Related Factors Influencing on Organizational Efficiency in Fire Incident Crisis Management

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Abstract

The purpose of the study was to investigate the factors that affected the organizational efficiency in fire incident crisis management and recovery during a fire at a B thermal power plant in Korea. The data were collected from 286 employees of the B thermal power plant who gave their informed consent and completed a self-reported questionnaire in December, 2012. A structural equation model was established and used to assess parameters such as burnout, organization based self-esteem, organizational image, job satisfaction, and organizational commitment. The fitness of the modified model was adequate ($\chi^2$/df = 4.313, goodness of fit index = 0.995, adjusted goodness of fit index = 0.978, Tucker Lewis index = 1.004, comparative fit index = 1.000, normal fit index = 0.997, root mean square error of approximation = 0.000). Analysis of the modified model demonstrated that the direct and total effects of job satisfaction, organizational image, burnout, and organization based self-esteem were significantly correlated with organizational commitment. The results of this study indicate that it is necessary to develop a burnout intervention program to enhance organizational efficiency, organization based self-esteem, and organizational image.

Keywords: Burnout, Fire Incident Crisis, Organizational Based Self-esteem, Organizational Efficiency

1. Introduction

Happiness and well-being are the most important factors that comprise the quality of life for human beings. An individual's quality of life is inseparable from his physical and mental safety, which is threatened by various risk factors in the social environment. In Korea, society has been threatened by continuous range of disasters that have affected the safety of the social environment since the 1970s. The inevitable potential risks should not be overlooked as the society becomes more complex, more sophisticated, more convenient, and more efficient. Therefore, unexpected disasters and moral hazards should be considered by companies that provide electrical, mechanical, and construction services.

A majority of people live their lives in the workplace, job satisfaction and devotion is considered as the most important variable in order to increase the organization efficiency and productivity. The influencing factors on organization efficiency include burnout, organization based self-efficacy, and organization image. This fact suggests that psychological and social factors are the important influential factors in unexpected crisis management in the workplace.

Self-esteem is defined as the organization competency, and it is the important factor that stimulates the job satisfaction. The organization based self-esteem is explained as the degree of value in the organization role play. Individual work competency is proportional to self-esteem. In the meanwhile, burnout is the degree of physical, emotional, and psychological exhaustion including negative self-ego, negative attitude, and decreased attention due to stressful working condition. When the members face the massive fire, there will be a close relationship between burnout, self-esteem, and organization image.

There is a strong relationship between job satisfaction, organizational commitment, and the sociopsychological
factors, including self-esteem, burnout, and organizational image. Bjerkan also recognized the importance of surrounding environment apart from the psychological aspects of the working environment. The organizational efficiency includes job satisfaction and organizational commitment and on which it has a positive effect, while organizational commitment in turn prevents turnover intentions. At the same time, organizational efficiency includes the total affective responses, which also play roles as emotional factors that are acquired during job-related experiences.

When the national disaster incident has increased continuously, the integrative post-surveillance system is not sufficiently prepared. The social and psychological factor in crisis management is able to have an important influence on the organization efficiency. However, there are few researches on the relationships between the sociopsychological factors and results in those who weathered a crisis.

At present, the frequency of disasters has increased nationwide, and the overall disaster evaluation system is not fully satisfactory. Very few reports of critical incident management related to the members of the organizations who must deal with the effects of the sociopsychological factors.

Massive fire outbreak is defined as a total failure of the social safety system and the risk prevention system, including fire prevention, preparedness, response, and recovery. Crisis management is essential for debriefing after the experience of critical incident stress because it can help intervene a crisis that affects the organizational efficiency.

Thus, the aim of the present study is to investigate the relationships between organization based self-esteem (OBSE), burnout, organizational image, job satisfaction, organizational commitment, and organizational efficiency using structured equation model (SEM). Based on the results, we propose a solution to increase organizational efficiency.

1.1 Theoretical Framework
The theoretical framework of the study was based on the organization based self-esteem, burnout, and organization image in the hypothesis that these three factors have an influence on the job satisfaction. Job Satisfaction model of Hackman's index was cited that burnout has a negative effect on the job satisfaction.

