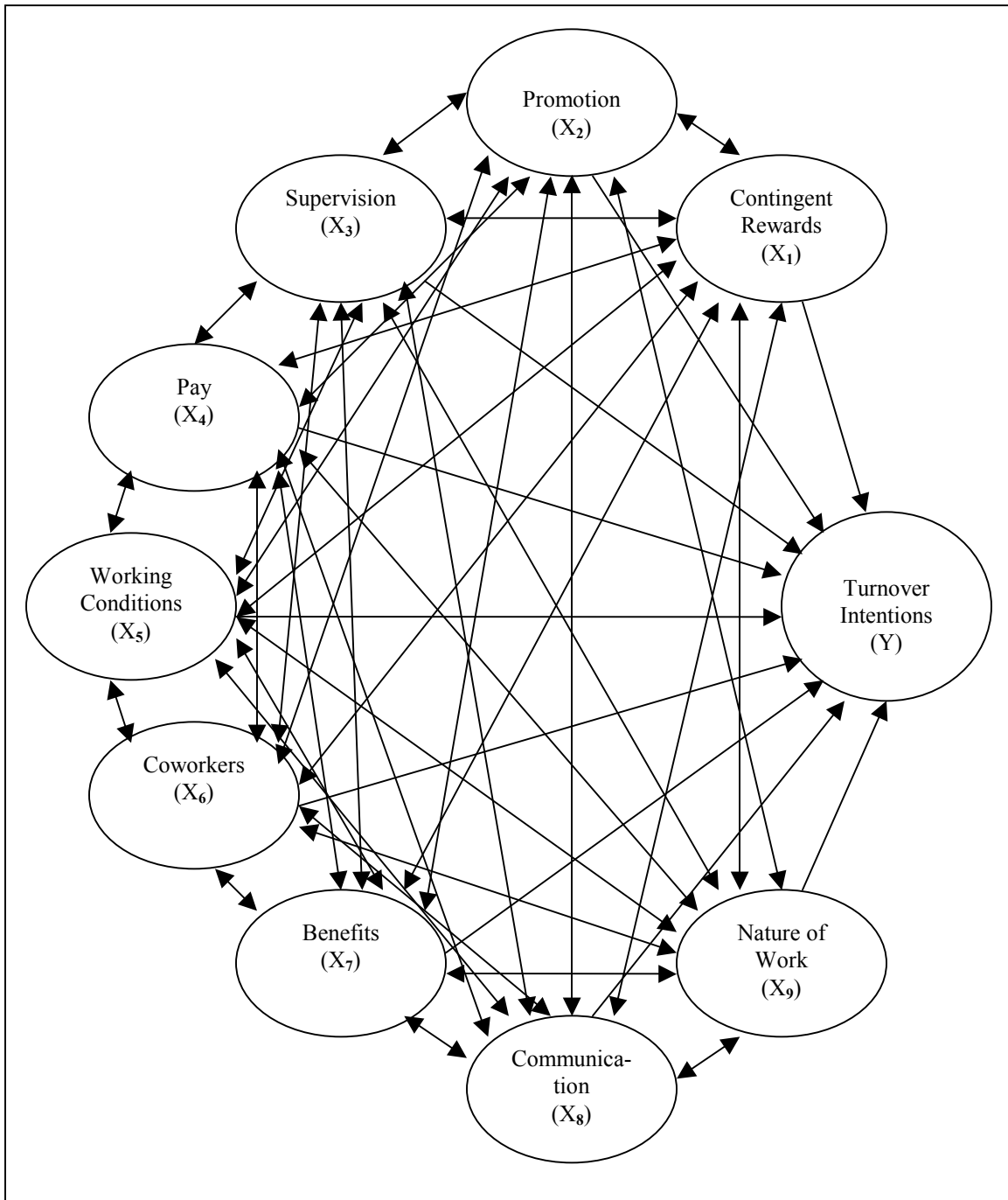


Figure 1: Conceptual Framework

Motivational theories related to job satisfaction and employee turnover include (a) equity theory, (b) ex-

pectancy theory, and (c) need theories. Equity theory is useful for predicting absence and turnover. Expectancy

theory has provided explanations of employee productivity, absenteeism, and turnover. The need theories related to job satisfaction include Alderfer's [2] existence, relatedness, and growth (ERG) theory, the two-factor theory [11], and Deci and Ryan's [6] self-determination theory (SDT).

## Job Satisfaction

Alderfer [2] identified three groups of core needs. He argued that people have the need for (a) existence, (b) relatedness, and (c) growth. The existence needs are concerned with providing the basic material requirements for life. The need for existence is similar to the physiological needs and several of the security needs in Maslow's [19] hierarchy. The relatedness needs are concerned with the desire to maintain important interpersonal relationships. The need for relatedness is comparable to the social needs and several of the security and esteem needs in Maslow's hierarchy. The growth needs satisfy the desire for personal development. These include Maslow's self-actualization needs and several esteem needs.

