



## LJMU Research Online

Lin, CC and Chang, CH

**Evaluating employee's perception toward the promotion of safety marketing at ports**

<http://researchonline.ljmu.ac.uk/id/eprint/12976/>

### Article

**Citation** (please note it is advisable to refer to the publisher's version if you intend to cite from this work)

**Lin, CC and Chang, CH (2021) Evaluating employee's perception toward the promotion of safety marketing at ports. International Journal of Shipping and Transport Logistics, 13 (3/4). pp. 275-299. ISSN 1756-6517**

LJMU has developed **LJMU Research Online** for users to access the research output of the University more effectively. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LJMU Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain.

The version presented here may differ from the published version or from the version of the record. Please see the repository URL above for details on accessing the published version and note that access may require a subscription.

For more information please contact [researchonline@ljmu.ac.uk](mailto:researchonline@ljmu.ac.uk)

<http://researchonline.ljmu.ac.uk/>

# Evaluating employee's perception toward the promotion of safety marketing at ports

Chi-Chang Lin

Department of Transportation and Technology Management,

Feng Chia University

No. 100, Wenhwa Rd., Seatwen District, Taichung City, Taiwan

Email: [joseph5473@gmail.com](mailto:joseph5473@gmail.com), [chiclin@fcu.edu.tw](mailto:chiclin@fcu.edu.tw)

Chia-Hsun Chang\*

Department of Maritime and Mechanical Engineering

Liverpool John Moores University

3 Byrom St, Liverpool, L3 3AF, UK

Email: [c.chang@ljmu.ac.uk](mailto:c.chang@ljmu.ac.uk)

\* Corresponding author

## Biographical notes:

Chi-Chang Lin is currently an Assistant Professor at the Department of Transportation and Logistics of Feng Chia University, Taiwan. He received his Ph.D. from the Department of Transportation and Communication Management, National Cheng Kung University (Taiwan) in 2013. Dr. Lin is acting a consultant in Innovation Center for Intelligent Transportation and Logistics at Feng Chia University. His research interest focuses on port operation, global logistics, and smart logistics. His recent publication can be found in professional journals such as *Maritime Policy and Management*, and *Maritime Business Review*, etc.

Chia-Hsun Chang is a Lecturer in the Department of Maritime and Mechanical Engineering at Liverpool John Moores University. He earned his PhD in International Shipping, Logistics and Operations from Plymouth University. Before joining Liverpool John Moores University, he worked at Chung-Ang University and Nanyang Technological University. His research interests are in the areas of maritime management, risk management, global logistics, autonomous shipping, and maritime cybersecurity.

## Abstract

This research aims to evaluate the effects of safety marketing on employee safety climate, safety attitude, and safety behaviour in the context of logistics operations at ports in Taiwan. Exploratory factor analysis is initially proceeded to identify the key factors of safety marketing and safety climate. Confirmatory factor analysis and Structural Equation Modelling examined the effects between safety marketing safety climate and supervisor's safety commitment on employees' safety attitude as well as behaviour. Results reveal that safety marketing has a positive effect on safety climate and employees' safety attitude, whereas a non-significant effect on employees' safety behaviour. Meanwhile, safety climate has a positive effect on employees' safety attitude. Results also show that supervisor's safety commitment has a positive effect on safety climate, safety attitude, and safety behaviour respectively. The mediating effect of safety attitude is also found between safety marketing, safety climate, supervisor's commitment and safety behaviour.

Keywords: safety marketing, safety climate, safety attitude, safety behaviour, supervisor's

commitment

## **1 Introduction**

Ports, as key nodes of the land–sea interface, exist as a vital networking site for trade and transportation. According to UNTCAD's (2019) report, around 80 per cent of global trade by volume and over 70 per cent of global trade by value are carried by sea and are handled by ports worldwide. Nowadays, ports have further extended their service scope to not only ships operations in berths but also value-added logistics activities (e.g. warehousing, distribution processing, and seamless delivery) in land side with other logistics service providers to enhance their competitiveness (UNTCAD, 2004). The role of contemporary ports has been conceived as integrated logistics hubs for both maritime and inland transport services. Numerous operators and activities are involved in port areas in which characterising a highly complex and dangerous operating system.

The diverse requirements on handling huge volume freight at port areas lead to more safety-related concerns. Over-loading operations increases the likelihood of potential damaging consequences and losses from improper cargo handling. Thus, ports are recognized as high-risk operating environment. Although port authorities have adopted relevant safety norms (e.g. OHSAS18001, ISO 14000 series) and have implemented many safety policies, initiatives, and regulations (e.g. the International Convention on Safety of Life at Sea (SOLAS)) for port operation, these measures seem unable to effectively lower accident events.

Most of research has found that human error is as the main risk factor contributing to the occurrence of accidents. Results indicates that around 80-90% of shipping accidents are caused by direct and indirect human error (Schröder-Hinrichs, 2010; Yip et al., 2015; Heij and Knapp, 2018). UK P & I Club (2012) concluded several reasons that can be categorised into human error that causes to maritime and port accidental damages, including failure to observe safety operation rules, lack of basic knowledge and experience, misjudgement, poor communication about work fatigue, and so on. Lu and Shang (2005) argued that managers' unsafe attitude regularly leads to accidents in port operations. Darbra and Casal (2004) and Hetherington et al. (2006) suggested that human error in safety related accidents can be categorized as unsafe behaviour and incorrect safety concepts and awareness. Other studies have revealed that human error might be due to organizations' inability to ensure that employees fully understand the importance of safe behaviour (Gillen et al., 2002; Shang and Lu, 2009). Yip et al. (2015) provided evidence that crew's unsafe behaviour are determinants of passenger injuries in passenger vessel accidents. Studies concluded that the occurrence of accidents can be reduced by the improvement of employees' safety attitudes and behaviour (Diaz and Cabrera, 1997; Neal et al., 2000; Lirn and Shang, 2015; Lu et al., 2016, 2018). To effectively change employees' safety attitudes and behaviour to prevent accidents, port operators need to emphasis the importance of complying safety regulations to their employees by promoting valid safety marketing programmes. Whether employees effectively enforce or merely recognize safety regulations become a crucial issue for the prevention of casualties. This indicates that despite the complete safety training programmes has been adopted in the organization, a lack of effective promotion mechanism will lead to a failure of programmes implement. Thus, safe marketing needs to deems as an active role rather than merely proposing static training materials.

As regarding port marketing, activities proceeded mainly focus on issues of how to provide competitive operating capabilities (Mandják et al., 2019) and maintain sustainable development (Lam and Li, 2019) from ports. Fewer discussions are found in the pushing of safety marketing (Lu et al., 2018). The implementation of safety norms cannot be just a simple way of carrying out sales and marketing activities but should pay close attention to the implementation of marketing strategies (Vecchio-Ssdus and Griffiths, 2004). In avoiding of irreparable disasters occurred, port operators should conduct safety marketing from the marketing strategy point of view. Effective promotion of safety concepts radically improves employees' safety awareness (Lu et al., 2018), increases the execution of safety regulations, as well as ensures that safety-related specifications and messages are precisely delivered to their target groups (i.e. port operations employees). Safety marketing also facilitates the shaping of organizational safety climate at port operations (Nævestad et al., 2019), which delivers correct safety perception to employees and enhances employees' safety attitudes. Further, the shaping of safety climate in the workplace brings effective effects on developing employees' safety behaviour (Neal et al., 2000; Hystad et al., 2014; Bergheim et al., 2015; Lu et al., 2016; Nævestad et al., 2019). Thus, the implementation of safety marketing requires not only setting up rules/regulation but also continuously arousing employees' awareness toward their safety behaviour.

Besides, supervisors' safety commitments are emphasized when carrying out safety marketing. Kletz (1985) considered that organizational commitment to safety requires, in addition to the publication of policies in a traditional written form, that supervisors are personally involved in developing more practical safety practices to change employees' safety practices and further reduce the likelihood of safety incidents. The more supervisors support and value safety behaviours, the more possible they can commit the implementation of safety marketing. The promotion and implementation of safety activities require the provision of appropriate resources and adequate support from high-level managers in organizations (Eiff, 1999).

Although many studies have addressed the relationship between the dimensions of safety climate, safety attitude, and safety behaviour in the context of shipping, logistics and transport fields, there is a lack of research investigating in the interrelationship between supervisors' safety commitment, safety marketing, safety attitude, safety climate, and safety behaviour in port operations. A research question is therefore arising that what are the interrelationship between these dimensions in port operations. To fill this gap, this research aims to examine the effects of safety marketing on employees' safety behaviour in the context of port operations.

