

DERIVATION OF SAFETY CLIMATE MODEL IN EAST MALAYSIA
CHEMICAL PROCESSING INDUSTRY

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A project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Science (Industrial Engineering)

Faculty of Mechanical Engineering
Universiti Teknologi Malaysia

JANUARY 2017

To my beloved mother and father

ACKNOWLEDGEMENT

I am grateful and would like to express my highest gratitude to those people, researchers, academicians and practitioner for all the guidance, encouragement and opinion in accomplishing this master's project report. In particular, I wish to express my sincere appreciation to my main supervisor, Dr. Jafri Mohd. Rohani for his guidance, motivation and advises.

I would like to thank occupational safety officers of studied companies for their sincere cooperation in the collection of data and all participated employees in this study. Furthermore, I also would like to express my gratitude to the following fine people: Madam Rozlina Md. Sirat and Mr. Affandi bin Mohd Zainal (academic member of staff in Universiti Teknologi Malaysia); Madam Roseni Abdul Aziz and Mr. Abdul Hanan bin Md. Basri (Officer of Safety and Health in Malaysia) for their sincere professional guidance I received. Without their continued support and interest, this study would not have been the same as presented here.

I acknowledged my greatest attitude to my fellow colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Lastly, my parents and sibling should also be recognized for their encouragement, sacrifices, financial support and being supportive during completing this project.

ABSTRAK

Kebanyakan penyelidikan fokus dalam mengkaji tentang pengesahan secara merentasi budaya iklim keselamatan model antara barat dengan timur dalam industri konteks. Kajian untuk menganalisis pengesahan iklim keselamatan model jarang dijalankan antara konteks industri timur. Kajian ini memberi tumpuan kepada pengesahan iklim keselamatan antara timur industri yang berkait dengan pemprosesan industri kimia di timur Malaysia. Kajian ini bertujuan untuk mengesahkan iklim keselamatan model yang berasal dari India supaya diuji untuk menilai ksesuaian dengan diaplikasikan oleh seluruh pekerja dari pemprosesan kimia industri di Malaysia. Lapan faktor iklim keselamatan model yang dicipta oleh Vinodkumar dan Bhasi (2009) akan disahkan melalui kajian perintis dan perundingan dengan panel pakar dalam membentuk kesahihan faktor model. Kaji soal selidik yang telah disemak semula akan diuji dengan sejumlah 544 pekerja daripada dua belas pemprosesan kimia industri. Hasil pengesahan kesahihan konstruk faktor iklim keselamatan model adalah tertakluk kepada *Exploratory* (EFA) dan *Confirmatory factor analyses* (CFA). Kesahihan berkaitan kriteria akan dianalisa dengan mengaitkan skor iklim keselamatan dengan kemalangan yang dilaporkan oleh pekerja sendiri dan kumpulan yang dikategorikan dari segi umur, tahap pendidikan, pengalaman bekerja dan jawatan di syarikat. Keputusan kajian menunjukkan bahawa asal lapan faktor iklim keselamatan model yang dicipta oleh Vinodkumar and Bhasi gagal diaplikasi oleh pemprosesan kimia industri di Malaysia. Salah satu alternatif iaitu tujuh faktor iklim keselamatan model telah dicipta dan disahkan dengan menggunakan EFA dan CFAs. Sampel tambahan juga disahkan untuk menyokong tujuh faktor iklim keselamatan model ini. Kajian ini menyediakan instrumen yang sah untuk mengukur iklim keselamatan di pemprosesan kimia industri di Malaysia.