In contrast to Maslow's [19] hierarchy, Alderfer's [2] ERG theory does not follow a rigid progression of steps from one level to the next, recognizing that more than one need may be operative at the same time. According to the author, if gratification of a higher need is stifled, the desire to satisfy a lower need increases.

Herzberg, Mausner, and Snyderman [11] suggested that the opposite of satisfaction is no satisfaction, not dissatisfaction. Therefore, an individual's feelings of satisfaction are different than his or her feelings of dissatisfaction. In the two-factor theory, the authors proposed that intrinsic factors are related to job satisfaction and extrinsic factors are related to job dissatisfaction. Intrinsic factors include advancement, responsibility, achievement, and recognition. The Extrinsic factors are supervision, pay, company policies, relations to others, and working conditions.

Herzberg et al. [11] argued that the removal of extrinsic factors from a job does not guarantee that the job will be satisfying. Rather, people will not be dissatisfied when these external conditions, known as the hygiene factors, are adequate. To motivate workers, the authors suggested placing an emphasis on the job characteristics that people find intrinsically rewarding. These characteristics include promotions, personal growth, recognition, responsibility, and achievement.

SDT research also focused on intrinsic and extrinsic motivation. Ryan and Deci [32, p. 70] defined intrinsic motivation as "the inherent tendency to seek out novelty and challenges, to extend and exercise one's ca-

pacities, to explore, and to learn." A person is intrinsically motivated to do something because it is inherently interesting or enjoyable. The authors defined extrinsic motivation as the performance of an activity in order to attain a separable outcome. There are four classifications:

1. External regulation is the least autonomous and most controlled form of extrinsic motivation. An individual performs the behavior to satisfy an external demand or externally imposed contingent reward.
2. Introjected regulation is a controlled form of regulation. A person performs the action to avoid feelings of guilt or anxiety, or to maintain self-esteem and feelings of worth.
3. Regulation through identification is a more autonomous form of extrinsic motivation. An individual identifies with the personal importance of the behavior and accepts the regulation as his or her own.
4. Integrated regulation is the most autonomous form of extrinsic motivation. Actions become self-determined as the person internalizes the reasons for the action and assimilates them to the self.

Within SDT, there are three innate psychological needs that provide the basis for self-motivation and integration. These are the needs for: (a) competence, (b) relatedness, and (c) autonomy. According to Ryan and Deci [31], feelings of competence (self-efficacy) will not enhance intrinsic motivation unless they are accompanied by a sense of autonomy.

Much of the SDT research and some controversy have focused on the issue of autonomy versus control. Ryan and Deci [31] argued that contingent rewards, threats, deadlines, directives, and competitive pressures diminish intrinsic motivation since people experience these as controllers of their behavior. A meta-analysis by Deci, Ryan, and Keostner [7] confirmed that expected tangible rewards made contingent on task performance hinder and undermine intrinsic motivation.

The effects of stress and burnout have been linked to job dissatisfaction [34]. A study by Agarwal and Ferratt [1] identified employee stress as a barrier to successful IT human resource strategies. One source of stress was the sense of having an overwhelming amount of work to do. In companies where project management activities were performed well, the authors found a greater balance and sense of equity among the staff. In organizations where IS projects were funded at appropriate levels, the stress level within the IT workforce appeared less likely to lead to burnout.

## Turnover

Employee turnover affects organizations, the individuals who leave, and those who stay. Voluntary turnover can have positive and negative consequences for organizations and individuals. According to Mobley [23], the determinants of employee turnover can be simplified into four general classes:

1. The external economy, which affects the availability of alternative jobs.
2. Organizational factors, such as leadership, the reward system, and job design.
3. Individual non-work variables, like a spouse's career and family considerations.
4. Individual work-related variables, such as values, expectations, abilities, satisfaction, commitment, and intentions.

Researchers have developed a number of significant theoretical models to better understand employee turnover. These frameworks include the Price-Mueller model of voluntary turnover [29] and Jackofsky and Slocum's integrated process model [15]. Price primarily researched structural variables that refer to patterned social interaction. These variables are (a) autonomy, (b) distributive justice, (c) job stress, (d) pay, (e) promotional chances, (f) routinization, and (g) social support. According to the author, pay decreases turnover along with the following intervening variables: (a) job satisfaction, (b) organizational commitment, (c) search behavior, and (d) intent to stay. Autonomy and social support decrease turnover through their positive impact on job satisfaction. Job stress and routinization increase turnover through their negative impact on job satisfaction. Price identified three types of social support: (a) supervisory, (b) peer, and (c) kinship. Promotional chances and supervisory support decrease turnover indirectly through their positive impact on job satisfaction and organizational commitment.

The Price-Mueller model [29] is based on three assumptions. First, it is assumed that employees bring expectations to the workplace. If these are met, the employees should remain satisfied, committed, and employed. Second, it is assumed that there is an exchange of rewards between the employer and the employees, and the rewards are at the disposal of the employer. Third, it is assumed that the employees are motivated to achieve these rewards and avoid costs. Price's model is most applicable to full time employees who expect long-term relationships with their employers.