Organization based self-esteem had a positive effect on organization image, job satisfaction, and organization commitment. Burnout had a negative effect on organization image, job satisfaction, and organization commitment. Organization image had a positive effect on job satisfaction and organization commitment.

Through these results, the direct and indirect paths were made (Figure 1).

2. Methods

2.1 Study Design
In March 2012, an unprecedented fire broke out at a B thermal power plant in Boryeong, Korea, and all of the workers made their best efforts to recover normal operation and process.

This study was a cross sectional study and using structured equation model (SEM) was used in order to

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**Figure 1.** Theoretical framework of the study.
explain the relationship between factors influencing on the organization efficiency in B power plant in massive fire incident.

2.2 Study Subjects
The authors visited the B thermal power plant on December 18, 2012 and explained the purpose of the survey to the director. Informed consent was obtained after the participants read a document that described the purpose of the study, which guaranteed anonymity, and voluntary participation, allowed for refusal to participate or withdrawal, and outlined the benefits and disadvantages of participating in the study. The personnel voluntarily completed the questionnaire after signing a written consent form. The personnel voluntarily completed the questionnaire after signing a written consent form and the data were collected.

Kline suggested that sample size calculation is determined at least 20 times per variable. The number of the variables of the study was 13 and the authors determined 260 sample size. Lee and Rim suggested that the ideal sample size for the hypothesis is at least more than 200 samples. In total, 263 questionnaires were obtained after excluding nine incomplete answers sheets (96.7%).

2.3 Ethical Consideration
The Institutional Review Board (IRB) gave approval to protect to data obtained from the subjects on December 17, 2012 (permit PIRB12-059-02). All of the informed consent forms were submitted to the IRB.

2.4 Study Measurements

2.4.1 Burnout
Burnout was measured using Pine’s burnout index, assessed the level of burnout experienced by each subject. Higher scores indicated a higher level of burnout, which were calculated by the reverse conversion of positive items. Using a 20 item Likert scale, the items were scored on a five-point scale, no experience (1 point), sometimes (2 points), usually (3 points), often (4 points), and very often (5 points). The exploratory factor analysis demonstrated that a higher score indicated physical burnout, emotional burnout, and psychological burnout. The internal consistency was adequate, because Cronbach’s α = .92.

2.4.2 Organization based Self-esteem (OBSE)
Organization Based Self-esteem (OBSE) was analyzed by 7 questions of Pierce et al. Likert 5 points ranged from “never” (1 point) to ‘always’ (5 points). High score means high OBSE. Cronbach’s α was 0.82 in this study.

2.4.3 Organizational Image
Organizational image was defined as a specific and continuous organizational belief, which was assessed using the scale developed by Mael and Ashforth. This was a 10 item Likert scale where the items were scored on a five-point scale, never (1 point), sometimes (2 points), usually (3 points), often (4 points), and always (5 points). Higher scores indicate the better organizational image. Cronbach’s α for organizational image was 0.93.
2.4.4 Job Satisfaction
Job satisfaction was measured using the Hackman's index\(^24\), which used a 12 item Likert scale where the items were scored on a 5-point scale, never (1 point), sometimes (2 points), usually (3 points), often (4 points), and always (5 points). Higher scores indicated better job satisfaction. Cronbach's \(\alpha\) for job satisfaction was 0.93.

2.4.5 Organizational Commitment
Organizational commitment was measured using the Mowday's index\(^29\), which used a 13 item Likert scale where the items were scored on a five-point scale, never (1 point), sometimes (2 points), usually (3 points), often (4 points), and always (5 points). Higher scores indicated the better organizational image. Cronbach's \(\alpha\) for organizational commitment was 0.93.

2.5 Data Analysis
IBM Statistical Package for the Social Sciences (SPSS) Statistics (version 21.0; IBM Corporation, Somers, NY, USA) and Analysis of Moment Structure (AMOS) 22.0 were used to construct a database and to perform statistical analyses of the demographic characteristics and generate the descriptive statistics. Confirmatory factor analysis was used to analyze the validity of the data. Univariate normality and multivariate normality were also performed. Multicolinearity was analyzed using Pearson's correlation coefficient. The fitness, direct effects, indirect effects, and total effects of the SEM were calculated using covariance matrix and the maximum likelihood estimation. Bootstrapping methods was used for the statistical verification of the indirect effect and total effect. Evaluation of fit measurement in SEM was made by absolute fit measures, incremental fit measures, and Modification Indices (MI). As absolute fit index explains the covariance suitability, so it is not compared to other model. Absolute fit index must be decided by other various fit measures not by \(\chi^2\). Absolute fit index was verified by \(\chi^2\)(CMIN), RMR, GFI, and AGFI. The verification of incremental fit index was verified by NFI, RFI, IFI, TLI, and CFI.