ABSTRACT

Substantial research has investigated the cross-validation or cross-cultural of safety climate model between western and non-western industrial context. Few studies have analysed the validation of safety climate model among non-western industrial context. The present study focuses on the validation of safety climate in non-western industrial context of East Malaysia chemical processing industry. This study attempts to validate a safety climate model originally tested in India to assess its applicability in Malaysia context: across production workers in chemical industry. The eight first order factorial validity of safety climate model developed by Vinodkumar and Bhasi (2009) is initially validated through pilot study and consultation with expert panels. The revised items are subsequently implemented with a total of 544 employees at twelve chemical processing industries. Both exploratory (EFA) and confirmatory factor analyses (CFA) are performed to provide evidence of its construct validity. Criterion-related validity is then analysed to relate the safety climate scores to self-report accidents and independent groups (age, education levels, working experience and position). The findings of the present indicated that the original eight factors of safety climate model developed by Vinodkumar and Bhasi (2009) is failed to implement in the context of Malaysian chemical industry. An alternative seven factors model is developed and validated using EFA and CFA. Additional samples are again validated to support a consistent of this seven factors structure of safety climate. This study provides a valid and reliable instrument to measure the safety climate for in Malaysia chemical industry.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Occupational accidents and injuries continue to pose a major burden and challenge globally. It is estimated over 100 million occupational injuries occur worldwide each year; such injuries comprised for an approximately 350000 death (ILO, 2012). Occupational accidents and injuries have become one of the most important issues within workplace. One of the central demands for a good occupational safety and health at workplace is by having a good safety culture and climate within organization.

The study of safety culture and climate has gained many attentions from various researchers regarding its importance and contribution towards reducing occupational accidents, thereby increasing safety performance in workplace. Safety culture and climate serve as a basic guide for safety behaviours of employees (Zohor, 1980). These basic guidelines can help employees to develop perceptions and expectations regarding safety behaviours outcomes. However, there is an emergent of confusion relating to the relationship and differences between safety culture and safety climate based on the term defined by most researchers. Consequently, the term of safety climate is sometime used interchangeably with the term of safety culture. The definitions of climates are more based on perceptions whereas attitudes are considered to be a part of culture (Canso, 2008). Safety climate may consider as the psychological aspect of safety culture inclusive how people perceive and feel about their safety culture in an organizational. Furthermore, safety climate

can be seen as indicator of the organization's safety culture at a particular time and location (Cooper, 2004).

One of the earliest works done by Zohor (1980) had defined the safety climate as employees' shared perception of safety management including policies, procedures and practices in their work environment. Zohor's final safety climate model based on Israeli sample from metal fabrication, chemical, textile and food industries had included eight dimensions with worker's perception of the importance of safety training, management attitude towards safety, effect of safety conduct on promotion, level of risk at workplace, status of safety officer, effect of safety conduct on social status and status of safety committee. Revisited the works over the last 35 years, safety climate research has followed a four major trends: (I) designing psychometric measurement instruments and verifying their underlying factor structures (Hall *et al.*, 2013; Hassan *et al.*, 2015; Ghahramani and Khalkhali, 2015; Ghahramani, 2016); (II) investigating the relationship between safety perceptions and actual safety performance or safety behaviours (Cooper and Phillips, 2004; Clark, 2006; Baek *et al.*, 2011; Liu *et al.*, 2015); (III) examining the link between safety climate and other contributing occupational or organizational factors (Flin *et al.*, 2000; Yuan and Ma, 2008; Ghahramani, 2016); (IV) develop and cross-validate safety climate model constructed by previous work to ascertain its psychometric measure (Milijic *et al.*, 2013; Rodrigues *et al.*, 2015; Srinivasan *et al.*, 2016; Ajslev *et al.*, 2017; Huang *et al.*, 2017).

In Malaysia, the study of statistical based on PERKESO from 2009-2016 has showed the evidence of safety conditions in Malaysian manufacturing industry are more hazardous compared to other industries, although the manufacturing industry has become the most industry contribute to local economic development. With regards to this evidence, the NIOSH Malaysia aims to instil a safety culture and climate through education and safety training among Malaysia workforce (Thye, 2006). In addition, the DOSH in Malaysia has stated its OSH Master Plan 2015 where Malaysia currently is at the end of standard setting (2004-2010) and moving towards enforcement level (2011-2015) and preventative level (2016-2020) (DOSH, 2009a, 2009b). According to this master plan, this situation has developed one of

strategies to achieve this level by inculcating workplaces with safety and healthy work culture, emphasizing on ownership; self-regulation and preventive culture. A preventive safety and health culture could be initiated by measuring safety climate among the employees.