Jackofsky and Slocum's integrated process model [15] is based on the assumption that job performance is related to variables involved in the voluntary turnover process. The authors predicted that job performance

influences desirability of movement and ease of movement, which were two determinants of turnover originally proposed by March and Simon [18]. They operationalized these variables into job satisfaction and the expectation of finding alternatives.

Jackofsky and Slocum [15] theorized that job satisfaction and the expectation of finding alternatives were both linked to thoughts of quitting. This was based on March and Simon's [18] prediction that an increase in the desirability of movement stimulates the motivation to withdraw, and Jackofsky's [14] proposal that the motivation to quit may originate from either desirability or ease of movement. Their model showed a path of direct relationships between thoughts of quitting, intentions to quit, and job turnover.

Boswell, Boudreau, and Tichy [5] enhanced the traditional model of a simple sequence of declining job attitudes followed by job search and subsequent separation. The authors modeled within-individual job satisfaction as a function of job change patterns to determine if work attitudes change systematically within the temporal turnover process. Their findings supported a honeymoon-hangover effect suggested in the literature. Low job satisfaction was found to precede a voluntary job change, with an increase in job satisfaction immediately following a job change (the honeymoon effect) followed by a decline in job satisfaction (the hangover effect).

A number of scholars [4, 8, 36] have suggested that organizational commitment reduces employee turnover. Bentein, Vandenberghe, Vandenberg, and Stinglhamber [4] examined the role of commitment in the turnover process through the use of the Allen and Meyer framework of commitment [22]. The authors found that the steeper the decline in an individual's affective and normative commitments over time, the greater the rate of increase in that individual's intention to quit, and the greater the likelihood that the individual would actually leave the organization within the following nine months.

Thatcher, Stepina, and Boyle [36] tested a conceptual model that links perceptions of the internal work environment and external markets to IT worker turnover. Their model focused on organizational commitment as the primary predictor of turnover intention. The authors hypothesized that organizational commitment mediates the influence of (a) job satisfaction, (b) perceived job characteristics, (c) perceived competitiveness of pay, and (d) perceived job alternatives on turnover intention. Their results revealed that organizational commitment and perceived job alternatives distinctly affected turnover intentions. Organizational commitment was found to mediate the influence of job satisfaction, perceived job characteris-

tics, and perceived competitiveness of pay on turnover intention.

In a recent exploratory study, DelCampo [8, p. 465] sought to examine “how the strength of an organization’s culture influences, promotes, or impedes voluntary employee termination within firms.” DelCampo posited that voluntary turnover can be predicted through the identification of employee perceptions of pay, performance, withdrawal cognitions, and organizational commitment. Holtom et al. [12] presented a framework for aligning retention practices with organizational strategy and culture. The authors argued that job embeddedness is a stronger predictor of employee attendance, retention, and performance than job satisfaction and organizational commitment.

## STUDY METHODOLOGY

The purpose of this study was to not only advance our understanding of the relationships among the facets of software developer job satisfaction and turnover intentions, but to measure which job satisfaction facets are most significantly related to software developer turnover intentions. The study used a quantitative correlational design. Turnover intentions were measured as degrees of relationship to the following job satisfaction variables: (a) contingent rewards, (b) promotion, (c) supervision, (d) pay, (e) operating conditions, (f) coworkers, (g) benefits, (h) communication, and (i) the nature of work. Turnover intentions reflected combined scales of thoughts of quitting and intent to leave.

### Hypotheses

The following hypotheses were evaluated with a significance level of 0.05:

**H1<sub>0</sub>:** There is no significant correlation between turnover intentions and the nine facets of software developer job satisfaction.

**H2<sub>0</sub>:** There are no significant partial correlation coefficients among turnover intentions and the nine facets of software developer job satisfaction.

### Instrumentation

Two measurement instruments were employed, Spector’s [33] job satisfaction survey (JSS) and Jackofsky and Slocum’s [15] measure of turnover intentions. The JSS instrument was utilized to measure the seven facets of job satisfaction. Jackofsky and Slocum’s scales were employed to measure turnover intentions.

The JSS instrument was developed by Spector [33] to assess employee attitudes about the job and as-

pects of the job. The questionnaire contains 36 items and produces nine job satisfaction facet scales and a total score computed from all the items. Each JSS facet scale is measured by four items. The instrument uses a summated rating scale format. The six choices range from 1 (*strongly disagree*) to 6 (*strongly agree*) with items written in both directions, requiring about half of them to be reversed scored.

Spector [34] calculated reliability coefficients ( $\alpha$ ) from a sample of employees who completed the JSS with a sample size of  $N = 2,870$ . Coefficient alphas ranged from 0.60 on the coworkers subscale to 0.91 on the total scale. Test-retest reliability scores of the JSS have ranged from 0.37 to 0.74. Validity evidence for the JSS also has been provided by studies that compared different scales with one another on the same employees. According to Spector [34], these correlations ranged from 0.61 for coworkers to 0.80 for supervisors.

