

## **Impact of Earthquake Response Perception on Fire officials on Organizational Citizenship Behavior**

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### **Abstract:**

**Purpose:** This study identifies the impact on composition of the firefighting organization, fire command ability, and public opinion operation on organizational citizenship behavior for fire officials to respond to the earthquake disaster, and provides practical implications as basic data for firefighting organizations to cope with the earthquake disaster.

**Methods:** Questionnaire survey was performed for 159 fire officials, and the surveyed data was statistically analyzed by using SPSS 22.0 program.

**Results:** First, the results of the verification of the hypothesis showed that the composition of the fire organization, fire field command ability and public opinion operation have a positive impact on organizational citizenship behavior. Second, the relative contribution of independent variables to the dependent variables was identified in the order of composition of fire organization, fire command ability and public opinion operation.

**Conclusion:** The implications of this study suggested from a practical perspective that the government needs to organize firefighting organizations, develop fire field command ability and operate public opinion in advance in order to respond to earthquakes.

**Key Word:** Fire Official; Firefighting Organization Composition; Firefield Command Ability; Public Opinion Operation; Organizational Citizenship Behavior.

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Date of Submission: 08-07-2020

Date of Acceptance: 23-07-2020

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### **I. INTRODUCTION**

The primary function of the nation is to protect lives and property of nation from various natural disasters or risks. The government is responsible for managing such disasters in prior and foremost when there is a concern that the lives and property of the nation may be invaded from natural disaster, human or technological disasters (Byeon, 2018). South Korea has been known to be relatively safe from earthquakes in comparison to neighbouring countries such as Japan or China, as it is located interior of Eurasian. In other words, South Korea has a relatively low frequency of earthquakes and a smaller scale of them than Japans' which is located on the border of the Eurasian Plate. However, recently, earthquakes have occurred intensively within "L" shape in the southeastern part of the Korean Peninsula, in the southern inland and western coastal areas. According to experts, South Korea cannot be completely free from earthquakes since large-scale earthquakes in neighboring countries, such as Japan or China, which are affected by the time lag.

Earthquake is a phenomenon in which the earth's surface is shaken by natural and artificial causes and it is arousing by the destruction of rocks in the crust or mantle that often caused by natural reasons (Kim, 2019). Recently, the number of earthquake in South Korea has rapidly increased from an average of 50 times in 2016 to 223 times 2017 (Minister of Public Administration and Security, 2017) and earthquake occurred 115 times in 2018 and 88times in 2019 (<http://www.weather.go.kr>).

In South Korea, the largest earthquake occurred in Gyeongju in 2016 and the second largest earthquake occurred in Pohang in a year that caused a lot of human injuries and physical damage. Therefore, this increases public anxiety about earthquakes and it is likely to have bigger scale of earthquake which increases possibility and risk of major damage in future (Ko and Lee, 2015). In other words, Pohang earthquake, which occurred in 2017, can be great opportunity to raise public awareness that South Korea is no longer a safe zone for earthquake and to build a consensus that earthquakes are primary problems that are directly related to life. Furthermore, it is required to establish a system of disaster management including prevention, preparedness, response and recovery (Kim et al., 2020).

Recent research trends on seismic awareness surveys have conducting focusing on awareness of residents regarding earthquake prevention (Lee and Lee 2017; Byeon, 2018; Lee et al, 2018; Yang, 2011). In the meantime, fire officers have the work characteristics that require risk, urgency, risk of activity environment and

strong physical strength as disaster response officials and they play the most pivotal role in the field that occurred major disasters such as earthquake or other major disasters.

Research regarding fire officers who play a key role in earthquake prevention is investigated restrictively such as fire administration (Oh, 2018), role of fire officers (Kim, 2019), and tasks of local government response (Koo, 2019). Fire officials work in inadequate working environment depending on the region. As of 2020, it has been converted to one of national official position and the fire officers has been deployed into the disaster site as a top priority in the event of a major national disasters such as earthquake as well as emergency or rescue activities. In order for fire officials to successfully perform their tasks at disaster sites such as earthquake including protection of people's life and property it is required to be maintained organized civil actions such as voluntary devotion, consideration and cooperative spirit, as well as the roles officially assigned to their duties.