This research is structured as follows. A brief introduction to safety related issues is given initially. Section 2 presents the rational behaviour model and safety related factors. Section 3 discusses the assumptions made when examining the relationship between safety marketing, safety climate, safety attitude, and safety behaviour. The effect of supervisors' commitment is also explored in this section. The results of the research analysis are presented in Section 4. Finally, conclusions are drawn and several practical theoretical applications and suggestions are proposed in Section 5.

## **2 Theoretical background and research hypotheses**

## 2.1 Theory of Planned behaviour

Employees' safety awareness needs to be formulated ahead of changing their safety behaviours. Employees will perform safety behaviour when they are engaged in safe acts. Fishbein (1967) and Fishbein and Ajzen (1975) proposed the theory of reasoned action, which has been applied to safety research, for example, by Rundmo and Hale (2003) and Håvold (2010). This theory states that people's "intentions" are influenced by "attitudes", "background traits", and "subjective norms". The most direct determinant of individual behaviour is their perception of things. Ajzen and Fishbein (1980) indicated that an individual's attitude can be enhanced by the process of teaching, together with the formation of personal cognitions and beliefs. Hence, when a person has a stronger "awareness" of a certain behaviour and a more positive "attitude", he or she will have greater intention to perform such behaviour. Ajzen (1985) further proposed theory of planned behaviour (TPB) by including perceived behavioural control to improve the predictive power of the theory of reasoned action. Ajzen (1991) suggested that the more favourable the attitude toward behaviour and subjective norm, and the greater the perceived behavioural control, the stronger the person's intention to perform the behaviour in question should be. TPB concluded that given an adequate level of actual control over the behaviour, people are expected to carry out their intentions when the awareness arises. TPB has been applied to studies of the relations among beliefs, attitudes, behavioural intentions and behaviours in various fields (e.g. marketing, advertising, public relations, healthcare, sport management and sustainability etc.). Based on this theory, safety marketing with three major processes (notification, persuasion, and reminders) can direct employees' safety attitudes and their willingness to perform better safety behaviour.

## 2.2 Safety Behaviour

Safety behaviour can be measured by crucial safety related factors' performance (e.g. safety climate, safety perception, safety attitude etc.). The dimensions for measurement vary due to industry differences (Lu and Yang, 2009). Borman and Mtowidlo (1993) and Campbell et al. (1993) proposed a "Safety Performance Evaluation Model" to examine safety behaviour, which includes two elements, namely safety compliance and safety participation. Safety compliance emphasizes that work is conducted in a secure and safe manner (Neal et al., 2000), while safety participation focuses on mutual assistance among colleagues, implementation of safety programmes and safety activities, and efforts to improve workplace safety. Burke et al. (2002) also proposed four dimensions for the measurement of safety behaviour, namely "Using personal protective equipment", "Engaging in work practices to reduce risk", "Communicating health and safety information", and "Exercising employee rights and responsibilities". Safety behaviour has also been applied to several maritime-related studies such as those of Lu and Yang (2010, 2011), Lu and Tsai (2010), and so on.

## 2.3 Safety Marketing

There is limited research addressing safety marketing in port operations. In general management, Tait and Walker (2000) emphasized the importance of safety marketing in small business management. They indicated that individual perceptions, attitudes, and motivations affect one's behavioural patterns. Based on this concept, companies need to set up safety knowledge as a prerequisite for establishing employees' safety awareness and then proceed with safety training to facilitate safety marketing in organizations. Yeung and Yee (2012) explained the contents of safety marketing in

terms of the 4Ps marketing mix (price, place, promotion, and product). The price of the chosen safety standard means that employees understand the safety practices and thus the number of casualties is reduced. Place increase employees' safety awareness and understanding of the organization's safety norms of convenience. In the promotion part, a variety of promotional methods is also important. An organization can therefore use various activities in a marketing mix (e.g. publicity, media broadcasting, personnel safety training, oral and online communication, and so on) to formulate safety decision-making and policy-making results (products) for the safety climate within the organization. Vecchio-Sadus and Griffiths (2004) suggested that executing marketing strategies is an effective method of improving an organization's safety operations. They also stressed that safety marketing begins with the correct safety knowledge, changes employees' thinking and attitudes, affects their behaviour, and then achieves an organizational safety climate. The promotion and implementation of safety activities require the provision of appropriate resources and adequate support from organizations (Eiff, 1999). Lu et al., (2018) discussed the safety marketing effectiveness toward ferry passengers' safety behaviour based on marketing stimuli response theory. The results found that safety marketing significantly have a positive impact on consumers' safety awareness as well as behaviour. Therefore, safety marketing at port might enhance the development of the safety climate at the port. Accordingly, this research hypothesizes that:

**H1: Port safety marketing has a positive impact on port safety climate.**

For the purpose of effectively delivering and implementing safety norms to change employees' safety attitudes and behaviour, enterprises need to develop effective marketing mix methods (Vecchio-Ssdus and Griffiths, 2004; Lu et al., 2018). The implementation of safety marketing ensures that port employees can maintain a positive attitude towards safety issues and further improve their own safety behaviour. When port employees receive safety-related messages from the port authorities, there is a higher probability that they will change their safety attitudes and adopt safety behaviour at port. Accordingly, this research hypothesizes that:

**H2: Port safety marketing has a positive impact on port employees' safety attitudes.**

**H3: Port safety marketing has a positive impact on port employees' safety behaviour.**

## 2.4 Safety Climate

Safety climate is a concept derived from the study of organizational culture and organizational climate. Zohar (2014) indicated that safety climate is a robust predictor of subjective and objective safety outcomes across industries and countries.

Safety climate has also been discussed in port operations. For example, Lu and Shang (2005) and Shang and Lu (2009) investigated longshoremen in Kaohsiung Port to find the determinants influencing the safety climate in the container terminal. Diaz and Cabrera (1997) analysed the relationship between safety climate, safety attitude, and employees' behaviour at an air carrier based in Spain and found that the safety climate affects employee safety behaviour. Choudhry et al. (2007) concluded that safety culture/climate influenced employees' safety attitudes and behaviour. Lu and Tsai (2010) addressed the effects of safety climate on container shipping accidents and found that

safety climate and safety attitude had a positive relationship. The identical result also found in Nævestad et al.'s research (2019). Accordingly, this research hypothesizes that:

**H4: Port safety climate has a positive impact on port employees' safety attitude.**

Hoffmann and Stetzer (1996) found that safety climate affects workplace safety practices. Neal et al. (2000) and Choudhry et al. (2007) provided consistent consults showing that safety climate has a significant impact on safety behaviour. Reber and Wallin (1984) and Tyler (1986) indicated that when one company has a high safety climate, the chances of accidents at work are reduced. Lu and Tsai (2010) investigated the effect of safety climate on seafarers' safety behaviours in container shipping and the results revealed a positive association between safety climate and seafarers' safety behaviour. Nævestad et al. (2019) also stressed the importance of safety culture and climate on unsafe behaviours and work accidents in maritime transport. Accordingly, this research hypothesizes that:

**H5: Port safety climate has a positive impact on port employees' safety behaviour.**

## 2.5 Safety Attitude

Safety attitude can be defined as an attitude of responding to things in an effective and safe way in highly stressful situations (Hannaford, 1976). It can be altered by many external stimuli such as stimulation by media and the formation of the organization's safety climate (Lu and Shang, 2005). Glendon et al. (2016) suggested that changes in employees' safety attitudes (e.g. listening to their safety messages, selection of safety information delivery channels, interaction with safety messaging personnel, personality factors, the presentation of organizational safety issues, and ongoing safety changes) will lead to changes in their safety behaviour. They also suggested that there is a positive relationship between safety attitude and safety behaviour. This means that employees who have a better safe working attitude can comply with safety norms and reduce damage and casualties during the loading and unloading of goods. Håvold (2005) conducted research on safety culture in a Norwegian shipping company and found that safety attitude and safety behaviour have a positive correlation. Several studies also indicated that safety attitude has a relationship with safety behaviour (Siu et al., 2004, Huang et al. 2006, Luria, 2010). Lu and Tsai (2010) and Nævestad, et al., (2019) have also empirically proved such relationship in the maritime industry. Accordingly, this research hypothesizes that:

**H6: Port employees' safety attitudes have a positive impact on port employees' safety behaviour.**

## 2.6 Supervisors' commitment

Barling et al. (2002) discovered that specific leadership behaviours have an essential impact on organizations' safety climates and further impacts on employee safety behaviour and safety performance. When employees perceive the supervisor's commitment to safety, this will have a direct impact on the formation of an organization's safety climate (Mullen, 2004). It implies that if supervisors place greater emphasize on safety behaviour, then employees will increase their safety attitudes.

