

Turnover on Information Security Professionals: Findings from Korea

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Abstract: As the information security industry has developed and its proportion in the national economy has increased, the demand for the information security manpower also has expanded. With the frequent turnover of information security professionals within the industry and between other industries, it is essential to investigate the causes of turnover for efficient human resource management and for the sustainable growth of the industry.

This study aims to analyze the factors affecting the turnover intention of information security professionals. We reviewed related research to select the turnover causes that affect the turnover intention and tested the differences in these turnover causes among turnover paths. Human resource managers can use the results of this study to maximize the performance of their organization through reasonable turnover management of information security professionals.

Keywords: Information Security Professionals, Job Satisfaction, Turnover Paths, Turnover Causes

I. Introduction

The primary goal of an organization is to obtain a competitive advantage which enables them to maximize the organization's outcome through managing consistent development and setting up an efficient strategy. Recently, in keeping with the transition to an information-oriented society, the business environment has changed dramatically. Hence, it has become very difficult to make accurate estimates about factors that can seriously affect the outcome of any specific organization. To increase an organization's outcome, it is essential to manage the manpower which should adapt to the new surroundings of IT systems as well as enterprise culture, organizational structure and business process.

In the IT industry, efforts have been made to increase outcomes and create value in organizations from the point of view of the organization. In particular, turnover causes and turnover intentions have been studied extensively in organizational behavior research in the IT industry owing to the frequent movement of manpower within this industry. Some of these factors have been used to explain turnover among information technology workers. Frequent internal moves can arouse negative effects including the following: the loss of competent workers, consumption of additional expenses from reinforcements, and de-motivation of existing workers.

In Korea, as the information security industry has recently grown and developed to a great extent, demand for additional workforces increases every year, with turnover taking place more frequently. However, most studies of information security manpower have been conducted with reference to quantitative analysis that seek to find a gap between supply and demand and/or that seek to measure the demand for workforce. One study reported that 41,380 professionals were working as of December of 2008, while 5,927 professionals had resigned in 2008. More than half of the professionals resigned to move to other fields; hence, the outflow of manpower was considerable. Within the industry, the demand for experienced workers is increasing but feasible progress in hiring new personnel does not come easily. In contrast to quantitative reviews, few studies have focused on finding and explaining the turnover factors and paths. The present study focused on turnover intention and turnover causes by surveying security professionals. In this study, the differences between turnover paths are specified. In doing this, the factors of job satisfaction and dissatisfaction were selected from literatures sources.

The results of this study can offer insights into which professionals are likely to leave and help managers identify employees who are more at risk of leaving. Accordingly, it is possible to formulate appropriate strategies to retain them insofar as they are valued employees.

II. Literature Review

Many studies have been advanced to explain why employees voluntarily leave their organizations. These include mainly theories of turnover intention, which is a concept of a met inducement defined as a desire to move from an organization. Most studies selected some factors of turnover causes and analyzed their correlations. There were two main factors: (1) job satisfaction and (2) job stress. Specifically, these two factors are managed in other industries owing to their influence on an organization's outcome.

Several studies of turnover causes that have been classified into the two factors of job satisfaction and job stress are analyzed here to determine the representative factors of turnover causes.

2.1 Job Stress

Job stress is the concept of a positive effect of turnover intention that will make a professional leave an organization. Yang and Kwon (2005) defined job stress as a negative factor that has a bad effect on organizational involvement

and job satisfaction. They analyzed the factors of job stress based on the control effect of the employment mode. For the factors of job stress, they included role conflict, leadership style, task characteristics, participation in decision-making activities, and role ambiguity. Lee (2008) studied the impact of job stress on turnover intention, focusing on the moderating role of transformational leadership. Transformational leadership is suggested to reduce the negative results brought on by job stress. Job stress factors are the difficulties of completing a task, responsibility, and uncertainty regarding work. Song et al. (1988) researched the correlation between job stress and job satisfaction and then surveyed office workers and production workers. They classified job stress into four categories: environment factors, organizational factors, non-organizational factors, and job related factors. Cheon et al. (2006) insisted that job stress has a negative effect on relationships and therefore hinders job satisfaction and organizational involvement. The factors they proposed are role ambiguity and role conflict. Tak (2002) specified the comparisons between job stressors and job stress among white collar workers, blue collar workers, and professional research workers. He investigated job stress variables, role ambiguity, role conflicts, environmentally related problems, participation in decision-making activities, promotion problems, and work-family conflicts.