Besides fire officials, police officers are carrying out voluntary actions beyonds official roles to protect the safety and life of people in their tasks. Previous study conducted on police officials can be found in various studies that have identified the impact on organizational civic behavior through independent variable such as psychological empowerment (Yoo, 2015), psychological fulfillment (Jeong, 2017), Personal propensity (Joo, 2016), factors affected job related stress (Lim, 2017) and ethical leadership (Moon and Hur, 2019).

On the other hand, previous research regarding the influence of the fire officials is limited to investigate the relationship of effect on civic activities which set up as dependent variable (Kim et al., 2016). In order for fire officials to exercise voluntary organized civic actions including rescue and property protection, at disaster sites such as earthquakes. it is necessary to secure prior preparation, on-site activities and formation of cordial public opinion. In other words, the organization of fire-fight should be preceded by the formation of a cordial public organization to cope with disasters such as earthquakes, command power of confront with earthquake site, provision of information to public (Lee, 2014).

In the event of an earthquake or other disaster, the fire official is usually able to operate the disaster site coping with the earthquake who play a important role in the front line to protect the safety and property of the people through rescue and emergency services at the site. This study selected three variables as independent variables:

- 1) Fire-fighting organization: ability to operate disaster sites, the ability to expand professional manpower, the ability to operate professional equipment, the cooperation of related agencies)
- 2) Fire command ability: the ability to command disasters, the establishment of disaster systems, the efficiency of resource allocation and the requirement of general commend (As concepts of composition that can exclusively operate disaster sites.)
- 3) Public opinion management: public consensus, provision of correct disaster information, support for disaster relief (As concepts of composition that through media source, public opinion impact on policies or management of disasters.)

In order to successfully carry out the task at earthquakes sites, it is required for fire officials to identify their relationship with organized civic volunteer actions and to confirm their impact. The aim of this study is to identify the impact of fire-fighting organization composition fire command ability, public opinion operation on the behavior of the citizens of the organization to respond to earthquakes and provide practical implications for the fire-fighting organization as fundamental data for earthquake response.

## **II. BACKGROUND**

### **Organized Civil Action**

Organization civil action is defined as an act of personal contribution in the workplace beyond the role required by the agreement (Organ and Ryan, 1995), which is beneficial to the organization, but it is formally defined as an action that is difficult to specify or compensate, other than what the role requires (Morrison, 1994). It is also defined as an individual action in which discretionary and formal compensation systems were not directly or clearly recognized and overall promoted the effective function of the organization (Organ, 1998). It is also conceptualized as a positive action that in the interest of others or organizations by acting according to the internal motivations of the organizational members (Sung, 2014).

Organizational civic action is a positive action taken by members of an organization to achieve organizational goals efficiently, all other than the voluntary role that they perform without being forced by the official discipline of organizations or expecting compensation (Park, 2018). It is also mean carrying out various voluntary activities without special compensation, such as voluntarily helping other members of the organization, actively suggesting new and novel ideas within in organization, and voluntarily carrying out tasks other than those assigned to them. The component of organized civic action are divided into Altruistic actions that voluntarily helping others, Conscientious actions that are above the general level, noble actions that do their best to achieve organizational goals without criticizing the organization, Considerate actions that are necessarily

measures in advance, and Participatory actions that are intended to participate in other events with interest in the organization (Orgarn, 1988).

Fire officials are public officials who provide public services and, unlike material goods, rely on the conducting or performing subject. Research on organizational civic behavior is essential because role behavior, as well as non-role behavior, has a significant impact on the performance of the organization. Thus, it can be considered that although the definition is defined differently by the researchers, it is voluntary and does not require consideration and compensation, and that it has a positive effect on the performance of the organization. Member of organization do not seek official compensation for organized civil action by individual freedom, but act to improve the effectiveness of their organization. This organized civic action can be seen as an essential activity for the successful operation of the fire official organization since it is an act of collaboration with internal members that can maximize the efficiency of the organization.

In this study, organizational civic behavior like to be selected the following components altruistic, conscientious, noble, considerate and participatory behaviors refer to prior studies (Organ, 1988; Lee, 2019). Further, organizational civic actions are also intended active involvement in organizational activities while overcoming the burden of unexpected tasks and helping members of organization in a altruistic way beyond the responsibility of individuals to perform their duties.