Some research has emphasized the importance of the supervisor's commitment to

organizing a climate of safety and the impact on employees' safety behaviour (e.g. Mearns et al., 2003; Lu and Tsai, 2010). Supervisors at port with a high commitment to safety will also pay more attention to port safety issues. The supervisors' commitment also reflects managers' ongoing positive attitude towards safety issues and the ability to promote safety activities across the port. Supervisors' attitudes towards safety affect the port's decision to pursue its safety policy and safety-related matters. Safety policies and the implementation of safety marketing activities will affect the port employees' working environment. Hence, successful safety marketing needs participation from supervisors together with the utilization of appropriate promotion methods (e.g. creation of marketing concepts, the publication of safety articles, posters, advertising, and use of internet and e-mail) from the port. Therefore, supervisors' commitment to and support for employees' safety attitudes and behaviour will have both direct and indirect effects (Rundmo and Hale, 2003). In addition, supervisors' commitment plays a crucial role in facilitating the effects of safety marketing and safety climate to port employees' safety attitudes. Accordingly, this research sets up the following hypotheses:

**H7: Supervisors' safety commitment has a positive impact on port safety climate**

**H8: Supervisors' safety commitment has a positive impact on port employees' safety attitude**

**H9: Supervisors' safety commitment has a positive impact on port employees' safety behaviour**

Based on the above hypotheses, a research framework is proposed and showed in Figure 1.

**[Insert Figure 1 about here]**

### **3 Methodology**

#### **3.1 Sampling**

In order to ensure the clearly express of the original meaning of the fact, this study conducted several interviews with the relevant port's participants (including those engaged in port area operation) when designing the questionnaire. We surveyed port operators registered in Taiwan's international commercial ports (Keelung, Taipei, Taichung, and Kaohsiung), a total of 82 companies were found. Samples were selected from employees of these port operators (i.e. stevedore, shipside, tally, container yard, container freight station, transportation) working in port areas. In total, 1,500 questionnaires were sent to these companies for data collection, of which 1,000 questionnaires were distributed in the first wave, while the second wave of questionnaires was sent to those who did not respond to the first mailing to increase the response rate after two weeks. The questionnaire is asking by anonymous and has been passed the ethical approval. As a result, the total number of valid questionnaires collected was 606 copies, and the valid response rate was 40.4%.

#### **3.2 Non-response bias**



To detect any potential non-response bias, Armstrong and Overton (1977) recommend ensuring that the second wave of respondents' responses is similar to the responses of the first wave. The 606 survey respondents are divided into two groups based on their response wave (425 from the first wave and 181 from the second wave). A t-test is performed on the two groups' responses to the questions and the result indicates that, at a 5% significance level, there are no significant differences in the two groups' opinions. The result of the t-test reveals that non-response bias is not a problem in this study since the second-wave respondents' opinions remain similar to those of the first-wave respondents.

### 3.3 Common methods variance

In this research, a self-report questionnaire is utilized to collect related data. Some analysis findings might be biased as a result of measuring multiple constructs using the same respondent source, which could cause a common method variance (CMV) problem (Podsakoff et al., 2003). Accordingly, we used the ex-ante approach to remedy the 15 potential CMV bias. The dependent variable (safety behaviour) was evaluated based on respondents' perceptions of their peers' safety behaviour, while the independent variable (safety marketing, safety climate, and safety attitude) was also referred to the practice of other benchmarking port operators. Respondents were also assured of anonymity and the confidentiality of their responses and told that there were no right or wrong answers to encourage them to answer as honestly as possible. As a result, the common method variance problem was minimized in the study.

### 3.4 Measures

A research framework is established according to the research aim and literature review. Based on rational behaviour theory, the safety related factors of safety marketing, safety attitude, safety climate, and safety behaviour are connected and relevant hypotheses are formulated for the infrastructure. The questionnaire is designed under this framework and adjusted by carrying out interviews with port operating experts. Data are formulated by means of a questionnaire survey following the suggested approach of Iacobucci and Churchill (2010). Respondents are asked to give their levels of agreement with measurement items on a five-point Likert scale (from 1, strongly disagree, to 5, strongly agree).

### 3.5 Research Methodology

The purpose of this research is to examine the linkages between safety marketing, safety climate, safety attitude, and employee's safety behaviour in port operations. First, exploratory factor analysis (EFA) is utilized to identify the crucial factors of safety marketing and safety climate. Further, confirmatory factor analysis (CFA) is performed to assess the convergent and discriminant validity of the measurement items. Third, structural equation modelling (SEM) is structured to examine the research hypotheses. All analyses are carried out using the statistical packages SPSS 21.0 and AMOS 18.0 for Windows.

## 4. Research Findings

### 4.1 Characteristics of respondents

After collecting the questionnaire data, a descriptive analysis of the respondents' details is initially presented. With regard to gender, the result shows that 88.3% of port operation staff are male while only 11.7% are female. This is consistent with the fact

that most of the port operation staff are male. With regard to age, more than half (52.6%) of employees are between 36 and 45 years old, while 23.3% are over 46 years old, 18.7% are between 26 and 35 years old, and 5.4% are younger than 25 years old. This indicates that port operation faces an employee ageing issue. With regard to education, more than 90% of respondents have obtained a Bachelor's degree or above, and 11.1% of respondents have obtained a Master's degree or above, which indicates that most of the port operation employees in Taiwan have sufficient educational background and learning capability. With regard to job position, around 60% of respondents are specialists, while 30.4% are senior specialists, 6.6% are foremen with first-line management experience, 2.6% are managers, and 1.0% are supervisors. With regard to the work region, 33.2% of respondents work at Kaohsiung Port, 20.2% at Taichung Port, 18.0% at Keelung Port, and 18.3% at Taipei Port. With regard to work experience, 39.6% of respondents have more than 16 years of work experience, 30.2% have 11–15 years (30.2%), and 29.6% have less than 10 years. This indicates that most of the respondents have abundant work experience and thus the survey results are considered reliable. With regard to department, 23.4% of respondents work in the warehousing operation department, 20.5% in tally operations, 16.7% in stevedore, 15.8% in the loading/unloading operation department, 12.5% in the port area transport department, and 11.1% in shipside operations.

#### 4.2 Results of exploratory factor analysis (EFA)

EFA is conducted to identify the dimensions of “safety marketing” and “safety climate”. In total, 45 relevant questions are designed, of which 21 questions concern safety marketing and 24 questions are in the area of safety climate. This is to understand the awareness of port's operation employees to the promotion of safety marketing and to verify whether there is a safety climate within the organizations.

Before carrying out EFA, a Kaiser-Meyer-Olkin (KMO) test is conducted to examine the goodness of fit of the sampling. The KMO value lies between 0 and 1. A better common factor effect is shown by a KMO value closed to 1, which indicates that the data are fitter for conducting factor analysis. When a KMO value is greater than 0.8, it indicates that the data are fit for factor analysis. In this research, the KMO value is greater than 0.9, which indicates a proper index. Following that, this study uses Varimax to select an eigenvalue larger than 1 and factor loading larger than 0.5.

Factors named with variables are included after factor analysis. According to Hair et al. (2010), factors are named according to each variable's factor loading. In this study, factors are named according to the largest factor loading. The following paragraphs discuss the details of each factor under safety marketing and safety climate.

##### 4.2.1 Safety marketing

After conducting factor analysis in the dimension of safety marketing, a question item called “reward employees who have good safety performance” is deleted as it has factor loadings larger than 0.5 in two factors. Four factors are categorized with 66.773% of the accumulated explanatory variance and each factor's Cronbach  $\alpha$  is larger than 0.8 (see Table 1). The details of each factor are as follows.

##### Factor 1: Safety promotion

Nine question items belong to this factor, including “participating in public activities related to safety promotion to increase safety image”, “publishing safety promotion

advertisements in internal magazines”, “conducting safety operations promotion through the company’s website”, “sending e-mails to announce information about safety operations”, “Issuing reliable safety operation manual”, “delivering knowledge about hazardous goods to employees”, “Promoting warn marks of hazardous goods”, and “building and developing safety information website content”. The explanatory variance is 39.136%, the eigenvalue is 9.501, and the factor loadings are between 0.635 and 0.882. In addition, most of the items are related to safety promotion, and therefore this factor is named “safety promotion”.