Jackofsky and Slocum [15] designed their scales to test their model of job turnover. The scales measure thoughts of quitting and intent to leave as indicators of turnover intentions. Each scale contains four items that are rated on a five-point Likert scale. Choices range from 1 (*strongly disagree*) to 5 (*strongly agree*).

Jackofsky and Slocum [15] reported reliability scores for the turnover intention scales and calculated a reliability score of  $\alpha = 0.83$  for the thoughts of quitting scale and a reliability score of  $\alpha = 0.73$  for the intent to leave scale. These scales exceed the minimum standard (0.70). In testing the hypothesized linkages in their path model using ordinary least squares (OLS) regression, they found a correlation of 0.61 between the thoughts of quitting and intent to leave scales.

A questionnaire developed by Westlund [38] was used to collect participant demographic data, but was not included in responding to the primary research questions or hypotheses. The Multifactor Leadership Questionnaire (MLQ) 5X rater form [3] also was administered but not used as part of this study.

### Data Collection and Sample

Participating organizations had the option of responding via a paper-and-pencil or an on-line survey. Respondents filling out paper-and-pencil forms received a packet that contained a cover letter, instructions, questionnaires, and a return envelope addressed to the researchers. Those completing on-line surveys received an e-mail invitation with a link to [surveymonkey.com](http://surveymonkey.com), a secure commercial survey web site. The cover letter and the e-mail invitation notified the participants about the purpose of the study and assured them that their participation

was completely voluntary and anonymous, and responses were confidential.

The study's participants were software developers from 24 organizations representing higher education, consulting, defense contracting, and local government. This study included six demographic data elements. These were (a) gender, (b) age, (c) years of experience in IT, (d) education, (e) hours worked per week, and (f) primary project role. Demographic statistics from the 128 usable surveys revealed that the sample's population consisted of IS developers functioning primarily as analysts, programmers, and data specialists. The percentages of females, older workers, and employees with advanced degrees are higher in the sample's population compared to the U.S. IT workforce composition statistics. The hours worked per week by the sample population are typical for the IT profession.

## Descriptive Statistics

The descriptive statistics for the variables used to test the hypothesis are presented in Table 1. Four of the 128 cases were excluded from the analysis because they were missing values for some of the variables. Scores for satisfaction with pay, promotion, supervision, benefits, rewards, and the nature of work ranged from 1.0 to 6.0 on a 6-point Likert scale. Working conditions and communication variables values spanned from 1.250 to 6.0. The scores for coworkers were between 1.333 and 6.0, inclusive. Turnover intention scores ranged from 1.0 to 5.0 on a 5-point Likert scale. Promotion had the lowest mean score, with a value of 2.951. The standard deviation for this variable was 1.263. The supervision variable had the highest mean score, with a value of 4.827. Supervision scores were skewed toward higher values with a standard deviation of 1.214. The turnover intentions variable had a mean score of 2.348 and a standard deviation of 0.951.

Table 1: Descriptive Statistics

Variable	<i>N</i>	Minimum	Maximum	<i>M</i>	<i>SD</i>	Variance
Pay	124	1.000	6.000	3.629	1.303	1.678
Promotion	124	1.000	6.000	2.951	1.263	1.597
Supervision	124	1.000	6.000	4.827	1.214	1.466
Benefits	124	1.000	6.000	4.323	1.123	1.320
Contingent Rewards	124	1.000	6.000	3.850	1.259	1.605
Working Conditions	124	1.250	6.000	3.718	.978	.974
Coworkers	124	1.333	6.000	4.641	.958	.901
Nature of Work	124	1.000	6.000	4.769	.993	1.015
Communication	124	1.250	6.000	3.722	1.128	1.286
Turnover Intentions	124	1.000	5.000	2.348	.951	.898

Pearson correlation coefficients for all of the variables in this study are presented in Table 2. The strongest correlations are between the variables of contingent rewards and communications (.725), contingent rewards and pay (.717), and contingent rewards and supervision (.704). The weakest correlations are between the variables of benefits and supervision (.147), benefits and coworkers (.185), and the nature of work and pay (.194).

## Testing Linear Regression Assumptions

Plots of variables and linear regression residuals were used to test assumptions of: (a) linear relationships,

(b) equal variances, (c) normality, and (d) independent observations. The assumption of linear relationships was tested by generating scatterplots from dependent and independent variables, residuals and independent variables, and studentized residuals and predicted values. The Durbin-Watson statistic and a scatterplot of studentized residuals against predicted values were used to test the assumption of equal variances. Histograms and Q-Q plots of the studentized residuals were used in normality tests. An examination of unusual observations revealed mistakes in data entry and scoring that were corrected.