### **Response to Earthquake**

To prepare for major disasters, fire-fighting organization should construct the organizations for disaster response in advance, establish fire-fighting command capabilities to enable immediate response at disaster sites, and provide promote seismic information and media report for relief assistance (Lee, 2014). Therefore, Lee (2014) presented the following capabilities as a sub-component of the formation of disaster response organization of fire-fighting through previous research: organizational structure performance for disaster site operation; the capacity to organize and operate professional personnel who can exclusively handle and operate disaster sites; ability to operate specialized equipment and cooperate with related agencies. Also, as sub-factor of fire-fighting field command capability, the following components were selected: excellent field command at disaster sites; placement and operation of suppliers; establishing a response system by plan; efficient management of resources supplied to disaster sites. and overall command capacity for the overall operation of disaster management.

The study found that public opinion management confirmed that public opinion through the media was affecting policy or disaster management. Relief support with public bond of sympathy, correct provision of disaster information and systematic support for public opinion management was selected as the components (Lee, 2014). Therefore, Lee (2014) conducted a analysis of One-way Analysis Of Variance and regression analysis on the composition of fire-fighting organization, field command capabilities, public opinion management and their sub-components respectively. The component of organized civic behavior were viewed as five elements: altruism, conscience, courtesy, spirit of participation, and sportsmanship. Passionate sentiments have been shown to immerse the team in innovation (Organ, 1988), which has demonstrated that the enthusiasm of the members of the organization can lead to positive actions such as innovative behavior.

Therefore, this study will refer to research conducted by Lee (2014) on disaster response of fire-fighting organizations. The study set the organization of fire-fighting for earthquake response, ability to command fire-fighting and operation of public opinion as independent variables and set organizational civic behavior as a dependent variable. The hypotheses established through the preceding study are as follows:

**Hypothesis 1.** Fire officials' seismic response fire organization composition will have a positive impact on organized civic behavior.

**Hypothesis 2.** Fire officials' ability to command earthquake response sites will have a positive impact on organized civic behavior.

**Hypothesis 3.** The seismic response public opinion management of fire officials will have a positive impact on organized civic behavior.

### **III. MATERIAL AND METHODS**

This study conducted questionnaire survey on 210 fire officials who participated in the fire service training (education period) using extraction of random sampling The survey was conducted from 6th January 2020 to 21st January 2020 and a total of 186 copies of the questionnaire were collected with 88.6 percent collected rate. A total 159 questionnaires were used for data analysis, excluding 27 parts, including some non-response and outlier.

The measurement for perception of fire officials about earthquake response are consisted of three variables: formation of fire organization, fire command capability and management of public opinion. The sub-variables for each variable are composed of four variables, for example, the ability to operate a disaster site; the ability to expand professional manpower, the ability to operate specialized equipment and the cooperation of

related agencies. The questionnaire consisted of a total 16 questions, each sub-variable with four question. The sub-variable of fire command capability is consisted of four variables; capability to disaster command; establishment of disaster system; resource allocation efficiency; and need for general command. Each sub-variable has four questions, with a total of 16 questions, and the sub-variables in the operation of public opinion including three variables: public sympathy; provision of disaster information; and support for disaster relief. The questionnaires for each sub-variable were four questions and a total of 12 questions, using the measurement method presented by Lee (2014) on a five-point scale of Likert without modification.

According to Lee (2014), the internal consistency of Cronbach's  $\alpha$  value between questions was found in the following: 0.912 or higher in fire-fighting organization; 0.861 or higher in command ability of fire-fighting; 0.984 in public opinion. In this study found that 0.726, 0.747 and 0.737 in each of the components mentioned earlier, respectively.

The measurement tools for organization civic behavior consist of five sub-variables; altruistic behavior conscientious behavior, noble behavior, considerate behavior and participatory behavior based on survey contents developed by Organ (1988) and several previous studies (MacKenzie and Hue, 1993; Niehoff and Moorman, 1993; In, 2015; Lee, 2016). The questions for each sub-variable were used using the measurement of Lee (2016), which consist of a five-point scale of Likert, including four questions and a total of 20 questions. According to the research by Lee (2016), Cronbach's  $\alpha$  value, which is the internal consistency between the questions of organized civic behavior, was found to be 0.936 and in this study show 0.822.