#### Factor 2: Safety communication - Internal

Five question items belong to this factor, including “rapidly responding to safety related questions”, “Providing safety related conferences information”, “regularly conducting interviews with employees”, “preparing a budget to purchase safety protection equipment”, and “enhancing education and training related to professional safety knowledge to employees”. The explanatory variance is 13.56%, the eigenvalue is 2.933, and the factor loadings are between 0.616 and 0.776. In addition, most of the items are related to safety communication within an organization, and therefore this factor is named “safety communication - internal”.

#### Factor 3: Safety communication - External

There are four question items under this factor, namely “enhancing the safety management interactive relationship with port operators”, “posting information about safety operations”, “participating in domestic and international safety management associations”, and “regularly holding safety seminars or conferences to improve knowledge sharing”. The explanatory variance is 7.800%, the eigenvalue is 1.716, and the factor loadings are between 0.693 and 0.793. In addition, most of the items are related to safety communication with external partners or public, and therefore this factor is named “safety communication - external”.

#### Factor 4: Safety suggestion

There are three question items in this factor, namely “providing incentives and rewards for employees who propose safety operation schemes”, “providing incentives and rewards for employees who find safety problems”, and “establishing a safety promotion group”. The explanatory variance is 5.275%, the eigenvalue is 1.161, and the factor loadings are between 0.620 and 0.792. In addition, most of the items are related to safety suggestion, and therefore this factor is named “safety suggestion”.

[Insert Table 1 about here]

### 4.2.2 Safety climate

After conducting the factor analysis on the dimension of safety climate, a question item called “the company will implement the safety suggestions proposed by employees” is deleted as it has factor loadings larger than 0.5 on two factors. Four factors are categorized with 67.86% of the accumulated explanatory variance (see Table 2). The details of each factor are as follows:

#### Factor 1: Safety education

This factor has seven question items, namely “I think the safety education provided by my company is worth implementing”, “I think the safety education provided by my

company can be applied to my job”, “I think the safety education provided by my company is helpful for accident prevention”, “I think the safety education provided by my company is understandable”, “I think the safety education provided by my company has its own function”, “I think the safety education provided by my company is well designed”, and “I think the safety education provided by my company is very practical”. The explanatory variance is 42.071%, the eigenvalue is 6.945, and the factor loadings are between 0.556 and 0.801. In addition, most of the items are related to safety education, and therefore this factor is named “safety education”.

#### Factor 2: Safety regulation

This factor has eight question items, namely “the company strictly implements safety regulations”, “the company award safety behaviour”, “the company provides safety information”, “the company provides a safe work environment”, “the company cares about its employees’ safety”, “the company states that safety is as important as work”, “the company implements safety operation processes”, and “the company encourages safety behaviour”. The explanatory variance is 12.882%, the eigenvalue is 1.995, and the factor loadings are between 0.521 and 0.828. In addition, most of the items are related to safety rules and regulations, and this factor is named “safety regulation”.

#### Factor 3: Safety attention

Five question items belong to this factor, namely “I will pay attention to colleagues’ safety”, “I will pay attention to safety statements when working”, “I will keep the work environment safe”, “I will follow safety regulations”, and “I will encourage colleagues to pay attention to safety”. The explanatory variance is 7.580%, the eigenvalue is 1.566, and the factor loadings are between 0.582 and 0.832. In addition, most of the items are related to safety attention, and therefore this factor is named “safety attention”.

#### Factor 4: Safety information

Three questions items are categorized into this factor, namely “the company will provide correct information to employees when changing policies, operation processes, and production methods”, “the company will regularly promote safety activities and deliver work safety regulations and instructions”, and “the company has a good communication channel for discussion of employees’ safety issues”. The explanatory variance is 5.352%, the eigenvalue is 1.289, and the factor loadings are between 0.5031 and 0.792. In addition, most of the items are related to safety information, and therefore this factor is named “safety information”.

[Insert Table 2 about here]

### 4.3 Confirmatory factor analysis

The uni-dimensionality of each dimension explored is examined by employing CFA in this research. CFA refers to an approach of examining how well measured variables represent a smaller number of constructs involving the specification and estimation of one or more hypothesized models of factor structure (Koufteros, 1999; Hair et al., 2010). For each construct, a set of latent factors is proposed to account for the covariance among a set of observed variables (Koufteros, 1999). The measurement of safety marketing includes four latent variables, namely safety promotion, safety communication - internal, safety communication - external, and safety suggestion. Twenty-one observed variables are considered in the measuring model (nine observed

variables are loaded onto the safety promotion dimension, five onto the safety communication - internal dimension, four onto the safety communication – external dimension, and three onto the safety suggestion dimension). The measurement of safety climate is also examined in this research. Four safety climate related latent variables, namely safety education, safety regulation, safety attention, and safety information are considered in the examination (Koufteros, 1999; Hair et al., 2010).

After establishing examining factor structure, the goodness-of-fit of the model is tested through two stages. CFA is used on the theoretical model to test the goodness-of-fit of the whole model. As shown in Table 3, the results achieve the requirements (Hair et al., 2010), where  $\chi^2/DF = 1.45$  ( $\chi^2/DF < 2$ ), p value = 0.008 ( $p > 0.05$ ), GFI, AGFI, NFI, and TLI are all larger than 0.9, RMR is close to 0, and RMSEA is less than 0.08. All indicators achieve the requirements, and therefore the results show that this model is acceptable.

[Insert Table 3 about here]

#### 4.4 Discriminant validity and construct reliability

A factor's discriminant validity in a model can be justified by employing SEM methodology (Bagozzi and Phillips, 1982). High discriminant validity provides evidence that a factor is unique and captures some phenomena that other measures do not (Hair et al., 2010), which indicates that individual measured items should represent only one latent construct to avoid the presence of the cross-loading problem, which would discredit the CFA goodness of fit (Hair et al., 2010).

In this research, a chi-square test method is initially used to examine whether the chi-square value of the unconstrained model is significantly lower than that of the constrained model. Models with significant chi-square differences suggest the achievement of discriminant validity. If the fit of the two-construct model is significantly different from that of the one-construct model, then discriminant validity is supported. With regard to the four safety marketing factors, six different discriminant validity checks are compared. In addition, each set of four safety climate factors is also examined. The results reveal that all the differences between the fixed and free solutions in chi-square values are significant at the p-value of 0.05. The results provide evidence of discriminant validity among the theoretical constructs.

Then a more rigorous test is carried out to compare the average variance-extracted (AVE) values between any two factors in a construct (Hair et al., 2010) to compare its values with the squared correlation between constructs. According to Hair et al. (2010), the factor loading should reach at least 0.50, and then in practice, the AVE reveals an acceptable standard of at least 0.30 or 0.40. As depicted in Table 4, the AVE for a construct is considered substantially higher than the squared correlation between the safety marketing, safety climate, safety attitude, and safety behaviour. In Table 4, the highest squared correlation (0.236) is observed between safety attitude and safety marketing and is significantly lower than their individual AVE values. In addition, Table 4 reveals that all AVE values on safety related dimensions are higher than the squared correlation between the constructs. The results demonstrate evidence of discriminant validity for the study variables.

Further, we also examine the construct reliability for each construct. The reliability values of safety marketing, safety climate, safety attitude, and safety behaviour are 0.87, 0.86, 0.82, and 0.72 respectively. The construct reliability indicates the internal consistency between factors. The examined value of each construct ranges from 0.85 to 0.91, which reflects reasonable internal consistency in this research model, and therefore provides strong evidence of convergent validity.

[Insert Table 4 about here]

## 4.6 Results of Structure Equation Modelling (SEM)

### 4.6.1 Testing research hypotheses

Before examining the relationship of each factors, an F-test is conducted to examine whether any deferent perception exists among sample who drawn from different port operations roles. Result shows that no different perception between the different operators (i.e. stevedore, shipside, tally, container yard, container freight station, and transportation), which indicated that the sample is suitable for this research.

The second stage conducts the confirmation of the impact between safety marketing safety climate, and supervisor's commitment to employees' safety attitude and safety behaviour. First, this study analyses the relationship between safety marketing and safety attitude, safety climate, and employees' safety behaviour, respectively. The model identification results show that the standardized residual value is larger than  $\pm 1.96$  (Hair et al., 2010), which indicates that no item of the modification indices (MI) needs to be amended and all t-values for tested variables are significant (t-values  $> \pm 1.96$ ). The same results on the relationship between supervisor's commitment and safety climate, safety attitude, and safety behaviour have also been found. This implies that this model achieves coherent and convergent validity (Hair et al., 2010).