2.2 Job Satisfaction

Job satisfaction is comprised of cognitive and affective reactions to an employee's assessment of the amount of overlap between his expectations and actual returns received from his current employment. Accordingly, job satisfaction has a negative effect on turnover intention.

Lee and Kim (2006) examined the relationship between job satisfaction and turnover intention according to the employment type in Korea. They found that job satisfaction factors are pay, promotions, supervision, and coworkers. Suh (1999) investigated the direct effect of a supervisor's support on job satisfaction, job involvement, organizational citizenship behavior and mediating job satisfaction. To do this, he conducted a survey of travel agencies. Choi (2004) analyzed the effects of such factors as organization and job characteristics and inter-personal environmental characteristics on job satisfaction through the parameter of perceiving activity level. Data were collected from employees at financial institutions and the factors influencing job satisfaction were analyzed for both males and females. Carmeli and Weisberg (2006) examined the effect of affective commitment, job satisfaction and job performance on turnover intention across three professional groups of employees and managers, financial officers and social workers employed in the public sector as well as lawyers employed in the private sector. Chapman et al. (2009) meta-analyzed coefficients from studies examining the relationship between various predictors with job-organization attraction, job pursuit intentions, acceptance intentions, and job choice. The factors asked about when

recruiting for a job were found to be compensation, advancement, pay, type of work, work environment, location, and organizational familiarity. Ferratt et al. (2005) formalized hypotheses regarding the relationship between turnover with configurations of IT HRM (Human Resource Management) practices grounded in configurational theory and empirical research. To examine the organizational practices related to the management of IT human capital, they suggested factors of management, including the work environment, compensation, development opportunities, and level of job security. Joseph et al. (2007) combined a narrative review with meta-analytic techniques to yield important insights about existing research on the turnover of information technology professionals. Building on the findings from their review, they proposed a new theoretical model of IT turnover that presents propositions for future research to address existing gaps in IT literature. As positive factors of turnover causes, job-related factors and perceived organizational factors were included. Lee (2000) proposed a model assuming that information technology professionals work in a dynamic environment. Given this environment, individual growth needs play a significant role in influencing turnover intention. Summer and Niederman (2003) addressed the impact of gender differences upon the career experiences of information systems professionals, including the impact of gender differences on job satisfaction, job tasks, turnover behavior, job activities, and job transitions.

In summary, most turnover studies are mainly related to the factors of compensation, relationships, the work environment, and the actual work that the organization does. In this research, turnover causes which have a direct influence on turnover intention are classified into three categories: compensation-related factors, environmental factors, and work-related factors. These three factors include major ten turnover causes, as shown in Table 1.

Table 1. Turnover causes of professionals

Factors	Turnover causes
compensation-related	wage
	compensation
	promotion
environment-related	training opportunity
	physical environment
work-related	relationship problem
	dissatisfaction with leadership
	overwork
	role ambiguity
	role conflict

III. Research Hypothesis

Table 2 presents five turnover paths that are used here to analyze the perception gap in the turnover causes between each path.

Table 2. Turnover paths

Turnover paths
① no experience
② changing the job skill from an organization in the information security industry
③ changing the job skill within an organization in the information security industry
④ changing the job skill from an organization in other industries
⑤ changing the job skill within an organization in other industries
⑥ leaving an organization without changing the job skill

Turnover paths are classified according to previous turnover experience of leaving organizations, and/or that of a change of a job. In the case of a changing of a job, turnover paths are divided in two according to the relationship with the information security area in an effort to analyze the difference between two groups of professionals from the same field and from other fields.

Two hypotheses were established according to five turnover paths, excluding path 1, which has no turnover experience.

Hypothesis 1: There will be a significant perception gap among the groups of professionals: changing the job skill from an organization (paths 2 and 4), changing the job skill (paths 3 and 5), and leaving an organization without changing the job skill (path 6).

