Finance & Management Engineering Journal of Africa (https://damaacademia.com/fmeja/)
Volume 1, Issue 4, pp.34-38, April 2019
Published by: Dama Academic Scholarly & Scientific Research Society (www.damaacademia.com)

# Internal Factors That Influence Unsafe Acts on Construction Workers

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***Abstract***
*The workers' unsafe action is a major cause of the work accident on building construction industry. Personal factors are variables that needed to be examined in the study of unsafe action due to its strong influence on personal behavior. We established influence between personal factors and unsafe acts using structural equation modeling (SEM). The study was observational research with cross sectional design. A questionnaire was administered to building construction worker, and the following results were obtained. First, worker's knowledge affected unsafe action by means of perceived benefit, and safety attitude. Second, worker's perceived risk directly affected worker's unsafe action. These findings can be used as preliminary data to develop safety programs specifically for safety communication between subcontractor, and workers.*

***Keywords:*** *unsafe acts, personal factors*

## 1.0 INTRODUCTION

Construction is one of the most dangerous industries in the world (Dong et al., 1995; Brunette, 2004; Waehrer et al., 2007; Sacks et al., 2009; Kim et al., 2013). The poor safety performance of the construction industry continues to give international cause for concern (Haslam et al, 2005). Heinrich (1980) asserted that accidents are caused by unsafe act or unsafe condition. Heinrich further claimed that the removal of either unsafe acts or unsafe conditions can prevent accident and injuries.Suraji et al. (2001) studied approximately 500 accident reports and found 29.9% were caused by inappropriate operative actions. Haslam et al. (2005) examined 100 accidents, 70% of which originated from worker and work team factors and 49% are caused by workers' unsafe behaviors. Based on large literature review of current studies on construction workers' unsafe behaviors, three major research directions in this field can be distinguished: safety climate/culture research, behavior-based safety research, and cognition-related safety research (Fang et al. 2016). Behavior-based safety research focuses on personal factors and attempts to improve worker safety behavior (Austin et al. 1996).

Personal factors are variables that needed to be examined in the study of unsafe behavior due to its strong influence on personal behavior (Geller, 2000; Griffin and Neal, 2000). Personal factors are inherent and vary. One of the personal factors is knowledge. Knowledge or cognitive is an important domain which is important for the formation of individual actions. Lombardi et al. (2009) and Edelson et al. (2009) examined why workers chose to behave unsafe in state of danger. They believed that the workers individuals' risk assessment, contextual factors, and social factors influence the internal processes (decision-making, and perception).Huang and Hinze (2003) states that error in estimating the danger can lead to unsafe acts of workers. Mullen (2004) describes that perceived risk will affect the behavior of the worker. This was confirmed by Seo (2005) which states perceived work pressure provide influence on employee behavior through perceived risk and perceived barriers, while perceived hazard provided influence on behavior through perceived risk. Kouanbenan (2009) describes that the values, beliefs and perceptions of risk influence the behavior and accidents.

Study conducted by Shin et al (2013) describes that safe working attitudes affect employee behavior. In addition, a study review conducted by Khosravi et al (2014) showed that the attitude and motivation have sufficient evidence to influence the occurrence of unsafe behavior and accidents. According to studies above there was a need to conduct a study to analyze the influence of internal factors to unsafe acts on construction workers.

## 2.0 METHOD

This study was an observational analytic with cross sectional approach. Population in this research is worker in the construction project of a new Provincial Governor Office of NTT, with total sample 200 construction workers. This research used questionnaire to assess worker's knowledge, perceived risk, perceived benefit and safety attitude. Additionally, we used checklist to assess worker's unsafe action. Data analysis in this research used structural equation model with Amos.

**3.0 RESULT**

A confirmatory factor analysis was conducted on worker's knowledge, perceived risk, perceived benefit, safety attitude, and unsafe action. Convergent validity was verified by standardized factors loadings (FL>0.4) and construct reliability (CR> 0.7; Ferdinand, 2002). Factor credibility was verified, loading factor and construct reliability for all factors were confirmed above 0.4 and 0.7 (Table 1).