In terms of the goodness of fit of the SEM model, the  $\chi^2/DF$  is 1.99 (which is less than 2), GFI = 0.90, AGFI = 0.92, TLI = 0.91, NFI = 0.91 (all of which are larger than 0.9), RMR = 0.01 (which is very close to 0), and RMSEA = 0.02. Based on the above results, it can be concluded that this model has good goodness of fit. In terms of the cause-and-effect relationship between the latent variables of safety marketing, safety climate, safety attitude, safety behaviour and supervisor's commitment. This study uses the  $\beta$  value to test the research hypotheses and uses the t-value and p-value to test whether there are significant correlations between each pair of latent variables. The structure is shown in Figure 2. Table 5 lists the research results, which show that safety marketing has a positive and significant impact on safety climate and safety attitude but not a significant impact on safety behaviour. Safety climate has a positive and significant impact on safety attitude whereas it does not have a significant impact on safety behaviour. Safety attitude has a positive and significant impact on safety behaviour. Finally, supervisor's commitment shows a positive and significant impact of safety climate, safety attitude, and safety behaviour separately. Therefore, the results support H1, H2, H4, H6, H7, H8 and H9 indicating that employees' safety behaviour could be influenced by safety attitude as well as supervisor commitment.

[Insert Figure 2 about here]

[Insert Table 5 about here]

Table 6 displays the results of path analysis between each construct. In the relationship between safety marketing and safety climate, the total effect is 0.41. In the relationship between safety marketing and safety attitude, the total effect of safety marketing on safety attitude is 0.93 (direct effect = 0.81 and indirect effect =  $0.41 \times 0.29$ ). The results also show that only an indirect effect (0.10) on the link between safety marketing and safety behaviour, indicating that the safety market has no direct influence on employee safety behaviour. Regarding safety climate, there is a direct effect (0.29) on safety attitude, while only an indirect effect (0.03) is found on safety behaviour. The result also reveals that there is a significant direct effect (0.12) on the link between safety attitude and safety behaviour. Finally, supervisor's commitment reveals a significant relationship between safety climate (direct effect = 0.44), safety attitude (direct + indirect effect = 0.57), and safety behaviour (direct + indirect effect = 0.65).

[Insert Table 6 about here]

#### 4.6.2 Examining the mediating effect

From the above results in Figure 2, safety climate between supervisor's commitment and safety attitude has a positive effect, while safety attitude plays a mediating role between supervisor's commitment and safety behaviour. Results also show that safety marketing has an indirect effect on safety behaviour. With regard to safety climate, an indirect effect on safety behaviour is also found. This indicates the existence of the negative mediating effect of safety attitude. In figures 3 and 4, we examine the relationship between safety marketing and safety behaviour and between safety climate and safety behaviour separately. The results show a significant influence of safety marketing and safety climate on safety behaviour after a regression analysis. This indicates that port operators need to consider employee's attitudes toward safety issues when they promote safety marketing and formulate the safety climate.

[Insert Figure 3 about here]

[Insert Figure 4 about here]

## 5. Discussion and conclusion

Safety is an important issue, especially for port operations but it would be useless without effective promotion. Ports have been recognized as areas where accidents occur frequently due to the complication from diverse personnel and equipment operation. How to make the employees perceive the importance of safety and further change their behaviour has become an important issue in port areas. Employees' safety awareness needs to be transformed ahead of changing their safety behaviours. Port operators should consider adopting safety marketing measures to increase employees' understanding of safety concepts and willingness to follow the safety norms. This study aims to discuss the interrelationship between safety marketing, safety climate, safety attitude, and safety behaviour in port operations and further consider the effects of supervisor's commitment. Based on the results of factor analysis, four factors are categorized into the dimension of safety marketing, namely safety promotion, safety

communication - internal, safety communication - external, and safety suggestion. Another four factors are categorized into the dimension of safety climate, namely safety education, safety regulation, safety attention, and safety information. Through SEM analysis, this study finds that safety marketing has a significant positive impact on safety climate and safety attitude, while safety climate has a positive impact on safety attitude and employees' safety behaviour (Nævestad et al., 2019). The results also indicated that safety attitude has a positive influence on safety behaviour which consistent with the finding from Lu et al.'s (2018) research. When examining the effect of supervisor's commitment in the model, results reveal that supervisor's commitment has a significant effect on safety climate, safety attitude, and safety behaviours. While exploring the mediating effects, the result shows that employees' safety attitudes have an effect of weakening the relationship between safety marketing, safety climate and safety behaviour.

### 5.1 Implication of the research findings

Several implications are drawn from the findings of this study. First, safety marketing needs to be considered as a crucial factor in influencing employee safety behaviour in port operations. In consistency with previous studies (Neal et al., 2000), safety marketing (Lu et al., 2018) and safety climate (Nævestad et al., 2019) have positive effects on employee safety behaviour by means of safety attitude. Through safety related training and promotion, port operators shape a sound safety atmosphere within organizations, cultivate employees' awareness of correct and safe operations, and transform the safety values into part of the employees' attitudes and behaviour. Given the benefits of safety marketing in changing employee safety behaviour, port operators should strive to promote effective safety marketing programmes to influence employees' safety attitudes and further change their safety behaviour. Further, among four safety marketing related factors, safety suggestion earned the highest mean scores, followed by safety communication – external, safety promotion, and safety communication – internal. The results suggested that port operators should be prior to consider of providing appropriate incentives and rewards to employee's idea of finding solution for reducing the likelihood of accidents. Port operators are also to encourage their employee to form a group to share any useful improvement plan toward safety promotion. When observing another four factors which categorized the safety climate dimension, safety regulation ranks the highest position, which obtaining a mean score to 4.689. The findings suggest that port operators should start by formulating strict, clear and practical regulations as well as providing enough safety related information to establish a safe environment. Therefore, employees are encouraged to take safe behaviour based on the awareness of safety climate existing in the workplace.

Second, the research findings demonstrate the value of formulating a safety climate, which is found to be positively associated with employee safety attitudes and behaviour in port operations. Hence, in order to improve employees' safety behaviour, port operators should set up systems to reward safety behaviour. Through improving the operations environment atmosphere and changing employees' safety attitudes, employees can generate a positive impact on operational safety behaviour and reduce incidents of injury and death in the complex and dangerous port operation environment. This research recommends that port operators should focus on creating a safety climate that emphasizes employees' good safety attitudes and behaviours by concentrating on adherence to regulations and professional norms.



Another important finding of this research is that an existing mediating effect of safety attitude exists between safety marketing, safety climate, supervisor's commitment and safety behaviour. Therefore, port operators need to realize that when promoting safety marketing programmes, it is better to effectively improve employees' safety attitudes. This indicates that employees are likely to perform safety behaviours well when they fully understand the importance of safety norms. In addition, supervisor's commitment plays a crucial role for enhancing the organizational safety climate, employee's safety awareness. Active supervisor promises make employee safety behaviour more practicable. In addition, supervisors' safety commitments reinforce the awareness of safety attitude effect.

Theoretically, this study highlights the importance of safety marketing and safety climate as well as supervisor's commitment to the impact on safety attitude and behaviour of employees. Moreover, this study answers several crucial questions. For example: What are the components of safety marketing in the context of port operation? What are employees' perceptions of safety marketing and safety climate in the port context? Further, this research illustrates how safety marketing and safety climate influence employee safety behaviour in the port sector. In particular, this research finds a mediating effect of safety attitude on the relationship between safety marketing, safety climate, supervisor's commitment and safety behaviour.

Practically, previous studies have focused on the topics of competitiveness and sustainable development in port marketing while limited research on the importance of promoting safety behaviour (Mandják et al., 2019). From reviewing previous literature, we only found that Lu et al.'s (2018) research considers safety marketing stimuli, safety awareness, and safety behaviour simultaneously in the context of ferry industry. To the best of our knowledge, this is the first study to provide empirical evidence of the importance of safety marketing in explaining employee's safety attitude and behaviour in the port context. More specifically, this research fills the gap in port operation literature since there is a scarcity of studies explaining employees' safety behaviour from the safety marketing and safety climate perspectives in the port context.

## 5.2 Limitations and future research

This research has several limitations. First, the sample adopted for the survey may be subject to bias as a result of respondents' reluctance to express safety-related behaviours due to potential personal repercussions. Future research could consider a more objective method of sampling to obtain more precise results. Second, a mediating effect of safety attitude is found when examining the relationship between safety marketing and the link between safety climate and safety behaviour. However, the unexpected effects of why safety attitude mitigates the relationships between related factors in this research were not further addressed due to the original research framework. Future research can further explore the actual influencing factors of safety attitudes. This research finds that port supervisors play a crucial role in strengthening employees' safety attitudes. Port operators should apply such finding to implement safety marketing activities and develop internal attention to the importance of safety climate. This can significantly improve employees' development of the correct safety operations attitude and thus they will be willing to follow safety operation behaviour to reduce the occurrence of accidents. This result is supported by Rundmo and Hale (2003), who suggested that the support for the organization's safety concept by port supervisors not only impacts on the promotion of safety marketing but also helps the development of safety climate.