3. Results

3.1 General Characteristics of the Subjects
Table 1 shows the general characteristics of the subjects. The subjects comprised 228 men (87.4%) and 35 women (12.6%). The age distribution of the subjects was categorized as; 20s (15.4%), 30s (45.0%), 40s (24.5%), and >50 years (14.1%). Table 1 shows that 72.1% of subjects were married and 73.8% of subjects were university graduates, and 71.8% of subjects were normal employees, including electricians (42.5%), mechanics (30.1%), and chemists (12.7%). We found that 34.6% of the subjects had a monthly income of more than 5,000,000 Korean Won (4,500 US dollars) and 55.0% of subjects had worked for more than 10 years.

3.2 Descriptive Statistics and Correlations
To demonstrate the validity of the instruments, confirmatory factor analysis was applied to all of the parameters, i.e., burnout, self-esteem, organizational image, job satisfaction, and organizational commitment. All of the standardized regression coefficients were >.5 and the coefficients confirmed the validity of the SEM\(^27\).

Table 2 shows the descriptive statistics for the variables, which were normally distributed. The multivariate analysis showed that the skewness was below 3 and the kurtosis was above 10\(^27\). The results confirmed the validity of the data.

| Variables                      | M±SD  | Min | Max | Skewness | Kurtosis |
|-------------------------------|-------|-----|-----|----------|----------|
| Burnout                       |       |     |     |          |          |
| Affective burnout             | 2.22±0.68 | 1.00 | 5.00 | 0.221     | 0.384    |
| Mental burnout                | 1.99±0.64 | 1.00 | 3.75 | 0.307     | -0.545   |
| Physical burnout              | 2.31±0.81 | 1.00 | 4.60 | 0.156     | -0.489   |
| Organization based self-esteem| 4.03±0.62 | 2.57 | 5.00 | -0.003    | -0.712   |
| Organizational image          | 3.74±0.57 | 1.60 | 5.00 | -0.081    | 0.489    |
| Job satisfaction              | 4.20±0.56 | 2.50 | 5.00 | -0.202    | -0.462   |
| Organizational commitment     | 4.20±0.56 | 2.77 | 5.00 | -0.212    | -0.653   |

If the correlation coefficient between variables \((r)\) is >0.85, the hypothesis should be rejected because the variables would be very highly correlated\(^30\). However, correlation coefficient of the variables in the present study was <0.80, which indicated low multicolinearity (Table 3).
3.3 Analysis of the Modified Model

Structured Equation Model (SEM) demonstrated the organization efficiency in B thermal power plant personnel who weathered massive fire crisis. $\chi^2$ was not significant in fit measures between variables. $\chi^2$ did not seem suitable because it was very vulnerable to the number and size of the variables. So goodness of fit index (0.995), Tucker Lewis index (1.004), comparative fit index (1.000), normal fit index (0.997), adjusted goodness of fit index (0.978) was calculated and the index above 0.9 revealed that the model was good. Root Mean Square Error of Approximation in this study was 0.000. The model was good when the root mean square error of approximation was below 0.10. The fit indices of the study