Hypothesis 2: There will be a significant perception gap between two groups of professionals: changing the job skill or organization in the information security industry (paths 2 and 3), and changing the job skill or organization in other industries (paths 4 and 5).

IV. Methodology

4.1 Measure

Table 3 shows ten variables of turnover causes for this study as used to test the two hypotheses. To test the level of each turnover cause, factors were defined as follows for the ten variables: compensation-related factors, environmental factors, and work-related factors, as mentioned above. All of the research variables were evaluated with a seven-point Likert scale. Specifically, a “seven” represents the highest score for a factor and a “one” is the lowest score.

Table 3. Research variables

Factors	Definition	Turnover causes
compensation- related	The level of satisfaction with compensation	wage
		compensation
		promotion
environment- related	The level of satisfaction with physical environment and various training opportunity	training opportunity
		physical environment
work-related	The level of satisfaction with relationship and role in organization	relationship problem
		dissatisfaction with leadership of master
		overwork
		role ambiguity
		role conflict

To identify the perception gap between the respondents from the two groups for each hypothesis, Multivariate Analysis of Variance (MANOVA) and Analysis of Variance (ANOVA) were used. MANOVA is a method of comparing the mean values of correlate dependent variables between groups simultaneously. ANOVA is a method of comparing the mean values of one dependent variable between groups.

4.2 Sampling and Data Collection

A survey of information security professionals was conducted over a period of two months (December 2009 - February 2010) with individuals involved in information security companies that were affiliates of the Korea Information Security Industry Association (KISIA). 231 professionals of industry from KISIA participated. 24 responses were eliminated because they were incomplete. The remaining 207 responses were finally used for the analysis. The career experience and skills refer to the “Development of IS Skill Standard and Survey on Demand

and Supply of the IS Workforce” published by Korea Information Security Agency (KISA). Table 4 shows the

demographics of the selected respondents.

Table 4. Characteristics of the sample

	Characteristics	Samples	Percent of respondents (%)
Career Experience	Under 5 years	64	30.9
	5-9 years	68	32.9
	9 years over	75	36.2
Position	Staff	15	7.2
	Assistant Manager	62	30
	(Deputy General) Manager	122	58.9
	General Manager	8	3.9
Skills	Strategy & Planning	28	13.5
	Marketing & Sales	2	1.0
	Research & Development	80	38.6
	Education & Training	5	2.4
	Management & Operation	52	25.1
	Accident Response	27	13.0
	Assessment & Authentication	13	6.3

V. Data Analysis

5.1 The Level of Turnover Causes

In the results of examined variables, Table 5 presents the level of turnover intention and causes among the respondents. The level of turnover intention was 4.67, and the highest level of turnover causes was the environment-related factor. For each turnover cause, the level of wage and

compensation appeared to be high. Accordingly, information security professionals perceived the compensation-related factor is an important part of their work or decisions regarding changes in their job skills. However, the level of the work-related factor appeared to be very low relative to other factors. Specifically, the turnover causes of relationship problems and dissatisfaction with leadership were found to be very low.

Table 5. The level of turnover causes

factors	Turnover causes (variable)		Mean
compensation-related	1	wage	4.26
	2	compensation	
	3	promotion	
environment-related	4	training opportunity	4.27
	5	physical environment	
work-related	6	relationship problem	2.75
	7	dissatisfaction with leadership	
	8	overwork	
	9	role ambiguity	
	10	role conflict	

Table 6 presents the level of turnover causes among the three professionals groups sorted by career experience. In the results of the level of turnover intention, those in the beginner group (under 5 years) were found to be far more likely to leave their organization compared to the other groups. For each turnover cause, the beginner group and

senior group (9 years over) were tested very high in terms of wage of the compensation-related factor. Additionally, the intermediate group (5-9 years) responded to training opportunity of the environment-related factor at the highest level.

Table 6. The level of turnover causes within the career experience

Career Experience	Turnover intention	compensation-related			environment-related		work-related				
		1	2	3	4	5	6	7	8	9	10
Under 5 years	5.21	4.73	4.67	4.17	4.31	4.28	2.14	2.34	3.03	3.21	2.95
5-9 years	4.59	4.47	4.32	3.67	4.62	4.11	1.68	2.44	2.97	2.61	2.53
9 years over	4.21	4.50	4.44	3.85	4.16	4.38	2.05	2.59	3.20	3.00	2.93

5.2 Hypothesis Tests

To analyze the perception gap among the turnover paths, the samples from 191 responses were examined with the exception of 16 responses from respondents who had no turnover experience.

