The effects of safety delivery and safety awareness on passenger behaviour in the ferry context

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Abstract

This research empirically examines passengers' perception of safety delivery and awareness on their preventative behaviours in the ferry context. Using survey data collected from 422 ferry passengers in Hong Kong, confirmatory factor analysis and structural equation modeling were conducted. An exploratory factor analysis identified two main dimensions of safety delivery, namely: safety facilities and safety demonstration. Safety awareness was further clustered into three dimensions, which included safety information, vessel condition and rescue equipment. Resuts indicated that safety delivery and safety awareness positively influence passengers' preventative behaviour, as well as safety delivery positively influences passengers' safety awareness. This study highlighted the importance of passengers' perception of safety awareness and safety delivery in ferry safety. Implications of the study findings for improving safety in ferry operations and suggestions for the development of safety delivery are discussed.

Keywords: ferry; safety delivery; safety awareness; preventive behaviour; passenger

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1. Introduction

The increase of passenger transport had led to serious maritime accidents occurring in Asia over the past few years. For instance, the passenger ferries Sea Smooth and Lamma IV collided off Yung Shue Wan, Lamma Island, Hong Kong, leading to 39 people died and 92 people injured on 1st October 2012. The accident of Sewol Ferry disaster in South Korea killed 304 passengers and crew members in 2014 (Hystad et al., 2016). The root causes of the accident were improperly secured cargo and overloading. Golden (2014) highlighted that overloading of passengers and insufficient training for emergency situations pose the high rates of accident and fatality. Another notable example is the sinking of Eastern Star (i.e., Dongfang Zhi Xing) ship which was caused by a severe thunderstorm on the Yangtze River in Jianli, Hubei Province. 442 deaths were verified, with 12 rescued on 13 June 2015 (BBC News, 2015). Notably, most maritime accidents stemmed from human error in vessel operations. One critical factor for preventing accidents is the passengers and crew members maintaining an adequate understanding of their environmental situation. This means having a high level of awareness of safety and environmental conditions and judging how these could happen in the near future to predict how the situation will develop.

A number of prior researches pointed out the importance of safety management and safety climate in ship safety (Gan et al., 2017; Lu and Yang, 2011; Lu and Tseng, 2012; Zhang and Wang, 2015) from a ship operator's perspective. However, an investigation of passengers' safety behaviours, safety awareness and knowledge from ship operators is lacking. Accurate safety behaviours of passengers might increase the chance of survival, reducing a large number of deaths or vital injuries (Fabiano et al., 2010). Awareness of safety behaviours in maritime emergency and enhancement of passengers' knowledge can enrich the quick reactions in accordance with emergency occurring. Despite the International Maritime Organization (IMO) and marine department making great efforts to improve safety in marine transport (Allianz Global Corporate and Specialty, 2015), maritime accidents are still happening (Jeon et al., 2016; Baird, 2017). Lu and Yang (2011) addressed that the majority of injuries and accidents stemmed from employee's unsafe behaviours rather than unsafe physical or mechanical conditions. Human factor is the key to the problem (Baird, 2017). 80-85% of all the recorded maritime accidents are attributed to a degree of human error or directly created by unspecified human error (Nielsen and Jungnickel, 2003; Yang et al., 2013). The human factor pertaining to recklessness or carelessness under a misplaced sense of overconfidence, a lack of either experience or knowledge, commercial pressure (Lu and Yang, 2011). Nielson and Jungnickel (2003) summarized the human factor is created by some critical factors including (1) lowered levels of situation awareness and vigilance; (2) slowed reaction time; (3) impaired decision making ability; (4) memory problems; (5) narrowness of attention; (6) lapsing or micro sleep; (7) time on task decrement; and (8) adoption of simpler, but riskier strategies.

Prior researches have paid attention to the ship safety from an operator's perspective. It seems relatively little research developed the theoretical mechanisms in explaining passengers' safety behaviours. Specifically, Hystad et al. (2016) highlighted the importance of safety delivery and safety knowledge for passengers. Safety delivery such as safety knowledge demonstration and promotion can foster passengers' safety awareness to react in peril of sea (Gan et al., 2017).