**Table 1. General characteristics of the subjects (N = 263)**

| Characteristics | Categories       | Frequency | %   |
|-----------------|------------------|-----------|-----|
| Gender          | Male             | 228       | 87.4|
|                 | Female           | 33        | 12.6|
| Age (year)      | 20-29            | 44        | 16.4|
|                 | 30-39            | 121       | 45.0|
|                 | 40-49            | 66        | 24.5|
|                 | ≥50              | 38        | 14.1|
| Marital status  | Single           | 73        | 27.9|
|                 | Married          | 189       | 72.1|
| Education level | High school      | 06        | 06.2|
|                 | College          | 31        | 11.9|
|                 | University and above | 213 | 81.9|
| Position        | Employees        | 186       | 71.8|
|                 | Executive        | 73        | 28.2|
| Work category   | Machine          | 78        | 30.1|
|                 | Electricity      | 110       | 42.5|
|                 | Chemistry        | 33        | 12.7|
|                 | Clerical work    | 22        | 8.5 |
|                 | Construction     | 8         | 3.1 |
|                 | Others           | 8         | 3.1 |
| Monthly income  | <200             | 29        | 10.8|
| Won             | ≥200 ~ <300      | 54        | 20.1|
|                 | ≥300 ~ <400      | 51        | 19.0|
|                 | ≥400 ~ <500      | 42        | 15.6|
|                 | ≥500             | 93        | 34.6|
| Work duration   | <10              | 148       | 55.0|
| (years)         | ≥10~<20          | 51        | 19.0|
|                 | ≥20~<30          | 39        | 14.5|
|                 | ≥30              | 31        | 11.5|

**Table 3. Correlation between variables**

| Sl. No. | Variables                    | 1  | 2      | 3    | 4     | 5     | 6    | 7 |
|---------|------------------------------|----|--------|------|-------|-------|------|---|
| 1       | Affective burnout            |    | 1      |      |       |       |      |   |
| 2       | Mental burnout               |    | 0.707** | 1    |       |       |      |   |
| 3       | Physical burnout             |    | 0.577** | 0.773** | 1  |       |      |   |
| 4       | Organization based self-esteem |   | -0.636** | -0.479** | -0.374** | 1  |      |   |
| 5       | Organizational image         |    | -0.505** | -0.424** | -0.408** | 0.485** | 1   |   |
| 6       | Job satisfaction             |    | -0.681** | -0.652** | -0.538** | 0.562** | 0.680** | 1 |
| 7       | Organizational commitment    |    | -0.654** | -0.636** | -0.518** | 0.522** | 0.642** | 0.761** | 1 |

*p<.01

3.3 Analysis of the Modified Model

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were above the average, this study showed the fit model. Table 4 showed the nonstandardized index (B) and critical ratio (C.R.) and Table 5 analyzed the standardized index (β). Figure 2 revealed that ten pathways were statistically significant. Organization commitment had a positive effect on organization based self-esteem (B = 0.182, β = 0.204), and burnout had a negative effect on OBSE (B = -0.245, β = -0.285). OBSE (B = 0.173, β = 0.180) and job satisfaction (B = 0.286, β = 0.288) had a positive effect. OBSE had a positive effect on job satisfaction (B = 0.413, β = 0.458). Burnout had a negative effect (B = -0.312, β = -0.362), and organization image had a positive effect (B = 0.195, β = 0.202). The influencing factors on organization image included that OBSE had a positive effect (B = 0.597, β = 0.641) and burnout had a negative effect (B = -0.108, β= -0.121). OBSE had a negative effect on burnout (B = -0.108, β= -0.121). Squared multiple correlations (SMC) is explained by the multiple correlation coefficient of dependent variable toward independent variable. The explanation power of organization commitment, job satisfaction, organization image, and burnout was 66.4%, 73.9%, 50.2%, and 24.3%, respectively.

**Table 4.** Path coefficient of the final model

| Endogenous variables | Exogenous variables | B     | SE   | β     | C.R. | SMC  |
|----------------------|---------------------|-------|------|-------|------|------|
| Organizational commitment | Job satisfaction | 0.286 | 0.072 | 0.288 | 3.962*** | 0.664 |
| | Organizational image | 0.173 | 0.051 | 0.180 | 3.374*** | 0.641 |
| | Burnout | -0.245 | 0.046 | -0.285 | -5.285*** | 0.528 |
| | Organization based self-esteem | 0.182 | 0.056 | 0.204 | 3.275** | 0.458 |
| | Organizational image | 0.195 | 0.044 | 0.202 | 4.414*** | 0.739 |
| | Burnout | -0.312 | 0.037 | -0.362 | -8.532*** | 0.573 |
| | Organization based self-esteem | 0.413 | 0.043 | 0.458 | 9.640*** | 0.790 |
| | Burnout | -0.108 | 0.046 | -0.121 | -2.333* | 0.502 |
| | Organization based self-esteem | 0.597 | 0.047 | 0.641 | 12.797** | 0.778 |
| | Burnout | -0.515 | 0.065 | -0.493 | -7.963*** | 0.243 |

Note. B = unstandardized regression weight; β = Standardized Regression Weight; CR = Critical Ratio; SMC = Squared Multiple Correlations; *p<.05, **p<.01, ***p<.001.