More recently, researchers have paid more attention on exploring the nature of safety climate in non-western countries and adopting it in the eastern cultures (Bahari and Clarke, 2013; Yousefi *et al.*, 2016). Most of the safety climate research has been conducted predominantly in developed western country (Bahari and Clarke, 2013), particularly Europe. Very limited work on safety climate measurement has been conducted in Eastern countries, particularly in Malaysia.

The present study decided to apply methodology originally developed in the west, and subsequently adopted to Indian context. The authors did this because India is a developing country in transition toward coexisting capitalist and socialist system. Furthermore, there is a wide presence of both private and public companies which lead to appearance of a specific working culture and safety climate. Malaysia is going through a similar transition. Accordingly, this study adopted a questionnaire developed by Vinodkumar and Bhasi (2009), which had been used to measure the safety climate in the chemical industry in India. This questionnaire is a basis for a further adoption of this model to the Malaysia context. It is hypothesized that the original eight factor model would be validated using the current sample.

1.2 Problem Statement

Most of studies have been conducted on developing and construction of the safety climate in organization. However, they have not reached a general consensus on safety climate dimensions or factors (Glendon and Litherland, 2001; Chen and Chen, 2012). Thereby, substantial research seeks to continue for developing a new safety climate instruments. Few developed instruments have been reused or

replicated by other researchers, contributing to the little agreement on the number of safety climate dimensions or factors. This occurrence is due to replication studies are less likely to gain attention as negative pre-conceptions of first tiers journals (Eden, 2002) and often less creative as perceived by most researchers (Easley *et al.*, 2000). However, Flin and his colleagues (2000) had claimed that the research should not be undertaken to generate a new safety climate measurement instruments, it should be focused on the validity of the construct and whether it produce a robust indication of an organization's safety climate. Within the same years, Guldenmund also claimed that lack of reliable and valid instrument to measure the safety climate of an organization. Hence, the author decided to adopt and validate previous' well developed questionnaire for this study.

Although a considerable amount of investigations on safety climate and culture studies have been conducted in Malaysia manufacturing industry, it is found that most of researchers are failed to distinguish between the safety climate and culture and treated both as synonymous to each other. Neal and Griffin (2004) and Guldenmun (2000) claimed that both safety climate and culture are distinct even though they are closely linked. To the best of author's knowledge, there have been very few safety climate studies conducted in Malaysia, and more specially, high hazard workplace such as chemical industry.

1.3 Objectives of the Study

The objectives of study are listed as follows:

- i. To develop and validate the origin Vinodkumar and Bhasi (2009) of first order factor structure of safety climate model
- ii. To investigate the status of safety climate in Malaysia chemical industry

1.4 Scope of the Study

The study is limited to chemical processing industry in East Malaysia to ensure homogeneity of the sample against cultural and language differences. The scopes are listed as below:

- i. Only local employees working in production areas are included in the study, excluding administrative staffs.
- ii. The validation of safety climate model is limited to three: (a) predictive validity; (b) discriminant validity, (c) construct validity

1.5 Importance of the Study

The study is important and significant in term of its theoretical and practical viewpoints. The rational and motivation for present study are:

- I. This study focuses on testing the factor validity of Vinodkumar and Bhasi safety climate model. Thereby, the developed instrument is a valid measurement for evaluating safety climate in Malaysia chemical industry and it is cheap and easy use for health and safety professionals.
- II. The study of safety climate in workplaces provides relevant information regarding level of safety climate on a group of workers in Malaysia chemical processing industry for developing effective safety strategies and policies.

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