However, it seems relatively few previous studies investigated the effects of ferry operators' safety delivery on passengers' safety awareness and preventive behaviours. To address this research gap, we have generated key research questions to achieve the research objectives: (1) How the ferry operator's safety delivery affects passengers' preventive behaviours? (2) How the passengers' safety awareness enhances their preventive behaviours? (3) How the ferry operator's safety delivery improves passenger's safety awareness? Accordingly, the objective of this research is to examine the relationships between passengers' perceptions of safety delivery, safety awareness, and preventive behaviours.

This research consists of five sections. In Section 1, we explore the research background, the rationale behind our research, research questions and the scope of study. In Section 2, we review the evolution of Hong Kong Macau ferry and studies about how

Hong Kong Macau ferry interacts with Macau and its neighbouring cities. In order to foster the preparation for questionnaires and further interpretation on the theoretical background and research hypotheses, we conduct a critical review on the relevant literature and studies about safety awareness, safety delivery, and preventive behaviours in Section 3. We discuss the research methodology containing a questionnaire design, sample measures, data collection and measurement, and the methods employed for data analysis in Section 4. A series of empirical results obtained from a questionnaire survey is shown in Section 5. Conclusions illustrated from the analyses, theoretical and managerial implications are discussed in the final section.

2. Ferry services between Hong Kong and Macau

A ferry refers to a 'boat or ship used to convey passengers and goods, especially over a relatively short distance and as a regular service' (Khazabi, 2017: pp. 137). Ferry transport as a travel service is mainly offered in short sea shipping routes, notably, the connections between islands and coastal cities (Gan et al., 2017). Ferries provide convenient, flexible, fast and cost-efficient waterborne transportation for people living in Hong Kong and Macau as well as for people travelling for sightseeing and gambling (Song and Witt, 2006; Khazabi, 2017). Ferries are a convenient and low-cost transport system (Chan et al., 1999; Ceder, 2006; Ceder and Sarvi, 2007), allowing travellers to shop, work, live, go to school and enjoy recreation across all of Hong Kong and Macau (Meligrana, 1999; Wong and Lam, 2006). As Mason (2003) and Gan et al. (2017) highlighted, ferry service interacts with the economy, local environment, social prosperity and culture.

There are two ferry terminals on the Macau peninsula, located at the Outer and Inner Harbours. In 2017, the Taipa Ferry Terminal was upgraded to cope with a dramatic increase in visitors and ease congestion at the Macau ferry terminals (Santos, 2011). Ferries are an efficient form of passenger transportation. Figure 1 shows that the number of ferry passengers between Hong Kong and Macau has significantly increased from 12.65 million in 2005 to 20.78 million in 2017. Due to the extremely high construction and operational costs (i.e., repairs, maintenance and fuel) of hydrofoils, ferry operators currently use catamarans. Cotai Water Jet and TurboJET are the two main ferry operators providing daily ferry service between Hong Kong and Macau. Ferry services are offered by private firms in a wholly competitive and open market with a commercial approach. Without any legal obligations or market failures, public intervention is restricted to minimal regulatory schemes overseeing safety standards (Barid, 2012). Passenger ferry service provides fast sea transport between Hong Kong and Macau. The volume of transport is immense, so safety management is urgently demanded (Baird, 2004).

[Insert Figure 1]

3. Literature review and research hypotheses

3.1 Definitions of safety delivery, safety awareness and preventive behaviour

3.1.1 Safety delivery

Safety delivery is drawn from the notion of service delivery. Service delivery refers to an organisation's design for delivery of its services and products to fulfil the needs of target customers and achieve the organisation's goals. Bettencourt (1997) revealed that there are few empirical studies on the antecedents of key customer behaviours in the service delivery research. Armstrong (1992) modelled the delivery process as a system and explored the underlying service quality perceptions, aggregating case data after the fact. Boulding et al. (1993) investigated how perceptions of service quality are determined by customers' expectations of what should happen during a service encounter. Service delivery is a significant process that is vital to the behaviour of people in a ferry service organisation (Yercan and Roe, 1999).