Table 1. The Results of Confirmatory Factor Analysis

| Construct | Indicator | Loading Factor | Critical Ratio | P | Construct reliability |
|---|---|---|---|---|---|
| Knowledge | Know | .561 | | | .720 |
| | Understand | .670 | 4.009 | .000 | |
| | Assess | .556 | 4.064 | .000 | |
| Perceived Risk | Perceived Susceptibility | .878 | 1.978 | .048 | .993 |
| | Perceived Severity | .987 | | | |
| Perceived Benefit | Indicator 1 | .447 | 4.867 | .000 | .759 |
| | Indicator 2 | .482 | 5.131 | .000 | |
| | Indicator 3 | .428 | 4.658 | .000 | |
| | Indicator 4 | .501 | 5.324 | .000 | |
| | Indicator 5 | .536 | 5.395 | .000 | |
| | Indicator 6 | .405 | 3.971 | .000 | |
| | Indicator 7 | .561 | | | |
| Safety Attitude | Belief | .512 | 6.660 | .000 | .980 |
| | Internal Evaluation | .822 | | | |
| | Tend to behave | .740 | 9.941 | .000 | |
| Unsafe action | Observation 1 | .708 | | | .978 |
| | Observation 2 | .690 | 7.717 | .000 | |
| | Observation 3 | .787 | 8.101 | .000 | |

The initial research model was then analyzed. Result were $X^2$ = 187,733 ($p$ < .001), $X^2/df$ = 1.46, GFI = 0.905, AGFI = 0.874, NFI = 0.858, and RMSEA = 0.048. This process satisfied conformity and the hypotheses were tested (Table 2 and Figure 1). Worker's knowledge do not affect perceived risk and perceived risk do not affect safety attitude. But perceived risk directly affected worker's unsafe action. Additionally, worker's knowledge affected unsafe action by means of perceived benefit, and safety attitude.

Table 2. Hypothesis testing results

| Hypothesis | Estimate | C.R. | p | Hypothesis testing results |
|---|---|---|---|---|
| H1. Knowledge → Perceived Risk | .053 | .695 | .487 | Rejection |
| H2. Knowledge → Perceived Benefit | .300 | 2.690 | .007 | Adoption |
| H3. Perceived Risk → Safety Attitude | -.034 | -.537 | .591 | Rejection |
| H4. Perceived Benefit → Safety Attitude | .887 | 6.819 | .000 | Adoption |
| H5. Perceived Risk → Unsafe action | -.261 | -2.441 | .015 | Adoption |
| H6. Safety Attitude → Unsafe action | -.417 | -4.443 | .000 | Adoption |