Table 2: Pearson Correlation Matrix

Var.		Pay	Promotion	Supervision	Benefits	Cont. Rewards	Work Cond.	Co-workers	Nature of Work	Comm.	Turn-over Int.
Pay	<i>r</i>	1	.670	.549	.352	.717	.345	.401	.194	.604	-.486
	Sig.		.000	.000	.000	.000	.000	.000	.031	.000	.000
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Promotion	<i>r</i>	.670	1	.610	.212	.664	.313	.273	.239	.603	-.463
	Sig.	.000		.000	.018	.000	.000	.000	.008	.000	.000
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Supervision	<i>r</i>	.549	.610	1	.147	.704	.219	.372	.297	.615	-.512
	Sig.	.000	.000		.103	.000	.015	.000	.001	.000	.000
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Benefits	<i>r</i>	.352	.212	.147	1	.355	.211	.185	.229	.305	-.231
	Sig.	.000	.018	.103		.000	.018	.040	.011	.001	.010
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Cont. Rewards	<i>r</i>	.717	.664	.704	.355	1	.460	.456	.355	.725	-.529
	Sig.	.000	.000	.000	.000		.000	.000	.000	.000	.000
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Work Cond.	<i>r</i>	.345	.313	.219	.211	.460	1	.411	.241	.462	-.265
	Sig.	.000	.000	.015	.018	.000		.000	.007	.000	.003
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Co-workers	<i>r</i>	.401	.273	.372	.185	.456	.411	1	.478	.544	-.311
	Sig.	.000	.002	.000	.040	.000	.000		.000	.000	.000
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Nature of Work	<i>r</i>	.194	.239	.297	.229	.355	.241	.478	1	.385	-.375
	Sig.	.031	.008	.001	.011	.000	.007	.000		.000	.000
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Comm.	<i>r</i>	.604	.603	.615	.305	.725	.462	.544	.385	1	-.526
	Sig.	.000	.000	.000	.000	.000	.000	.000	.000		.000
	<i>N</i>	124	124	124	124	124	124	124	124	124	124
Turn-over Int.	<i>r</i>	-.486	-.463	-.512	-.231	-.529	-.265	-.311	-.375	-.526	1
	Sig.	.000	.000	.000	.010	.000	.003	.000	.000	.000	
	<i>N</i>	124	124	124	124	124	124	124	124	124	124

A scatterplot of the regression studentized deleted residual against the predicted value is shown in Figure 2. The plot reveals points that are scattered more or less randomly about the center line, indicating the assumptions of linearity and equal variances were met. The Durbin-Watson statistic was 1.975. A value close to 2 indicates that adjacent residuals are not correlated with each other, and that the data meets the assumption of in-

dependent observations. The studentized deleted residual, illustrated in histogram form in Figure 3, reveals a fairly normal distribution. A Q-Q plot of the studentized deleted residual is presented in Figure 4. This plot shows a normal distribution containing points more or less on a straight line with an observation on the high end. The histogram and Q-Q plot indicate that the data meet the assumption of normality.



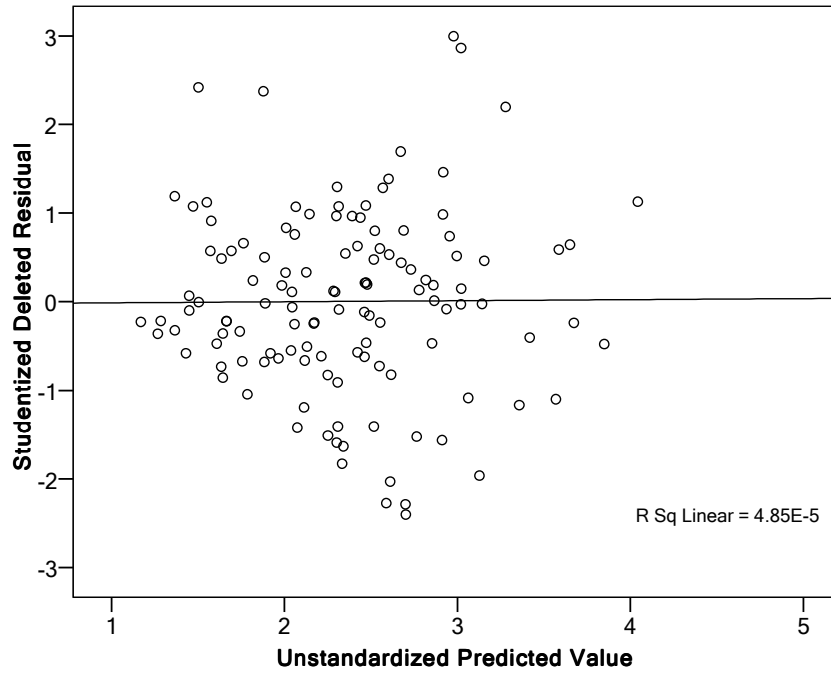


Figure 2: Scatterplot of the Studentized Deleted Residual and Unstandardized Predicted Value