Based on the notion of service delivery, safety delivery can be defined as an organisation's design for its safety operations and services to fulfil the needs of customers (e.g., passengers or cargo owners) and to achieve its safety goals. Safety delivery refers to the process of offering safe service to achieve common goals of safety improvement and satisfying customers' requirements (Gupta et al., 2008). Safety delivery can be explained as an organisation's efforts to protect human lives from incidents or accidents as well as the critical steps necessary to avoid or reduce risks (Lawson and Weisbrod, 2005). The activities of safety delivery include safety equipment, ship structure, safety instruction, navigation and communication, and crew member ability (i.e., knowledge of rescue procedures and emergency response) (Lekakou and Remoundos, 2015; Yip et al., 2015). To ensure appropriate and timely response in the event of an emergency, ferry operators must provide passengers with safety training and information as part of safety delivery. Safety delivery is a determinant of safety performance (Datta and Roy, 2011; Ruyter et al., 1997).

To ensure that ferry service is delivered in line with passenger expectations, maritime safety should be proactive. ‘Proactive means an early stage identification of factors that may adversely affect maritime safety and the immediate development of regulatory action to prevent undesirable events, as opposed to just an after-the-fact ad-hoc reaction to a single accident’ (Psaraftis, 2002, p. 5). Therefore, further improvement of safety delivery is important for ferry safety. Safety delivery can be considered a quality feature of transportation (Savage, 2013). Much of the literature concerning safety delivery deals with significant problems in various tourism fields (Teye and Leclerc, 1998) and society (Savage, 2013).

3.1.2 Safety awareness

Passenger safety awareness can be described as how passengers feel about and maintain awareness of safety considerations during a voyage. At a basic level, safety awareness is an appropriate awareness of safety in a situation (Smith and Hancock, 1995). Drawing from the concept of situational awareness, safety awareness refers to the perception of the safety elements in an environment within a certain time and space, the comprehension of their meaning and a projection of their status in the near future (Endsley, 1988). Chang and Liao (2009) investigated aviation passenger cabin safety awareness based on the notion of knowledge, attitude and behaviour (KAB). They found that safety education involves accurate instruction about emergency equipment procedures and emergency responses and increasing situational awareness to positively affect airline passenger cabin safety behaviours, knowledge and attitudes. The situational awareness and responses for passengers include noticing the exits during takeoff and landing, the correct response when turbulence occurs, correct use of life jackets, how to fasten the seat belt, and so on. Sneddon et al. (2006) examined situational awareness and safety for offshore drill crews. They found that most participants would use the term ‘situational awareness’ for safety awareness because safety is critical in the offshore environment. Safety awareness is crucial and the first thing that is assessed, such as the hazards inherent in the surrounding area and formulation of ways of dealing with potential risks. This is particularly relevant to ferry and passenger transport given their interactive and dangerous environment.

3.1.3 Preventive behaviour

Passenger ship operations must comply with all relevant conventions and regulations covering every aspect of ship operation and construction, such as load line conventions and the International Convention for the Safety of Life at Sea (SOLAS). Many incidents over the past few years have led to improvements in safety requirements, such as fire protection systems, cruise ship escape routes and life-saving appliances and arrangements (International Maritime Organization, 2019). Research on worker or crew member safety behaviour has usually concentrated on safety compliance and safety participation (Neal and Griffin, 2000; Neal and Griffin, 2002; Lu et al., 2018; Lu and Yang, 2011) to improve passenger safety, but less attention has been devoted to passengers' preventive behaviours. Chang and Liao (2009) examined passengers' preventive behaviours, such as correct use of life jackets, fastening seat belts and correct responses when turbulence occurs. Baker (2013) conducted research with cruise passengers in the Western Caribbean. Results indicated that passenger preventive behaviours include knowledge of life vest locations, nearest fire exits, what to do and where to go in an emergency and information about safety. Similarly, passenger preventive behaviours in a ferry include activities such as correct use of a life jacket, how to use a fire extinguisher and fastening seat belts during the voyage.