Simultaneously, it also has impacts on employees' recognition of safety attitudes and further influences their safety behaviour. Therefore, when port operators promote activities related to safety marketing, it is suggested that they let supervisors understand in advance the importance of safety marketing and acquire their permission to participate in future research. This can allow employees' trust to be gained when companies promote activities related to safety marketing and further improve their safety attitudes and safety behaviour in operations. Therefore, through confirmation by supervisors about the recognition level of the importance of safety issues and their willingness to cooperate with the promotion of safety measures by companies, port operators can use interviews and case studies to enhance these supervisors' willingness to promote safety marketing. Fourth, this research mainly focused on employees of the port operators in Taiwan. It would be valuable to collect data from employees from other countries to obtain a balanced view of the relationship between safety marketing, safety climate, safety attitude, and safety behaviour in port operations. Finally, future research can consider using the longitudinal approach to investigate the short- and long-term effects of safety marketing and safety climate on employees' safety attitudes and behaviour in port operations.

## References

1. Ajzen, I. 1985. From Intentions to Actions: A Theory of Planned Behaviour. *Action Control*. Berlin, Heidelberg: Springer Berlin Heidelberg. 11–39.
2. Ajzen, I. 1991. *Organizational Behaviour and Human Decision Processes*, 50(2), 179-211.
3. Ajzen, I. and Fishbein, M., 1980. Understanding attitudes and predicting social behaviour. Prentice-Hall, Englewood Cliffs: NJ.
4. Armstrong, S. J., and T. S. Overton. 1977. Estimating nonresponse bias in mail survey. *Journal of Marketing Research* 14, 396-402.
5. Bagozzi, R.P., Phillips, L.W., 1982. Representing and testing organizational theories: a holistic construal. *Administrative Science Quarterly* 27(3), 459-489.
6. Barling, J., Loughlin, C. and Kelloway, K., 2002. Developing and test of a model linking safety-specific transformational leadership and occupational safety. *Journal of Applied Psychology*, 87, 488-496.
7. Bergheim, K., Nielsen, M. B., Mearns, K., and Eid, J. 2015. The relationship between psychological capital, job satisfaction, and safety perceptions in the maritime industry. *Safety science*, 74, 27-36.
8. Borman, W.C. and Motowidlo, S.J., 1993. Expanding the Criterion Domain to Include Elements of Contextual Performance. In: Schmitt, N., Borman, W.C. and Associates, *Personnel Selection in Organizations*, Jossey-Bass: San Francisco, 71-98.
9. Bureke, M.J., Sarpy, S.A., Tesluk, P.E. and Smith-Crowe, K., 2002. General safety performance: a test of a grounded theoretical model. *Personnel Psychology*, 55(2), 429-457.
10. Campbell, J.P., McCloy, R.A., Oppler, S.H. and Sager, C.E., 1993. A Theory of Performance. In: Schmitt, J., Borman, W.C. Associates. *Personnel Selection in Organization*, Jossey-Bass: San Francisco, CA, 35-69.
11. Choudhry, R.M., Fang, D., and Mohamed, S. (2007). The nature of safety culture: a survey of the state-of-the-art. *Safety Science*, 45(10), pp. 993-1012
12. Darbra, R.M. and Casal, J., 2004. Historical analysis of accidents in seaports. *Safety Science*, 42(2), 85-98.

13. Diaz, R.I., Cabrera, D. D. 1997. Safety climate and attitude as evaluation measures of organizational safety, *Accident Analysis and Prevention*, 29, 643-650.
14. Eiff, G., 1999. Organizational safety culture. In: *Proceedings of the Tenth International Symposium on Aviation Psychology*, 1-14.
15. Fishbein, M., 1967. *Readings in attitude theory and measurement*. Wiley: New York.
16. Fishbein, M. and Ajzen, I., 1975. *Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research*. Reading, Addison-Wesley: MA.
17. Gillen, M., Baltz, D., Gassel, M., Kirsch, L. and Vaccaro, D. 2002. Perceived safety climate, job demands, and co-workers' support among union and nonunion injured construction workers. *Journal of Safety Research*, 33, 33-51.
18. Glendon, A.I., Clarke, S., and Mckenna, E.F., 2016. *Human Safety and Risk Management*. Chapman & Hall: New York.
19. Hair, J. F., Black, W. C., Babin, B. J. and Anderson, R. E. 2010. *Multivariate Data Analysis*, 7th ed. Upper Saddle River, Prentice-Hall, New Jersey.
20. Hannaford, E., 1976. *Supervisors Guide to Human Relations*. National Safety Council: Chicago.
21. Håvold, J. I. 2005. Safety-culture in a Norwegian shipping company. *Journal of safety research*, 36(5), 441-458.
22. Håvold, J. I. 2010. Safety culture and safety management aboard tankers. *Reliability Engineering & System Safety*, 95(5), 511-519.
23. Heij, C. and Knapp, S., 2018. Predictive power of inspection outcomes for future shipping accidents – an empirical appraisal with special attention for human factor aspects, *Maritime Policy and Management*, 45 (5), 604-621.
24. Hentherington, C., Flin, R., Mearns, K., 2006. Safety in shipping: the human element. *Journal of Safety Research*, 37, 401-411.
25. Hofmann, D.A. and Stetzer, A., 1996. A cross-level investigation of factors influencing unsafe behaviours and accidents. *Personnel Psychology*, 49, 307-339.
26. Huang, Y.K., Ho, M., Smith, G.S., and Chen P.Y. (2006) Safety climate and self-reported injury: assessing the mediating role of employee safety control. *Accident Analysis & Prevention*, 38, pp. 425-433
27. Hystad, S. W., Bartone, P. T., & Eid, J. (2014). Positive organizational behaviour and safety in the offshore oil industry: Exploring the determinants of positive safety climate. *The journal of positive psychology*, 9(1), 42-53.
28. Iacobucci, D., and G. A. Churchill. 2010. *Marketing Research: Methodological Foundation*, 10th edition, The Dryden Press, New York.
29. Kletz, T.A., 1985. *An Engineer's View of Human Error*, Institute of Chemical Engineers. Warwickshire: England.
30. Koufteros, X.A., 1999. Testing a model of pull production: a paradigm for manufacturing research using structural equation modeling. *Journal of Operation Management* 17(4), 467-488.
31. Lam, J.S.L, and Li, K. X. 2019. Green port marketing for sustainable growth and development. *Transport Policy*, 84, 73-81.
32. Lirn, T.C. and Shang, K.C., 2015. An empirical survey on port risk management in the Kaohsiung Port. *Journal of the Eastern Asia Society for Transportation Studies*, 11, 2277-2295.
33. Lu, C. S., Hsu, C. N., and Lee, C. H. 2016. The Impact of Seafarers' Perceptions of National Culture and Leadership on Safety Attitude and Safety Behaviour in Dry Bulk Shipping. *International Journal of e-Navigation and Maritime Economy*, 4, 75-87.
34. Lu, C.S., Poon, H.Y., and Weng, H.K. 2018. A safety marketing stimuli response