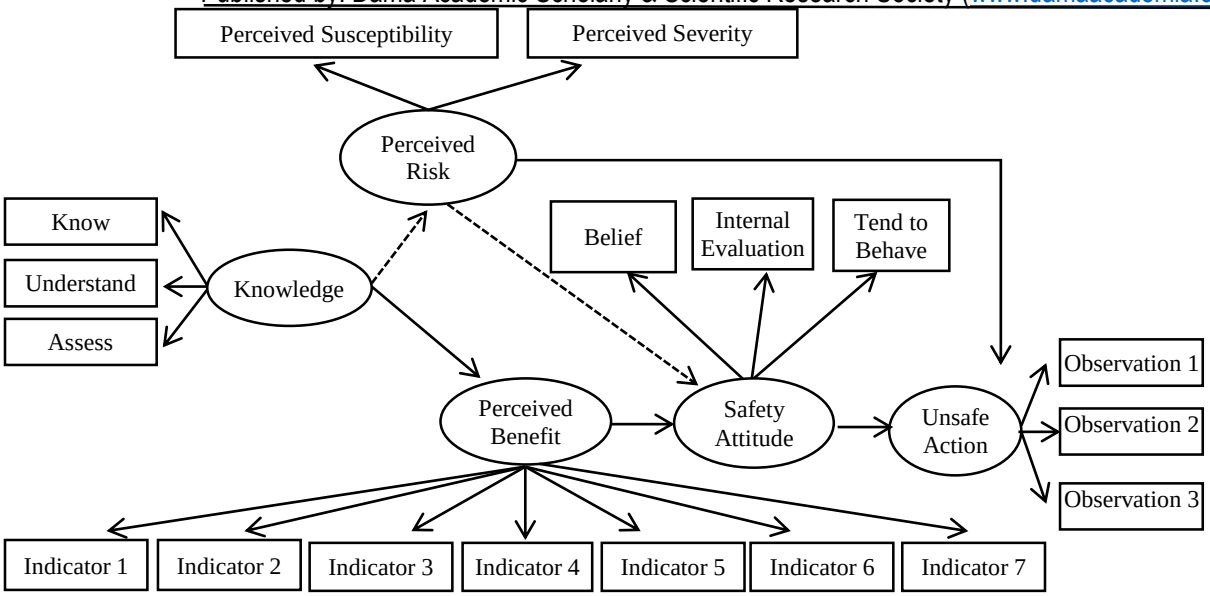


Figure 1. Structural model of unsafe action based on internal factors

**4.0 DISCUSSION**

Workers knowledge concerning Occupational Health and Safety (OHS) is influenced by how much information obtained by the workers in particular through training and various programs applied in the workplace. The better the knowledge of the respondent, the better the respondent assess the benefit of acting based on perceiving safe. Knowledge of unsafe acts and risks posed leads workers to think of ways to avoid the risks. At this stage, the workers have to think of the benefits of safe acts in work. After workers try and feel the benefits, they will defend these actions. Postlethwaite, et al (2009) describes the same that person with high cognitive abilities further demonstrate safe work behaviors. Additionally, Abdelhamid and Everett (2000) concluded that, workers who lack the training and knowledge of the job cannot identify both unsafe conditions and possibility of preventing the accidents. Thus knowledge becomes a factor that increases the perceived benefits of workers to act safely.

The results of this study indicated that knowledge did not influence the perceived risk of the respondents directly. This was due to other factors beyond the knowledge that provided influence to the perceived risk of the worker. Dejoy et al (2004) mentions that contextual factors at work are one of the factors that influence perceived safety in the workplace. These contextual factors may be the existing situation, the behavior of co-workers, behavior of subcontractors, behavior of contractors, workers experience, and the needs of workers, worker expectations, emotional states, and motivation of workers (Feldman, 2003). Experiencing workplace accidents (Oliver *et al*, 2002; Rundmo, 1992), and participation in the OHS programs (Cheyne *et al*, 1998; Goldberg, Dar-El, dan Rubin, 1991) are variable that provide influence to perceived risks of workers. Moreover, it is not uncommon that workers knowledge about the risks, benefits, and prevention of unsafe actions to be different from the real conditions faced in the workplace. This also causes unsafe acts.

Perceived respondent regarding the benefits of acting safely provide influence to respondents' attitudes towards safety, because the more respondents understand the benefits derived from an act, the person will decide to be positive about such measures. Edberg (2010), states that the perceived benefit is the positive result of believing a result of an action. Health Belief Model (HBM) assumes internal and rational processes, the person assessing the degree of risk they have and making calculations of the profit and loss if they participate or do not participate in a behavioral prevention/ control. In the cost-benefit calculation, perceived on the benefits become consideration before a person determines his attitude toward an action / behavior. Perceived risk did not influence attitudes about workplace safety. This was due to the majority of respondents (96%) perceiving enough vulnerability (at variable perceived risk) therefore variation of statistical data was too small. In addition, differences in understanding the risk among respondent with existing standards caused incorrect assessment. Huang, et al (2016) reported that perceived of workers about the risks are in different levels, there is a role of the project management to improve and adjust the level of understanding about the risks of workers. This will help reduce unsafe acts of workers.

The better the respondents' attitudes about workplace safety, the lower the unsafe acts will be done by respondents in construction of the building. Unsafe acts in the work being acted by workers because of two things: the workers do not know that the act was an unsafe act, and the workers knew that the acts were unsafe but workers deliberately not paying attention. The second reason was related to the influence of worker attitudes about workplace safety to unsafe acts. Positive attitudes reduces unsafe act, otherwise the negative attitude of the worker that leads to unsafe acts.Results of the review Khosravi, Asilian-Mahabadi, dan Hajizadeh (2014) showed that individual factors influenced unsafe behavior and accidents with substantial evidence. Attitude was one part of the individual factors influencing unsafe behavior and accidents on construction sites. Abdelhamid and Everett (2000), explains that workers who have been trained and have proper knowledge of his work but still decided to commit unsafe acts, will not be free of workplace accidents, unless they change the attitude.

Communication plays an important role in the process of change in the attitude of a person, because one of the goals is to influence attitudes of communicant, ranging from changes in thoughts, views, opinions, and feelings, even to behavioral change as desired by the communicator (Liliweri, 2009). A high frequency of communication will have an impact on worker attitudes changes, thereby reducing the unsafe behavior of workers (Kines, 2010). Liao et al (2014), also explains that good communication between workers and supervisors increases the cognition of workers and supports the reduction of unsafe acts in the workplace.

## 5.0 CONCLUSION

This study provided further evidence as to how the knowledge of workers affected worker's unsafe action, and the model has generated two core results. First, worker's knowledge affected unsafe action by means of perceived benefit, and safety attitude. Second, worker's perceived risk directly affected worker's unsafe action. Communication between sub-contractor and the workers can improved the knowledge of workers, worker's perceived benefit, and worker's safety attitude.

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