3.2 Research hypotheses

For effective safety delivery, ferry operators and passengers should interact closely (Singh, 1991). Ferry passengers' involvement in safety delivery is determined by their perceptions and personal feelings about ferry operators (Parker, 2006). Personal feelings regarding safety delivery may affect passengers' proactive or reactive accident prevention behaviours (Lawson and Weisbrod, 2005). If a passenger has received proper safety information from ship operators, they will adhere to preventive safety behaviour during the voyage (Bae et al., 2016). Serap et al. (2017) indicated that good quality safety delivery from ferry operators will motivate passengers to participate in the safety delivery campaign. Passengers with good safety knowledge will take quick and effective action to protect their own and others' lives and property from known or unknown risks and react appropriately if an emergency occurs (Bang and Kim, 2016). Hence, we suggest the following hypothesis:

H1. Ferry safety delivery is positively related to passengers' preventive behaviour.

Ferry passengers are the receivers of safety delivery and processes (Alter, 1990). Safety delivery is critical to ferry passengers' perception of their travel experience (Grandey, 2003). An effective safety delivery process is highly influenced by organisational safety activities and the motivations of ferry passengers participating in safety delivery (Bettencourt, 1997). Safety delivery comprises safety demonstrations, passenger care and safety equipment (Tinali and Temba, 2015). Passengers often perceive safety delivery from their experience of ferry transport. Ferry operators are required to think about what kinds of safety information and education to share and what approaches to take with passengers for effective participation in the safety delivery process (Bitner et al., 1997). Klein et al. (1993) and Brady and Cronin (2001) indicated that individuals with a strong sense of safety awareness will pay attention to potential hazards and risks. Thus, the quality of safety delivery affects passenger safety awareness that can avoid loss of life and accidents (Serap et al., 2017). Therefore, we posit the following hypothesis:

H2. Ferry safety delivery is positively related to passenger safety awareness.

Klein et al. (1993) and Jeon et al. (2016) asserted that individuals with a strong perception of safety situational awareness would be much more accountable for preventive safety behaviours and sensible about potential hazards. 'Situational awareness refers to the ability of an individual to possess a mental model of what is going on at any one time and also to make projections as to how the situation will develop' (Hetherington et al., 2006, pp. 405) Human beings generate awareness through perception and by being cognizant of the existing situation. The reinforcement of safety knowledge can foster passengers' awareness of safety critical information (Gan et al., 2017). Ferry passengers can acquire safety information and improve their safety knowledge through ferry operators' educational efforts and by paying attention to the safety information provided, for instance, how to wear a life jacket and where to muster when the emergency signal is sounded (Klein et al., 1993; Hystad et al., 2016). Edwards (1990) explained that increasing ferry passenger safety awareness can decrease injuries and panic in an accident. Zhang and Wang (2015) reinforced safety awareness and identified safety habits as the drivers of safe behaviour. It could influence the quality of decisions and even lead to inappropriate judgement (Edwards, 1990). Ferry passengers with a high level of safety awareness will take actions to rescue and take the time to avoid incidents or disclose a dangerous situation. Thus, we propose the following hypothesis:

H3. Passenger safety awareness is positively related to passenger preventive behaviour

4. Methodology

4.1 Sample

This study's data were collected using a survey questionnaire following the procedures proposed by Iacobucci and Churchill (2010). Such procedures include (1) determining the required information from relevant literature; (2) using an appropriate administrative approach and question type; (3) using appropriate question content and design; (4) appropriately structuring of question responses; (5) adoption of precise wording in each question; (6) determining a systematic and effective series of questions and (7) making a judgement on the appropriate layout of the questionnaire. Then, we re-examined steps 1 to 7 and revised where necessary. Finally, we conducted pre-testing with a final draft of the questionnaire.

The sample comprised ferry passengers in Macau. In November 2016, we conducted a survey with ferry passengers at Hong Kong Macau Ferry Terminal, China Ferry Terminal and Tuen Mun Ferry Terminal. We collected 422 valid questionnaires. Table 1 shows the respondents' profile. More than half of the respondents were female (56.0%). Over 62% of respondents worked for companies and 37.4% were students. More than 65% of respondents were between 18 and 40 years old. Respondents were asked to indicate which pier they usually boarded at in Macau. Over 60% of passengers had either embarked or disembarked at the Outer Harbour Ferry Terminal. Table 1 also shows passengers' purpose for taking the ferry to Macau. Most passengers (70.9%) aimed to travel, and 89.1% passengers have travelled the route more than once.