Table 7 presents the results of the test of the two hypotheses. The MANOVA result shows that only hypothesis 1 was valid. As a result, there is a significant perception gap

among the groups of professionals for the following factors: changing the job skill from an organization (paths 2 and 4), changing the job skill (paths 3 and 5), and leaving an organization without changing the job skill (path 6). However, there was no significant perception gap between the two groups of professionals in terms of information security industry and other industries.

Table 7. MANOVA: Significant level of the difference (P ≤ 0.5)

Hypotheses	Pillai's Trace	Wilk's Lambda	Hotelling Trace	Roy's Largest Root
1	0.010	0.010	0.010	0.006
2	0.772	0.772	0.772	0.772

An ANOVA analysis was also used to test hypothesis 1 to specify the differences among the three turnover paths. As shown in Table 8, four turnover causes, compensation,

training opportunity, physical environment, and role conflict were found to be significant among all of the turnover causes.

Table 8. ANOVA: Significant level of difference (P ≤ 0.5)

factors	turnover causes (variables)		p-value
compensation-related	1	wage	0.130
	2	compensation	0.050
	3	promotion	0.274
environment-related	4	training opportunity	0.010
	5	physical environment	0.010
work-related	6	relationship problem	0.626
	7	dissatisfaction with leadership	0.702
	8	overwork	0.136
	9	role ambiguity	0.491
	10	role conflict	0.048

Table 9 presents the comparative mean values among the three groups of professionals classified by turnover path. Of the four turnover causes that were found to be significant, the level of compensation, training opportunity, and physical environment appeared to be high in group 3, leaving an organization without changing the job skill. Role conflict appeared to be high in group 1, those who changed their job skill from an organization. Accordingly, information security professionals with turnover experience concentrated

more on organizational compensation of various types, training opportunities, and on their physical environment when leaving an organization more than changing their job skill. On the other hand, when changing job skills, they moved to other skills within the industry owing to role conflicts mainly. This result shows that when changing their job skill, they perceive appropriate skills according to their work values.

Table 9. Mean values for turnover causes within turnover paths

Group	Samples	Turnover paths	Turnover intention	Turnover causes			
				2	4	5	10

group 1	110	changed the job skill from an organization (path ②+④)	4.89	4.43	3.99	4.35	3.23
group 2	34	changed the job skill (path ③+⑤)	4.92	4.02	3.67	3.88	2.64
group 3	47	leaved an organization without changing the job skill (path ⑥)	3.95	4.87	4.17	5.00	2.57

VI. Discussion and Conclusion

This study examined the level of turnover causes among information security professionals within turnover paths. To summarize the major findings briefly, only hypothesis 1 was found to have validity. This finding implies there is a perception gap among professionals with turnover experience depending on one of three paths: changing the job skill from an organization (paths 2 and 4), changing the job skill (paths 3 and 5), leaving an organization without changing the job skill (path 6).

The results of the comparative analysis among the three professional groups show that they consider organizational support as an important factor, as well as the type of compensation, training opportunities, and physical environment when leaving their organization. In addition, when changing their job skill, they move to another skill within the industry due to role conflicts.

The results of this analysis contributed some insight into the existing state of education programs and workforce management. As the widespread application of information security makes the activity of information security professionals more diverse, it is essential to support professionals with an appropriate environment and organizational compensation scheme. A systematic education program has to be made available in an effort to overcome role conflicts and to lead to higher satisfaction with their jobs.

More importantly, as the beginner group (under 5 years experience) moves on to other skills for better training opportunities, it is also necessary to manage manpower in a timely fashion to adapt to the changing skill set required by different professions.

There several limitations in this study. Although efforts were made to analyze the perception gap among various turnover paths, this gap was only found to be significant among three professional groups from three turnover paths. Exploring differences within all types of turnover paths and industries in future research would allow information security manpower to be managed more effectively.

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