- model of passenger behaviour in the ferry context. *Maritime Business Review*, 3(4), 354-374.
35. Lu, C.S. and Shang, K.C., 2005. An empirical investigation of safety climate in container terminal operators. *Journal of Safety Research*, 36(3), 297-308.
  36. Lu, C. S., and Tsai, C. L., 2010. The effect of safety climate on seafarers' safety behaviours in container shipping. *Accident Analysis and Prevention*, 42(6), 1999-2006.
  37. Lu, C.S. and Yang, C.S., 2009. Safety leadership and safety behaviour in container terminal operations. *Safety Science*, 48(2), 123-134.
  38. Lu, C.S. and Yang, C.S., 2010. Safety leadership and safety behaviour in container terminal operations. *Safety Science*, 48(2), 123-134.
  39. Lu, C. S., and Yang, C. S. 2011. Safety climate and safety behaviour in the passenger ferry context. *Accident Analysis & Prevention*, 43(1), 329-341.
  40. Luria, G. 2010. The social aspects of safety management: trust and safety climate. *Accident Analysis & Prevention*, 42, pp. 1288-1295
  41. Mandják, T., Lavissière, A., Hofmann, J., Bouchery, Y., Lavissière, M. C., Faury, O., and Sohier, R. 2019. Port marketing from a multidisciplinary perspective: A systematic literature review and lexicometric analysis. *Transport Policy*, 84, 50-72.
  42. Mearns, K. Whitaker, S.M. and Flin, R. 2003. Safety climate, safety management practice and safety performance in offshore environments. *Safety Science*, 41(8), 641-680
  43. Mullen, J., 2004. Investigating factors that influence individual safety behaviour at work. *Journal of Safety Research*, 35, 275-285.
  44. Nævestad, T. O., Phillipsa, R. O., Størkersenb, K. V., Laiouc, A. and Yannis, G. 2019. Safety culture in maritime transport in Norway and Greece: Exploring national, sectorial and organizational influences on unsafe behaviours and work accidents. *Marine Policy*. 99, 1-13.
  45. Neal, A., Griffin, M.A. and Hart, P.M., 2000. The impact of organizational climate on safety climate and individual behaviour. *Safety Science*, 34(1-3), 99-109.
  46. Podsakoff, P.M., MacKenzie, S.B., and Podsakoff, N.P., 2003. Common Method Biases in Behaviour Research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903.
  47. Reber, R.A. and Wallin, J.A., 1984. The effects of training, goal setting, and knowledge of results on safe behaviour: A component analysis. *Academy of Management Journal*, 27, 544-560.
  48. Rundmo, T. and Hale, A.R., 2003. Manager's attitudes towards safety and accident prevention. *Safety Science*, 41, 557-574.
  49. Schröder-Hinrichs, J. U., 2010. Human and organizational factors in the maritime world – are we keeping up to speed?, *WMU Journal of Maritime Affairs*, 9 (1), 1-3
  50. Shang, K.C. and Lu, C.S., 2009. Effects of safety climate on perceptions of safety performance in container terminal operations. *Transport Reviews*, 29(1), 1-19.
  51. Siu, O.L. Phillips, D.R., and Leung, T.W. 2004. Safety climate and safety performance among construction workers in Hong Kong: the role of psychological strains as mediators. *Accident Analysis & Prevention*, 36, pp. 359-366
  52. Tait, R., and Walker, D., 2000. Motivating the workforce: The value of external health and safety awards. *Journal of Safety Research*, 31(4), 243-251.
  53. Tyler, W.W., 1986. Measuring unsafe behaviour. *Professional Safety*, 31, 20-24.
  54. UK P& I, 2012. <http://www.ukpandi.com/loss-prevention/?source=www.ukpandi.com>. (Accessed on 10 Jan 2018)
  55. UNCTAD, 2004. Assessment of a seaport land interface: an analytical framework.

Available at [http://unctad.org/en/Docs/sdtetlbmisc20043\\_en.pdf](http://unctad.org/en/Docs/sdtetlbmisc20043_en.pdf). (Accessed on 10 Jan 2018)

56. UNCTAD. 2019. Review of Maritime Transport 20189, United Nations Publications, New York.
57. Vecchio-Sadus, A.M. and Griffiths, S., 2004. Marketing strategies for enhancing safety culture. *Safety Science*, 42, 601-619.
58. Yeung, R. and Yee, W.M.S., 2012. Incorporating marketing strategies into consumer risk coping framework. *British Food Journal*, 114(1), 40-53.
59. Yip, T.L., Jin, D. and Talley, W.K. 2015. Determinants of injuries in passenger vessel accidents. *Accident Analysis and Prevention*. 82, 112-117.
60. Zohar, D. 2014. Safety climate: conceptualization, measurement, and improvement. In: Schneider, B. and Barbera, K.M. *The Oxford Handbook of Organizational Climate and Culture*. NY: Oxford University Press.