[Insert Table 1]

4.2 Measures

- *Safety delivery*

Safety delivery was adopted from the studies of Lu and Yang (2011) and Lu and Tseng (2012), and measured with nine items referring to safety demonstration and safety facilities. Respondents were asked to rank the items on a five-point Likert scale from 1 = ‘strongly disagree’ to 5 = ‘strongly agree’. The tests are based on these nine items.

- *Safety awareness*

The safety awareness items in the questionnaire measured passengers’ level of agreement with statements related to the ferry operator’s services. This study used the 14 items of safety awareness developed by Lu and Yang (2011) and Lu and Tseng (2012). We assessed three dimension of safety awareness, including safety information, vessel condition and rescue equipment. Respondents were asked to indicate their agreement with the safety awareness items using a five-point Likert scale from 1 = ‘strongly disagree’ to 5 = ‘strongly agree’.

- *Preventive behaviour*

In this study, respondents were asked to indicate their level of agreement with items related to ferry passengers’ preventive behaviour. We used four items of preventive behaviour based on safety practices: ‘I fasten my seat belt (PB1)’, ‘I know how to use a fire extinguisher (PB2)’, ‘I know how to use a life jacket (PB3)’ and ‘I know how to use a life boat (PB4)’.

4.3 Research methods

We used several research methods in this study, including descriptive statistics analysis, exploratory factor analysis (EFA), confirmatory factor analysis, reliability tests, discriminant validity and structural equation modelling. Descriptive statistics were used to demonstrate respondent characteristics such as gender, occupation, age, degree of education and purpose of travel. EFA and the tests of reliability and discriminant validity were conducted to identify dimensions from a number of measures in the questionnaire

(Hair et al., 2006). Further, a confirmatory factor analysis (CFA) was conducted to verify measurement models. Finally, structural equation modelling (SEM) was used to examine the effects of safety delivery and safety awareness on passenger preventive behaviours. The relationships between the latent and observed variables are indicated in the SEM model.

5 Results of Empirical Analysis

5.1 Factor analysis results

To evaluate the posited structural model, the measurements of each construct were obtained. An EFA was conducted to create and examine measurement scales. This technique is useful in the early stages of empirical analysis, notably in new theoretical models, and its basic purpose is to explore. EFA with varimax rotation was conducted to reduce the 14 safety awareness attributes to a smaller manageable set of underlying dimensions of ferry service. The Kaiser–Meyer–Olkin (KMO) value of 0.825 indicates that the data are suitable for CFA, and the Bartlett Test of sphericity [$\chi^2 = 622.968$, $p < 0.00$] suggests that correlations exist among some of the response categories. When eigenvalue is greater than 1, it is used to determine the number of factors in each data set (Churchill and Lacobucci, 2014; Gorsuch, 1983). Table 2 shows that three factors were found to underlie safety awareness in the ferry services context based on ferry passengers' responses. It accounts for approximately 66.35% of the total variance. In addition, an examination of factor loading in Table 2 shows that each of the factor loadings were at 0.5 or higher. Factor 1 is a safety information dimension of three items with factor loadings ranging from 0.595 to 0.879. '*I am aware of the ferry's relevant safety information while taking the ferry'* (P1) had the highest factor loading for this factor. Factor 1 had an eigenvalue of 4.545 and accounts for 26.662% of the total variance. Factor 2 is a vessel condition dimension that contains five items with factor loadings ranging from 0.682 to 0.817. '*I pay attention to ferry's emergency exit routes'* (P8) had the highest factor loading for this factor. Factor 2 generates an eigenvalue of 1.548 and accounts for 21.23% of the total variance. Factor 3 is a rescue equipment dimension, including three items with factor loadings ranging from 0.743 to 0.873. '*I am aware of whether the ferry has been over* *speed'* (P12) had the highest factor loading on this factor. Factor 3 demonstrates an eigenvalue of 1.205 and accounts for 18.462% of the total variance.