**Data Analysis Method:**The data analysis was performed using the SPSS 22.0 programme to identify key characteristics of the research subjects, including demographic and technical statistical analysis, reliability and correlation. In addition, this study conducted analysis method of multiple regression using independent variable including forming organization of fire-fighting officials, ability to command in fire-fighting field and management of media to investigate the effect of organizational civic actions by fire-fight officers.

#### IV. RESULT

##### Demographic Analysis

According to the demographic characteristics of fire officials who are subject to this study, there are 130 males, and 28 females in gender standard and the age is ranging from under 30 to 50 divided five levels. The work experience is divided into five stages from less than three years to less than ten years, and the ranks are divided into five levels from fire-fighter to fire Marshall. The working area are divided into four areas; Seoul metropolitan area, Chungcheong area, Honam area and Yeongnam area. The duties in charge were divided into five categories: fire administration, fire control, first aid, rescue, and other. The results of analysis presented Table 1 below.

**Table no 1:**Characteristics of Survey Participants.

|                                 |                 | n(%)      |
|---------------------------------|-----------------|-----------|
| Gender                          | Male            | 131(82.4) |
|                                 | Female          | 28(17.6)  |
| Age(yr)                         | >30             | 44(27.7)  |
|                                 | 30 ~ 34         | 64(40.3)  |
|                                 | 35 ~ 39         | 33(20.8)  |
|                                 | 40 ~ 44         | 12(7.5)   |
|                                 | 45 ~ 50         | 6(3.8)    |
| Career in present work unit(yr) | > 3             | 36(22.6)  |
|                                 | 3 ~ > 5         | 37(23.3)  |
|                                 | 5 ~ > 7         | 51(32.1)  |
|                                 | 7 ~ 10 >        | 20(12.6)  |
|                                 | 10 <            | 15(9.4)   |
| Class                           | >Fire Engineer  | 46(28.9)  |
|                                 | Fire Lieutenant | 41(25.8)  |
|                                 | Fire Captain    | 43(27.0)  |

|           |                       |          |
|-----------|-----------------------|----------|
|           | Fire Marshall         | 20(12.6) |
|           | Fire Battalion Chief< | 9(5.7)   |
| Work area | Metropolitan area     | 56(35.2) |
|           | Chungcheong area      | 38(23.9) |
|           | Honam area            | 22(13.8) |
|           | Yeongnam area         | 43(27.1) |
| Duty      | Administration        | 29(18.2) |
|           | Disaster suppression  | 24(15.1) |
|           | Rescue                | 34(21.4) |
|           | First aid             | 45(28.3) |
|           | Other                 | 27(17.0) |

**Correlation Analysis**

The results of the correlation analysis are as follows; the each component shows positive correlation with following detail values; the composition of fire-fighting and capability to fire command ( $r= 0.57, p<0.01$ ); the composition of fire-fighting and management of public opinion ( $r=0.57, p<0.01$ ); the composition of fire-fighting and organized civil action ( $r=0.62, p<0.01$ ); fire command and public opinion management ( $r=0.68, p<0.01$ ); fire command and organized civil action ( $r=0.75, p<0.01$ ); and management of public opinion and organized civic action ( $r=0.67, p<0.01$ ). Table 2 summarize and preset correlation table within the components.

**Table no2:**Correlations among Study Variables.

|      |       |       |       |       |
|------|-------|-------|-------|-------|
|      | 1     | 2     | 3     | 4     |
| 1    | 1     |       |       |       |
| 2    | .57** | 1     |       |       |
| 3    | .57** | .68** | 1     |       |
| 4    | .62** | .75** | .67** | 1     |
| Mean | 54.48 | 52.43 | 39.54 | 65.77 |
| SD   | 6.78  | 6.77  | 5.73  | 9.10  |

\*\* $p<.01$  1. Firefighting Organization 2. Firefield command ability 3. Public opinion 4. Organizational citizenship behavior

**Multiple Regression Analysis**

The results of the stepwise multiple regression analysis are presented in Table 3 below. The results of the statistical significance test for the model with three independent variables for the organizational citizen behavior of fire officials which are subordinate variable, are as follows: The analysis confirm the validity of multicollinearity with Durbin-Waston value 2.364 which is over reference value of 2 but is not close to zero or four. It also independent of each other and suitable for the regression model. The tolerance limit value is greater than 0.1 and the variance inflation factor value (VIF) is less than 10. The F statistical values of the model, which includes the composition of fire-fighting organization, fire command capability and operation of public opinion, are 92.513 with a 0.000 from probability value (p-value). All of independent variables included in the model statistically and significantly explain the organized civic behavior of fire officials at a significant level of 0.05.