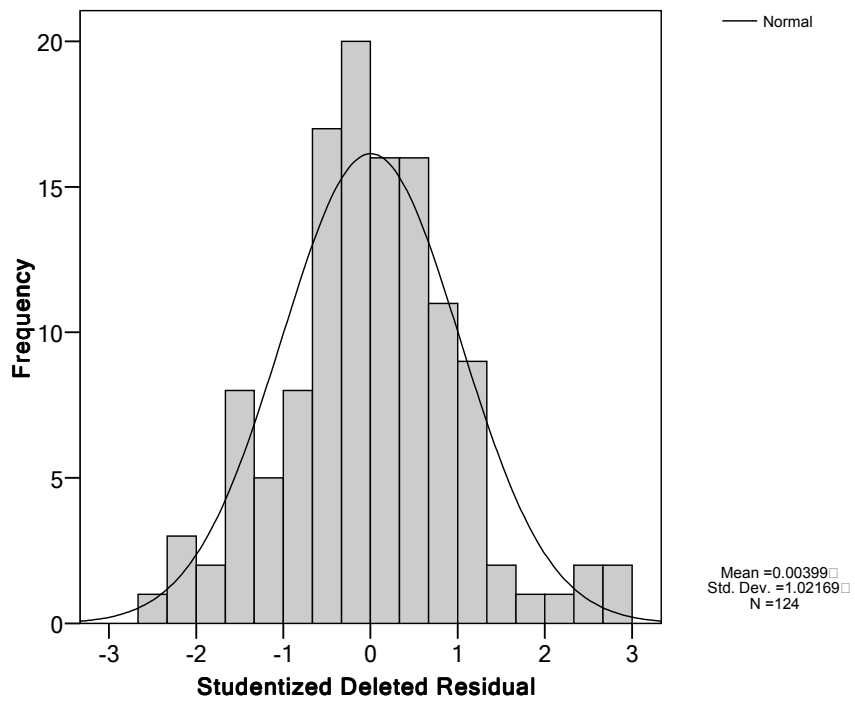


Figure 3: Histogram of the Studentized Deleted Residual

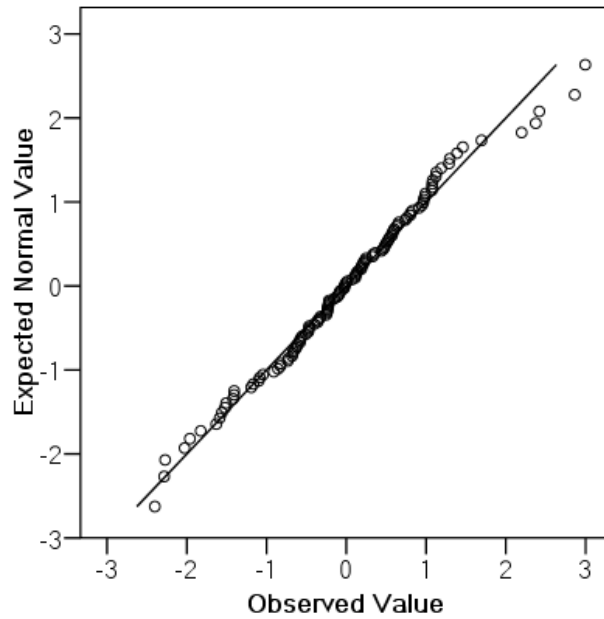


Figure 4: Q-Q Plot of Studentized Deleted Residual

## FINDINGS

The hypotheses were tested using multiple linear regression. All nine independent job satisfaction variables were included in the model for predicting the dependent variable of turnover intentions. The results provided support for the hypotheses with a 95% confidence level and 7.63% confidence interval

### Hypothesis 1

**H1<sub>0</sub>:** There is no significant correlation between turnover intentions and the nine facets of software developer job satisfaction.

The 0.000 significance level of the regression model was less than the significance for the test (0.05).

Therefore, the null hypothesis was rejected. Found was a significant predicting relationship between the software developers' turnover intentions and their satisfaction with: (a) contingent rewards, (b) promotion, (c) supervision, (d) pay, (e) operating conditions, (f) coworkers, (g) benefits, (h) communication, and (i) the nature of work.

A summary of the linear regression model is presented in Table 3. It includes the correlation coefficient (*R*), the coefficient of determination (*R* square), and the Durbin-Watson statistic. The coefficient of determination = 0.395, indicating that 39.5% of turnover intentions can be attributed to the variables in the model.

Table 3: Linear Regression Model Summary

Model	<i>R</i>	<i>R</i> Square	Adjusted <i>R</i> Square	SE of Estimate	<i>F</i>	Sig.	Durbin Watson
1	.629	.395	.347	.767933689	8.275	0.000	1.975

The partial correlation coefficients are presented in Table 4. The results indicate that software developer turnover intentions can be estimated by the following mul-

multiple regression equation: turnover intentions = 5.144 – 0.138 \* satisfaction with pay – 0.027 \* satisfaction with promotion – 0.164 \* satisfaction with supervision – 0.017

\* satisfaction with benefits – 0.024 \* satisfaction with rewards – 0.019 \* satisfaction with working conditions + 0.081 \* satisfaction with coworkers – 0.206 \* satisfaction

with the nature of work – 0.154 \* satisfaction with communication.