[Insert Table 2]

Table 3 illustrates the results of the EFA for the subsequent analysis of the six items that yielded two factors. The factors are labelled and described as follows. Factor 1 refers to sufficient safety facilities and contains three items: life-saving equipment, fire-fighting equipment and medical equipment. Life-saving equipment demonstrates the highest factor loading (0.868) and accounts for 58.825% of the total variance. Factor 2 refers to the safety demonstration dimension that includes these three items: a clear safety demonstration and announcement, initiatives of safety guidance and alertness and safety equipment use. A clear safety demonstration and announcement had the highest factor loading (0.886) and accounted for 17.246% of the total variance.

[Insert Table 3]

5.2 Reliability test

Reliability tests of a series of measures or constructs indicate the extent to which it evaluates without bias and hence ensures consistent measurement across time and across the items in the research instrument (Sekaran, 2003). The corrected item-total correlation and Cronbach's alpha coefficient are used to measure the internal consistency and stability of each construct. The Cronbach's alpha values for each construct are 0.734, 0.838 and 0.800, respectively, which are well above the suggested threshold of 0.7 (Nunnally, 1978; Litwin, 1995; Churchill and Iacobucci, 2014). All of the corrected item-total correlation values are marginally close to or greater than the recommended value of 0.5 (Koufteros, 1999; Churchill and Iacobucci, 2014) and therefore, each construct is considered acceptable (Ferketich, 1991; Kessler, 1998; Lauder et al., 2000) in the exploratory analysis stage.

5.3 Confirmatory factor analysis

CFA was used to examine the measurement model, including the unidimensionlity, reliability and validity of the latent and manifest variables (Hair et al., 2010). Figure 2 shows the measurement model, including the three latent variables, safety delivery, safety awareness and preventive behaviour, and their corresponding indicators. Safety delivery can be conceptualised as a composite of two dimensions, safety demonstration and safety facilities, which are at the first order of abstraction as shown in Figure 2. Safety awareness can be conceptualised as a composite of three dimensions, safety information, vessel condition and rescue equipment, which are also at the first order of abstraction. The statistical criteria for model modification decisions include squared multiple correlations, standardised residual covariances and model fit indices (Min and Mentzer, 2004; Koufteros, 1999). Once the proposed model has been purified, tests of validity, reliability and unidimensionality can be performed. Some goodness of fit indices were used to assess the fit and unidimensionlity of the measurement model (Koufteros, 1999; Hair et al., 2010), namely, goodness of fit index (GFI), comparative fit index (CFI), adjusted goodness of fit index (AGFI), root mean square residual (RMSR) and root mean square error of approximation (RMSEA).

The initial CFA results showed a normed chi-square ($\chi 2/df$) value of 4.841 and GFI and CFI values of 0.939 and 0.907, respectively, which are above the recommended level of 0.9. The AGFI value is 0.885, which exceeds the recommended level of 0.8. The RMR value is 0.036, which is below the recommended threshold of 0.05. However, the RMSEA is 0.096, which is greater than the recommended level of 0.08. The results of the initial CFA discredited the model. The standardised residual of the item 'I know how to use a life boat (PB4)' was less than -2.93, so it was eliminated in the revised model.

Figure 2 shows the results of the modified CFA. The normed chi-square ($\chi 2/df$) value is 2.988, and the GFI and AGFI values are 0.972 and 0.940, respectively, which are above the recommended level of 0.9. The CFI value is 0.958, which exceeds the recommended level of 0.9. The RMR and RMSEA values of 0.023 and 0.069 are below the recommended threshold levels of 0.05 and 0.08, respectively. CFA of the final model thus yielded an acceptable fit, and all item loadings were significant, as shown in Table 4.

[Insert Figure 2]

[Insert Table 4]

The variance extracted value is a complementary measure for construct reliability (Koufteros, 1999). The average variance extracted (AVE) statistics measure the amount of variance in the specified indicators that is accounted for by the latent construct. All variance extracted values are greater than 0.5, indicating that at least 50% of the variance in the specified indicators is accounted for by the latent construct, which is more than the recommended level of 50% (Fornell and Larcker, 1981). All items correlated strongly with their intended construct, and the square root of the AVE for the constructs is larger than any respective interconstruct correlations. These results provide evidence of discriminant validity and are shown in Table 5.

