

## Exploring Impacts of Manager and Industry Characteristics on Protection Motivation: Based on an Enriched Protection Motivation Theory Model

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### Introduction

In recent years, the chemical industry started paying more attention to preventing technological accidents during natural hazards (called Natech). However, insufficient effort has been made to protect supply chain continuity when facing the risk of natural hazards in the chemical industry. For example, during the Noto Peninsula earthquake on 1 January 2024 in Japan, several hazardous material releases (including hydrochloric acid [1], oil [2], and gas [3]) occurred due to ground shaking, although the releases were quickly controlled, the supply chain disruption in some sectors may still be ongoing and affecting business partners outside of the earthquake-affected area. Construction companies in the affected areas indicated a desperate shortage of construction materials such as metal and wires after the event [4][5]. A survey conducted after the Noto Earthquake found that about 20% of 1225 companies realized the importance of formulating and reviewing their business continuity plan (BCP) [5].

Managers play critical roles in adopting proactive planning for catastrophic events in supply chains and their motivation is the key to implementation [6]. However, many factors could affect their behavior and decision-making. According to Renn [7], perception is the primary driver. Borjigin *et al.* [8] proposed an enriched protection motivation theory (PMT) model (see Figure 1) that examined how perceptual factors influence managers' protection motivation, including the perception of risk, costs, efficacy of the response, self-efficacy, resources, and perceptions of other factors that indicate cognitive biases. Other studies tested the impact of socio-psychological variables on

the threat appraisal and the coping appraisal of the PMT framework. Bubeck *et al.* [5] investigated how socioeconomic characteristics and past flood experience affect flood-coping appraisal and found insufficient relationships. However, Veeravalli *et al.* [9] reported that business characteristics and flood experience influence flood mitigation behavior.

### Purpose

This research examines whether the characteristics of the managers and the industries they work for have an impact on their supply chain protection motivation based on an enriched version of the protection motivation theory model. Four manager characteristics (role, current role experience, responsibility in supply chain, and past flood experience) and four industry characteristics (company size, multinational and non-multinational company, industrial sector, and location) were selected to establish a series of hypotheses to explore their relationships with protection motivation.

### Methodology

Data for the study was collected through an online questionnaire distributed to 161 chemical companies in Colombia, and 42 complete samples were used to conduct Multiple Linear Regression analysis on SPSS. The general form of the linear equation used is:

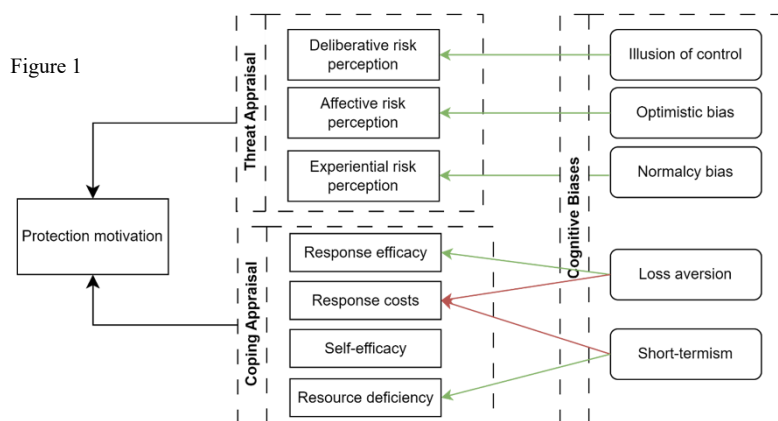
$$Y_{EpmiVar} = f(\text{role, current role experience, responsibility in supply chain, past flood experience, company size, multinational and non-multinational company, industrial sector, location}).$$

### Results

The results show that protection motivation is significantly related to roles, responsibilities in supply

chain, past flood experience, multinational companies, and industrial sector. In threat appraisal, experiential risk perception is influenced by industrial sector; affective risk perception is influenced by manager roles; while deliberative risk perception is not related to any characteristics in this study.

In coping appraisal, resource deficiency is found to be significantly affected by current role experience, company size, multinational and non-multinational companies, as well as industrial sector; response efficiency is influenced by flood experience, industrial sector and location; response costs are affected by current role experience; however, there are no factors found related to self-efficacy. Regarding cognitive biases, optimistic bias is related with current role experience and multinational and non-multinational companies; normalcy bias is related to responsibilities in supply chain and industrial sector. On the other hand, there was no relationship found between the illusion of control, short-termism and loss aversion to manager characteristics.



## Conclusion

To conclude, industrial sector is found to be related to the highest number of variables in the model (five). That is to say, managers from different industrial sectors showed distinctive cognitive processes in terms of supply chain protection motivation when facing the risk of flood-related Natech accidents. Besides, current role experience and multinational and non-multinational companies are found to be the strongest

factors that influence managers' protection motivation.

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