Table 4: Linear Regression Partial Correlation Coefficients

Model	Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig
		B	Std. Error	Beta		
1	(Constant)	5.144	.499		10.039	.000
	Pay	-.138	.086	-.189	-1.605	.111
	Promotion	-.027	.084	-.036	-.325	.746
	Supervision	-.164	.088	-.210	-1.865	.065
	Benefits	-.017	.069	-.021	-.254	.800
	Rewards	-.024	.108	-.032	-.226	.822
	Conditions	-.019	.086	-.020	-.225	.822
	Coworkers	.081	.097	.082	.842	.401
	Nature of Work	-.206	.083	-.215	-2.475	.015
	Communication	-.154	.102	-.183	-1.517	.132

**Hypothesis 2**

**H2<sub>0</sub>:** There are no significant partial correlation coefficients among turnover intentions and the nine facets of software developer job satisfaction.

The 0.015 significance level of the partial correlation coefficient between turnover intentions and satisfaction with the nature of work was less than the significance for the test (0.05). Therefore, the null hypothesis was rejected. Satisfaction with the nature of work was found to be significantly related to the dependent variable, turnover intentions, when controlling for the effects of the other independent variables.

**Secondary Findings**

The Pearson correlation coefficients shown in Table 2 reveal significant negative bivariate correlations between the dependent variable and each of the nine job satisfaction independent variables. The strongest correlations are between turnover intentions and satisfaction with contingent rewards ( $r(124) = -0.529, p < 0.01$ ), satisfaction with communication ( $r(124) = -0.526, p < 0.01$ ), and satisfaction with supervision ( $r(124) = -0.512, p < 0.01$ ). The weakest correlations are between turnover intentions and satisfaction with benefits ( $r(124) = -0.231, p < 0.05$ ), and satisfaction with working conditions ( $r(124) = -0.265, p < 0.01$ ).

**DISCUSSION**

**Job Satisfaction and Turnover Intentions**

The finding of a significant predictive relationship between the software developers’ nine facets of job satisfaction and their turnover intentions is consistent with other theoretical models [5, 15, 18, 29] that related job satisfaction to employee turnover. Price correlated job satisfaction positively with (a) autonomy, (b) distributive justice, (c) pay, (d) promotional chances, and (e) social support. He also related job satisfaction to lower job stress and routinization.

Pay is likely to be an issue in non-for-profit organizations that have difficulty offering salaries that are competitive with the business sector. Promotional chances tend to be limited in small IT departments. Management may prefer to hire new talent from outside the firm rather than promoting from within.

Individuals must experience satisfaction of the needs for both competence and autonomy if intrinsic motivation is to be enhanced or maintained [32]. However, the level of autonomy may be influenced by the organizational structure and culture.

Project managers exhibiting contingent reward behavior acknowledge a job well done. They may offer bonuses or pay increases in exchange for implementing a quality system on time and within budget. Reprimands

may be handed out for failure to meet performance goals. For this style of leadership to be effective, subordinates must perceive that recognition, rewards, reprimands, and punishments are delivered consistently and fairly.

### Nature of Work and Turnover Intentions

The finding of a significant negative relationship between satisfaction with the nature of work and turnover intentions when controlling for the effects of the other job satisfaction variables is consistent with theories of job satisfaction and turnover. Herzberg et al. [11] posited that job satisfaction is related to intrinsic factors while job dissatisfaction comes from extrinsic conditions, the hygiene factors. The intrinsic job satisfaction scales used in this study are (a) contingent rewards, (b) promotion, and (c) nature of work. The extrinsic facets of job dissatisfaction are (a) supervision, (b) pay, (c) operating conditions, (d) coworkers, (e) benefits, and (f) communication. Hygiene factors, such as satisfaction with supervision, are not enough to make a job satisfying. Intrinsic factors, such as the nature of work, have the greater influence.

Alderfer [2] suggested that people have the need for existence, relatedness, and growth. Pay, benefits, and operating conditions satisfy the need for existence. Supervision, coworkers, and communication fulfill the need for relatedness. Growth is related to the intrinsic factors of advancement, responsibility, achievement, and recognition. Managers can facilitate employees' growth needs through contingent rewards, opportunities for promotion, and the nature of work assigned. Supervisors can help satisfy subordinates' needs for relatedness by working collectively with them to solve problems. Team members also fulfill this need by discussing technical and functional issues with coworkers. Their need for growth can be met through progressively challenging assignments, opportunities to learn new technologies, and recognition of achievement from management and peers.

Ryan and Deci [31, p. 71] suggested that social environments can facilitate intrinsic motivation by supporting versus thwarting people's innate psychological needs for: (a) autonomy, (b) competence, and (c) relatedness. According to the authors, "It is critical to remember, however, that people will be intrinsically motivated only for activities that hold intrinsic interest for them, activities that have the appeal of novelty, challenge, or aesthetic value."

The reality of software development is that team members are called upon to perform tasks that lack intrinsic value. Projects face deadlines and resource constraints. A charismatic project manager exhibiting inspirational motivation and idealized influence leadership styles moti-

vates subordinates by facilitating regulation through identification and self-determination. Team members who identify with the importance of the mission align their own goals and objectives with those of the project manager, the team, and the organization. The project manager may choose to extrinsically motivate team members through externally-imposed rewards and punishments that are contingent on meeting performance goals and expectations. Westlund [38] found that software developers were more satisfied with supervisors who exhibited charismatic and contingent reward leadership styles than those who adopted management-by-exception or laissez-faire approaches.