[Insert Table 5]

5.4 Results of hypotheses testing

As shown in Figure 3, the results indicate that the chi-square/degree of freedom ratio statistic (χ^2/df = 3.0) and p-value (p = 0.00) achieve the model fit requirements in the revised model. In addition, the GFI is 0.973, and the AGFI yields 0.936 after adjustment for degrees of freedom relative to the number of variables. This reflects that 93.6% of the variance and covariance in the data are predicted by the estimated model. Moreover, results of fitting the structural model to the data reveal that the model had a good fit as indicated by the normed fit index (NFI = 0.948), Tucker–Lewis index (TLI = 0.933), root mean square residual (RMR = 0.021) and root mean square error of approximation (RMSEA = 0.070).

Figure 3 summarises the results and shows that all hypothesised relationships are significant and in the expected direction. Thus, all of the hypotheses are supported. Safety delivery is found to have a positive influence on passenger preventive behaviours (Estimate = 0.725, CR = 6.543). Therefore, H1 is supported. This study also found that safety delivery positively affects passenger safety awareness (Estimate = 0.450, CR = 5.664). Thus, H2 is supported. The results are consistent with the study of Chang and Liao (2009). Chang and

Liao (2009) identified emergency equipment, such as correct use of oxygen mask, ability to inflate a life jacket and explanation of fastening seat belt in safety education. Safety education was found to be positively related to passenger cabin safety behaviours. The findings imply that passengers having a better understanding of safety delivery in ferry operations, such as safety demonstrations, correct positioning of safety equipment and sufficient life-saving and fire-fighting equipment, will lead to greater passenger safety awareness and preventive behaviours.

The results also show that safety awareness positively affects passenger preventive behaviours (Estimate = 0.290, CR = 3.198). Thus, H3 is also supported. These findings imply that passengers having a higher awareness of the ferry's relevant information, such as regulations, the locations of fire extinguishers and life jackets, emergency exit routings and ferry conditions, will enhance passenger preventive behaviours.

[Insert Figure 3]

Further, to perform a bootstrap analysis, we used the SPSS AMOS 24.0 programme, which is the software currently available to examine indirect effects based on bootstrapped percentile (Arbuckle, 2016). Table 6 shows the results from the test of the indirect effect of safety delivery on passenger preventive behaviour. The percentile confidence interval is between 0.043 and 0.250, which does not include zero. We can conclude that the indirect effect is statistically significant at the 0.05 level. Thus, this study shows an indirect effect of safety delivery on passenger preventive behaviours via safety awareness.

6. Conclusion and discussions

Safety delivery has become important in industry (Lings et al., 2008; Tinali and Temba, 2015; Bae et al., 2016; Ljung and Oudhuis, 2016; Hazabi, 2017; Serap et al., 2017), but an examination of its effect on ferry passenger behaviour has been lacking. The purpose of this research was to explore the effects of safety delivery on safety awareness and passenger preventive behaviours in the ferry context. This study provides evidence that safety delivery has a positive influence on passenger safety awareness and preventive behaviour. In addition, the research found that safety awareness will foster passenger preventive behaviours. This shows that safety delivery can facilitate safety awareness and passenger preventive behaviours. To the best of our knowledge, this is the first study to explain the link between safety delivery, safety awareness and passenger preventive behaviour in the passenger ferry context.

6.1 Implications of the findings

This study summarises several implications for practices and theory as follows:

First, ferry operators should develop effective safety delivery and identify critical safety delivery attributes. Although safety facilities are important, this research found that a safety demonstration is the crucial safety delivery dimension affecting passenger safety awareness and preventive behaviours. We suggest that ferry operators provide a clear and effective safety announcement and demonstration with guidance regarding safety facilities that calls passengers' attention to them and reinforces their preventive behaviours to reduce the risk of injuries or death. Second, this is the first paper to use the notion of service delivery in safety research. We elaborate the importance of safety delivery and its effect on ferry safety. The model used in this study can be generalised to other industries, such as airline, railway and road transportation. Third, safety awareness was recognised as a critical driver of passenger preventive behaviour. Respondents indicated that they paid attention to the location of fire extinguishers, life jackets, emergency exit routes and doors and life boats. This provides helpful information for ferry operators to emphasise safety delivery when they conduct safety demonstrations and create safety promotion materials. Finally, this study found that safety delivery positively affects safety awareness and safety awareness positively affects passenger preventive behaviours. This reflects that safety awareness plays a mediating role between safety delivery and passenger preventive behaviours.