**Table 5.** Effects of predictive variables on endogenous variables

| Endogenous variables | Exogenous variables | Direct Effect (β) | Indirect effect (β) | Total effect (β) |
|----------------------|---------------------|-------------------|---------------------|-----------------|
| Organizational commitment | Job satisfaction | 0.288 | 0.288 |
| | Organization image | 0.180 | 0.058 | 0.238 |
| | Burnout | -0.285 | -0.133 | -0.418 |
| | Organization based self-esteem | 0.204 | 0.490 | 0.694 |
| Job satisfaction | Organization image | 0.202 | 0.202 |
| | Burnout | -0.362 | -0.024 | -0.386 |
| | Organization based self-esteem | 0.458 | 0.320 | 0.778 |
| Organization image | Burnout | -0.121 | -0.121 |
| | Organization based self-esteem | 0.641 | 0.060 | 0.701 |
| Burnout | Organization based self-esteem | -0.493 | -0.493 |

Note. β = standardized regression weight

**4. Discussion**

The present study established a hypothetical model to assess the effects of psychosocial factors on the organizational commitment of employees in public agencies. To demonstrate the validity of the hypothesis, we analyzed the correlations between parameters such as burnout, OBSE, organizational image, self-esteem, and organizational commitment.

Clearly individuals and organization are exposed to various crises in modern society. A crisis can be defined as a situation with a risk of consequences where an emergency situation could occur unexpectedly. Crisis management can be incorporated into the organization of a system, while an unintentional crisis, including defective products, fire incident, industrial accidents, and systemic errors. Accidents are unintentional and random. Thus the responsibility of the organization is minimized. The members of public agencies determine the quality of services provided to people on behalf of the government. The reasonable and effective management
of human resources has a positive and active effect on the motivation of employees in public agencies, and which ensures that provide the best services to the public.

OBSE had a negative effect on burnout. If burnout continues for a long time, it will lead to a reduction in job satisfaction and organizational commitment, and the individual employees will exhibit psychological and physiological symptoms that may affect their motivation. The present study showed that physical burnout had the highest score during the recovery from a major fire incident followed by emotional burnout, and psychiatric burnout. Burnout had a negative effect on the organizational image whereas OBSE had a positive influence on organizational image. Self-esteem is the sum of self-respect and self-worth and it can be improved by systematic training and experience. Subjects satisfy their needs for OBSE by participating in organizational role play. Thus employees try to satisfy their OBSE needs by participating in organizational activities, according to their organizational commitment. The present study assessed the hypothesis that the organizational image depends on the organization itself, and the self-esteem score was 4.03 out of 5.00 points.

Organization commitment is an important variable that reflects the positive experience of the organization and job satisfaction.

The positive factors that affected organizational commitment were OBSE, job satisfaction, and organizational image, whereas burnout had a negative effect on these parameters. The explanation power was 66.4%. It is very important that public agencies achieve their goals by reducing burnout thereby enhancing job satisfaction and organizational commitment.

5. Conclusion

This study suggests that the employees who participated in crisis management and the recovery process showed organizational commitment. Ultimately, the employees were involved in the positive cycle of organizational recovery. The enhancement of OBSE and the reduction of burnout had positive effects on the organizational culture and accomplishment. This is the first Korean study to assess the role of organizational commitment in crisis management and recovery process after a major fire incident. This study was cross-sectional, so it was necessary to use a combination of cross-sectional and longitudinal approaches to assess the psychological changes in those involved with the incident. The establishment of legislation related to the organizational image is very important for enhancing the organizational efficiency of public agencies during crisis management. An intervention program to improve OBSE and to manage burnout should be developed in the future.

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