### Limitations

The survey instruments quantitatively measured self-reported turnover intentions and facets of job satisfaction. Therefore, some degree of subjectiveness was inherent in the data collected. Influences unknown to us may have caused variances in the survey population to skew the results. Respondents were assured that their participation would be anonymous and their responses would be confidential. However, it is possible that the scores could have been skewed if the participants perceived their responses might be intercepted or reported back to management.

Job satisfaction measurements were limited to the nine facets proposed by Spector [33]. The measurements of turnover intentions were restricted to the thoughts of quitting and intent to leave scales proposed by Jackofsky and Slocum [15]. The quantitative correlational research design did not attempt to show causation.

We did not incorporate March and Simon's [18] perceived desirability of movement and perceived ease of movement variables into the conceptual framework used in this study. These factors also may have influenced the participants' turnover intentions.

The sample's population included software developers employed in institutions of higher education, local government, and consulting firms. Therefore, the results may not apply to IT professionals working in other sectors. The survey population was skewed slightly towards females, older workers, and employees with advanced degrees, which may affect the generalizability of the findings.

Price [28] and Mobley [23] acknowledged that older workers tend to have lower rates of turnover than younger employees. According to the authors, there is weak evidence to support the generalization that better educated workers have higher rates of turnover than less educated employees. However, the results of earlier stud-

ies investigating the correlation between gender and turnover were inconclusive.

## RECOMMENDATIONS

### Areas of Future Research

This research involved software developers working in higher education, local government, and consulting firms. There is an opportunity to replicate this study in other business sectors and organizational types. Scholars may wish to expand this research to other types of knowledge workers, such as engineers and architects. There also is an opportunity to investigate possible gender differences in software developer job satisfaction and turnover intentions.

Five of the nine facets of job satisfaction did not contribute to the regression model used in the analysis. Further research is needed to develop a simplified model that would exclude irrelevant variables from the prediction.

The JSS instrument [35] used in this study was originally developed for use in human service organizations, although it is applicable to all types of organizations. Future research could explore job satisfaction facets critical to software developers and tailor an instrument specifically for these professionals. A mixed methodology involving focus groups and survey research could be employed for this purpose.

This study did not consider the interactions of job embeddedness and ease of movement. Holtom et al. [12] recently suggested that job embeddedness is a stronger predictor of retention than job satisfaction and organizational commitment. Results of a recent survey by Hwang and Kuo [13] of executives and staff employed in the Taiwan government suggest that job satisfaction may not be significantly related to turnover when controlling for the effect of perceived alternative employment opportunities. More research is needed to assess the interactions of job embeddedness, ease of movement, and job satisfaction on the turnover intentions of software developers.

### Recommendations for IT Professionals

To increase retention, we recommend that IT managers take action to design jobs that top performing software developers will find satisfying. Job designers should pay particular attention to the nature of the work that these employees are called to perform. To this end, we encourage IT leaders to benchmark their software development practices against organizations such as Google, a widely-recognized industry leader in innovation. Ac-

ording to the company's web site [9], its mission is to organize the world's information and make it universally accessible and useful. The management team at Google recognized that exceptional thinking and technical expertise are required to accomplish this goal. It has facilitated a motivated and inspired workforce through the following practices:

1. Engineers work in small teams to promote spontaneity, creativity, and speed.
2. Management listens to every idea on the theory that any engineer can come up with the next great one.
3. Leadership provides the resources needed to turn great ideas into reality.
4. Engineers are offered 20% time to work on whatever they feel passionate about. Google News, Google Suggest, AdSense for Content, and Orkut are among the many products that have emerged from this practice.

## CONCLUSIONS

Tech-savvy IT workers are a vital resource in our 21<sup>st</sup> century digital economy. Firms can better leverage their IT talent by developing cultures that foster creativity, empowerment, motivation, and organizational commitment.

Westlund [38] reported that IS project managers who exhibited both charismatic and contingent reward leadership styles had more satisfied subordinates with lower turnover intentions. Westlund also found that overall job satisfaction was more significantly related to software developer turnover intentions than satisfaction with supervision. The results of this study furthered that research by showing that satisfaction with the nature of work had the greatest influence on turnover intentions among these software developers.

It is important to recognize that turnover can have positive outcomes. Mobley [23] noted that it can displace poor performers, infuse new knowledge and technology through the replacements, and stimulate changes in policy and practice. Without turnover, organizations can become stagnate and lose their competitive advantage.

Jackofsky and Slocum [15] concluded that the worst and the best performers are the ones most likely to voluntarily leave the organization. Most IS project teams cannot afford to lose their top performers, especially during the development life cycle. We suggest that this attrition can be reduced by designing jobs that software developers will find intrinsically rewarding and satisfying. This can be accomplished, in part, through progressively-

challenging assignments, opportunities to learn new technologies, and the recognition of achievement from management and peers.

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