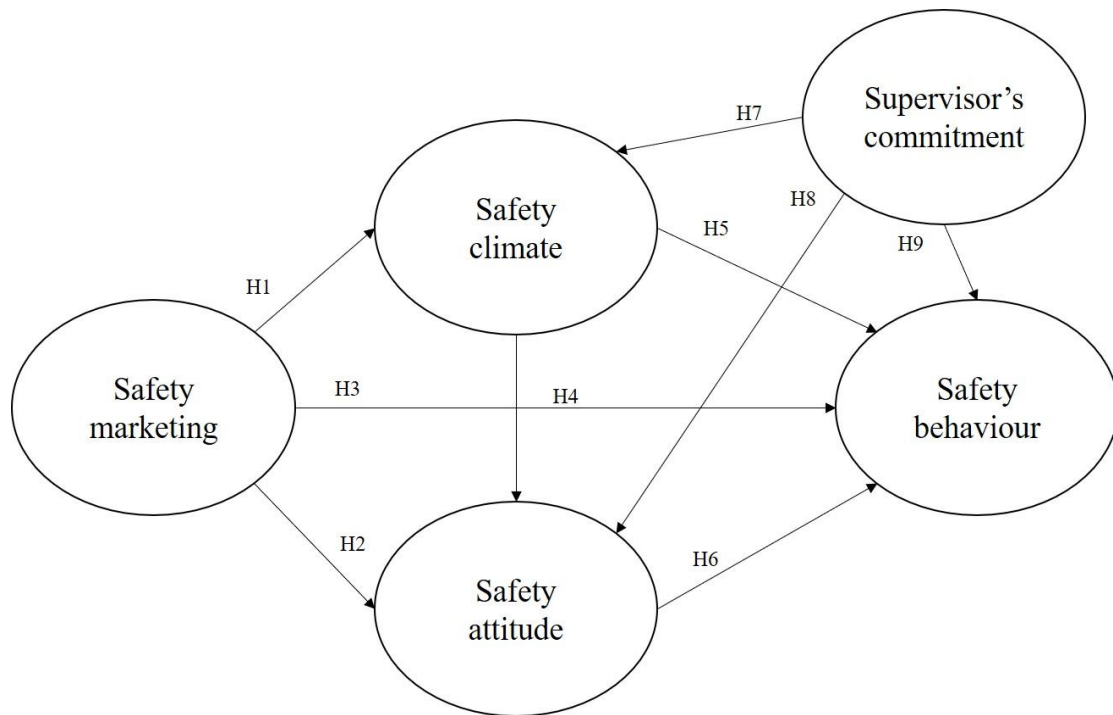


Figure 1 Research framework

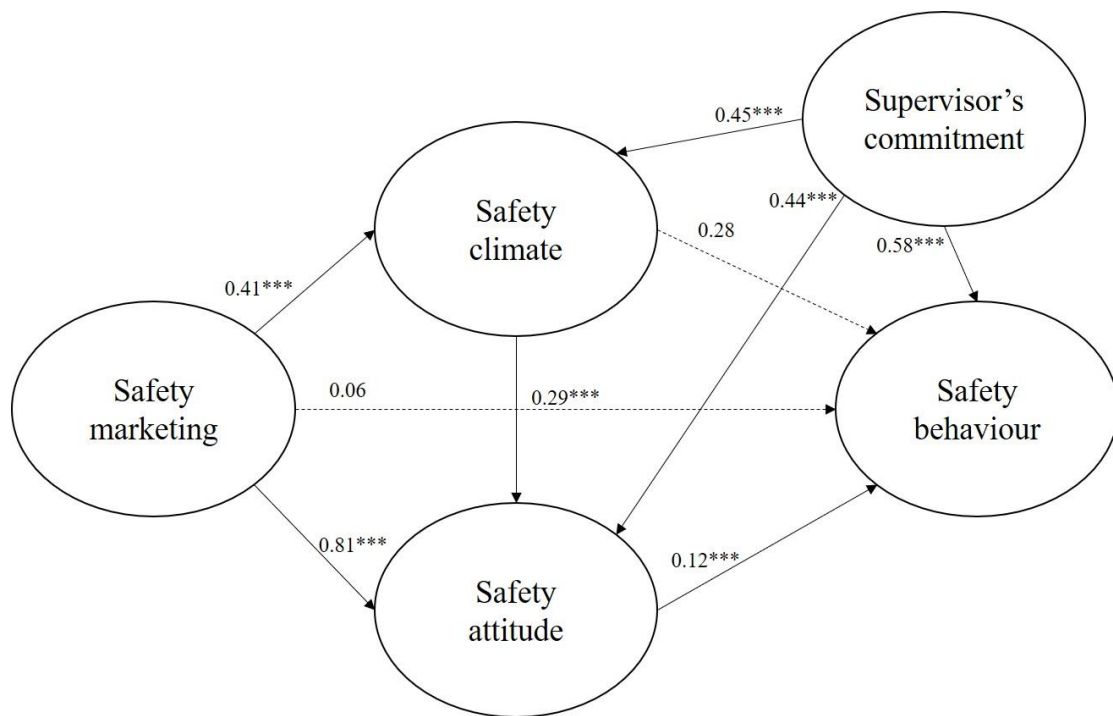


Figure 2 SEM results

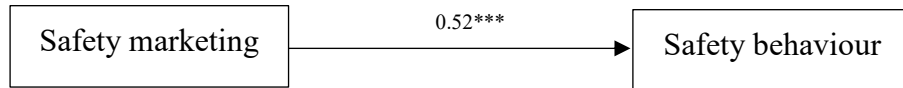


Figure 3 Regression results between Safety marketing and Safety behaviour

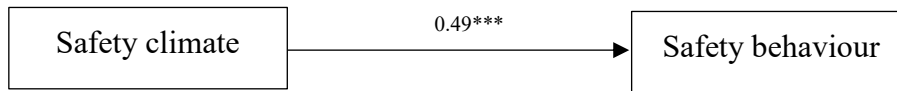


Figure 4 Regression results between Safety climate and Safety behaviour

Table 1 Factor analysis of safety marketing

Item	Factor			
	1	2	3	4
Participating in public activities related to safety promotion to increase safety image	<b>0.882</b>			
Publishing safety promotion advertisement in internal magazines	<b>0.826</b>			
Conducting safety operations promotion through the company's website	<b>0.801</b>			
Sending e-mails to announce information about safety operations	<b>0.796</b>			
Issuing reliable safety operation manual	<b>0.788</b>			
Delivering knowledge about hazardous goods to employees	<b>0.730</b>			
Promoting warn marks of hazardous goods	<b>0.726</b>			
Building and developing safety information website content	<b>0.635</b>			
Rapidly responding to safety related questions		<b>0.808</b>		
Regularly conducting interviews with employees		<b>0.824</b>		
Preparing a budget to purchase safety protection equipment		<b>0.727</b>		
Providing safety related conferences information		<b>0.692</b>		
Enhancing educations and training related to professional safety knowledge to employees		<b>0.616</b>		
Enhancing the safety management interactive relationship with port operators			<b>0.793</b>	
Posting information about safety operations			<b>0.781</b>	
Participating in domestic and international safety management associations			<b>0.701</b>	
Regularly holding safety seminars or conferences to improve knowledge sharing			<b>0.693</b>	
Providing incentives and rewards for employees who propose safety operations schemes				<b>0.792</b>
Providing incentives and rewards for employees who find safety problems				<b>0.712</b>
Establishing a safety promotion group				<b>0.620</b>
Mean	4.202	4.129	4.612	4.776
Standard deviation	0.408	0.378	0.225	0.103
Eigenvalues	9.501	2.933	1.716	1.161
Variance explained%	39.136	13.562	7.800	5.275
Cumulative variance explained %	39.136	52.698	60.498	65.773
Cronbach $\alpha$	0.868	0.902	0.892	0.910

Table 2 Factor analysis of safety climate

Item	Factor			
	1	2	3	4
I think the safety education provided by my company is worth implementing	<b>0.801</b>			
I think the safety education provided by my company can be applied on my job	<b>0.702</b>			
I think the safety education provided by my company is helpful for accident prevention	<b>0.699</b>			
I think the safety education provided by my company is understandable	<b>0.652</b>			
I think the safety education provided by my company has its own function	<b>0.632</b>			
I think the safety education provided by my company is well designed	<b>0.607</b>			
I think the safety education provided by my company is very practical	<b>0.556</b>			
The company strictly implements safety regulations		<b>0.828</b>		
The company award safety behaviour		<b>0.775</b>		
The company provides safety information		<b>0.701</b>		
The company provides a safe work environment		<b>0.721</b>		
The company cares about its employees' safety		<b>0.625</b>		
The company states that safety is as important as work		<b>0.611</b>		
The company implements safety operation processes		<b>0.555</b>		
The company encourages safety behaviour		<b>0.521</b>		
I will pay attention to safety statements when working			<b>0.832</b>	
I will pay attention to colleagues' safety			<b>0.782</b>	
I will keep the work environment safe			<b>0.729</b>	
I will follow safety regulations			<b>0.602</b>	
I will encourage colleagues to pay attention to safety			<b>0.582</b>	
The company will provide correct information to employees when changing policies, operation processes and production methods				<b>0.792</b>
The company will regularly promote safety activities and deliver work safety regulations and instructions				<b>0.668</b>
The company has a good communication channel for discussion of employees' safety issues				<b>0.531</b>
Mean	4.285	4.689	4.026	3.884
Standard deviation	0.370	0.102	0.289	0.131
Eigenvalues	6.945	1.995	1.566	1.289
Variance explained%	42.071	12.882	7.580	5.352
Cumulative variance explained %	42.071	54.953	62.533	67.885
Cronbach $\alpha$	0.925	0.825	0.899	0.902



Table 3 Goodness of fit indicators for structure model

Goodness-of-fit index of SEM	Criteria	Results
$\chi^2$ (Chi-square)	-	198.35
$\chi^2/df$	< 2	1.45
p-value	> 0.05	0.08
GFI	> 0.9	0.94
AGFI	> 0.9	0.92
TLI	> 0.9	0.91
NFI	> 0.9	0.92
RMR	Close to 0	0.00
RMSEA	< 0.08	0.02

Note : GFI: goodness of fit index; AGFI: adjusted goodness-of-fit index; TLI :Tucker-Lewis index; NFI: normed fit index; RMR: root mean square residual; RMSEA: root mean square error of approximation.

Table 4 Assessment of average variance extracted and construct reliability

Measures	AVE <sup>a</sup>	CR <sup>b</sup>	Safety marketing	Safety climate	Safety attitude	Safety behaviour
Safety marketing	0.44	0.87	1			
Safety climate	0.38	0.86	0.457** (0.209) <sup>d</sup>	1		
Safety attitude	0.47	0.82	0.486** ( <b>0.236</b> )	0.457** (0.209)	1	
Safety behaviour	0.42	0.72	0.243** (0.059)	0.325** (0.106)	0.271** <sup>c</sup> (0.073)	1

Note: a. Average variance extracted (AVE) = (sum of squared standardized loadings)/ [(sum of squared standardized loadings)/ (sum of squared standardized loadings) + (sum of indicator measurement error)]; Indicator measurement error can be calculated as 1- (standardized loading)<sup>2</sup>.

b. Construct reliability (sum of standardized loadings)<sup>2</sup>/[(sum of standardized loadings)<sup>2</sup>+(sum of indicator measurement error)]

c. \* correlation is significant at the 0.05 level; \*\* correlation is significant at the 0.01 level.

d. Squared correlation.

Table 5 Structural equation modelling results

Path	Estimates		S.E	C.R	P
	Standardized	Non standardized			
Safety marketing → Safety climate	0.41	0.58	0.41	3.89	***
Safety marketing → Safety attitude	0.81	0.93	0.22	2.88	***
Safety marketing → Safety behaviour	0.06	0.16	0.66	0.67	0.51
Safety climate → Safety attitude	0.29	0.35	0.79	5.31	***
Safety climate → Safety behaviour	0.28	0.25	0.85	0.25	0.81
Safety attitude → Safety behaviour	0.29	0.33	0.28	6.22	***
Supervisor's commitment → safety climate	0.45	0.65	0.95	3.45	***
Supervisor's commitment → safety attitude	0.44	0.64	0.15	2.97	***
Supervisor's commitment → safety behaviour	0.58	0.94	0.26	4.00	***

Note:  $\chi^2=284.76$ ; degree of freedom=143; \*\*\*= p-value $\leq$ 0.01;  $\chi^2/df = 1.99$ ; GFI= 0.90; AGFI=0.92; TLI= 0.91; NFI= 0.91; RMR=0.01; RMSEA= 0.02.

Table 6 Path analysis results

	Direct effect	Indirect effect	Total effect
Safety marketing → Safety climate	0.41	-	0.41
Safety marketing → Safety attitude	0.81	0.41*0.29	0.93
Safety marketing → Safety behaviour	-	0.81*0.12	0.10
Safety climate → Safety attitude	0.29	-	0.29
Safety climate → Safety behaviour	-	0.29*0.12	0.03
Safety attitude → Safety behaviour	0.12	-	0.12
Supervisor's commitment → Safety climate	0.45	-	0.45
Supervisor's commitment → Safety Attitude	0.44	0.45*0.29	0.57

---

Supervisor' s commitment	0.58	$0.44*0.12+0.45*0.29*0.12$	0.65
→Safety Behaviour			

---