Therefore, the study adopt all hypothesis and 80.1 percent of the total change in organized civic behavior of fire officials is explained by the independent variables included in the model (64.2 percent according to the correction factor). The results of tested the contribution and statistical significance of the dependent variables of the individual variables are as follows: the independent variables that statistically significantly affect the organized civic behavior of fire officials at a significant level of 0.05, are the composition of each category shows the following results: fire-fighting organizations ( $t=6.853, p=0.000$ ),

capability of fire command ( $t=4.466$ ,  $p=0.000$ ), public opinion management ( $t=3.358$ ,  $p=0.000$ ). In addition, according to the standardized coefficient, which indicates the relative contribution of independent variables, the composition of fire-fighting organizations, the ability to command fire-fighting, and the operation of public opinion are influencing the organized civic behavior of fire-fighting officers.

**Table no3:**Multiple regression analysis influencing factor for Organizational citizenship behavior.

| Variable                                   | B     | SE   | $\beta$ | t        | F         | tolerance | VIF   |
|--|-------|------|---------|----------|-----------|-----------|-------|
| Constants                                  | 2.408 | .942 |         | 2.611*** | 92.513*** |           |       |
| Firefighting Organization                  | .636  | .093 | .473    | 6.853*** |           | .485      | 2.063 |
| Firefield command                          | .286  | .082 | .213    | 3.466*** |           | .614      | 1.629 |
| Public opinion                             | .366  | .109 | .230    | 3.358*** |           | .491      | 2.035 |
| R2(adj. R2)=.801(.642) Durbin-Watson=2.364 |       |      |         |          |           |           |       |

## V. CONCLUSIONS

The aim of this study is to identify the impact of fire-fighting organization composition, fire command ability and operation of public opinion on the behavior of the citizens from the organization to respond to the earthquake disaster of fire officials and to provide practical significance as fundamental data for the fire-fighting organization to manage the earthquake disaster.

Based on the results of this study, this study present the following conclusions: First, the study adopted hypotheses from 1 to 3 due to the fact that all independent variables, including seismic response fire-fighting organization composition, capability of fire command and operation of public opinion, statistically explain the organized civil actions of fire-fighting officers at a significant level of 0.05. Therefore, the government should have a system of response including: the formation of a fire-fighting organization to prepare for earthquake disasters; the preparation and education training for fire-fighting command capabilities at the site; and the rapid provision of information to the public and relief measures.

Second, the statistical analysis presented that the relative contribution of fire officials to organized civic actions was in order of fire organization composition, ability of fire command and management of public opinion. Such a result means that the formation of fire-fighting organization to prepare for earthquake disasters should be on the priority. Since human injuries or physical damages caused by earthquake can lead to serious situations, a fire-fighting organization should be organized and operated at all times.

Third, besides the formation of an rapid earthquake-response for fire-fighting organization, it is ideal for the fire-fighting organization to receive training education on regular basis so that it can enhance systematical command capabilities at disaster sites.

It is that the ability of the organization to achieve its common goals through constant cooperation, unifying and systematizing of the organizations' members is interpreted as more effective within their positive immersion of organization.

In addition, it is expected that the government will actively promote the national level of earthquake prevention measures, establish a system to support relief and recovery of victims and align the laws or systems. It is greatly difficult for organization to establish regulations to predict and deal with any situation. Thus, discretionary and spontaneous actions of the officers become important. Therefore, it is important for the organization to be able to immerse itself and enhance various voluntary actions that the members themselves to hardly define or institutionalize through crisis response training to enhance the ability of organization including control, exercise and maintain it.

This study suggests meaningful outcomes since the study analyzed using One-Way Analysis of Variance and regression analysis for sub-factors of fire-fighting organization, fire command capability and public opinion operation for fire-fighting response to disaster in previous research of Lee (2014). It is also meaningful in that the study highlighted the relationship between each independent variable and the organized civic behavior of fire officials.

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JeeYun Kim. "Impact of Earthquake Response Perception on Fire officials on Organizational Citizenship Behavior." *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, 25(7), 2020, pp. 38-45.