6.2 Limitations and future research

This research has several limitations to be considered for future research. First, we used self-reported data on preventive behaviour and respondents' perceptions of safety awareness that may have been subject to prejudice in terms of willingness to answer and report correctly. Passengers may have been unwilling to report actual preventive behaviour due to potential personal repercussions, insufficient safety knowledge or a possibility of encountering a lawsuit against them by the government. Second, the data were collected mainly from ferry passengers at three ferry terminals in Hong Kong. Future studies might gather data from various stakeholders such as policy makers, ferry operators, transport associations, government bodies and terminal operators through semi-structured, face-to-face interviews or focus group discussions to gain broader views and generate in-depth data for analysis. Mixed research methodologies consisting of qualitative and quantitative could offset the shortcomings of a pure qualitative or quantitative research methodology. To generalise our study in the future, we could consider the same issue in other countries. Third, we conducted this research based a single year. Further research could examine the issue using a longitudinal approach to explore the short- and long-term effects of safety delivery and preventive behaviour in the passenger ferry context. The tendency towards change in organisational culture and between ferry operators means that there may be differences in the long- and short-term effects on passenger preventive behaviours. Fourth, the research design framework relied on only two variables to investigate the association between safety awareness and preventive behaviour. For future research, it would be more comprehensive to consider the effects of other variables, such as safety leadership, marketing stimuli (Lu et al., 2018), education (Lau et al, 2018) and socio-economic factors (Luo and Shin, 2019), on organisational safety delivery and passenger safety behaviours.

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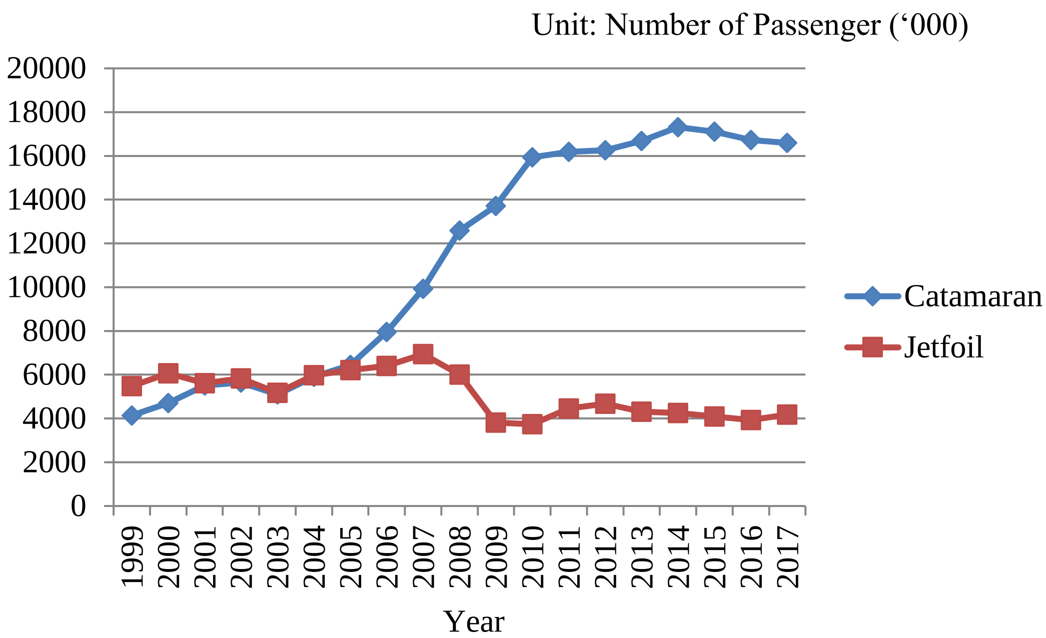

Figure 1. Number of ferry passenger arrivals and departures between Hong Kong and Macao (1999-2017)

Source: Marine Department, HKSAR (2018)

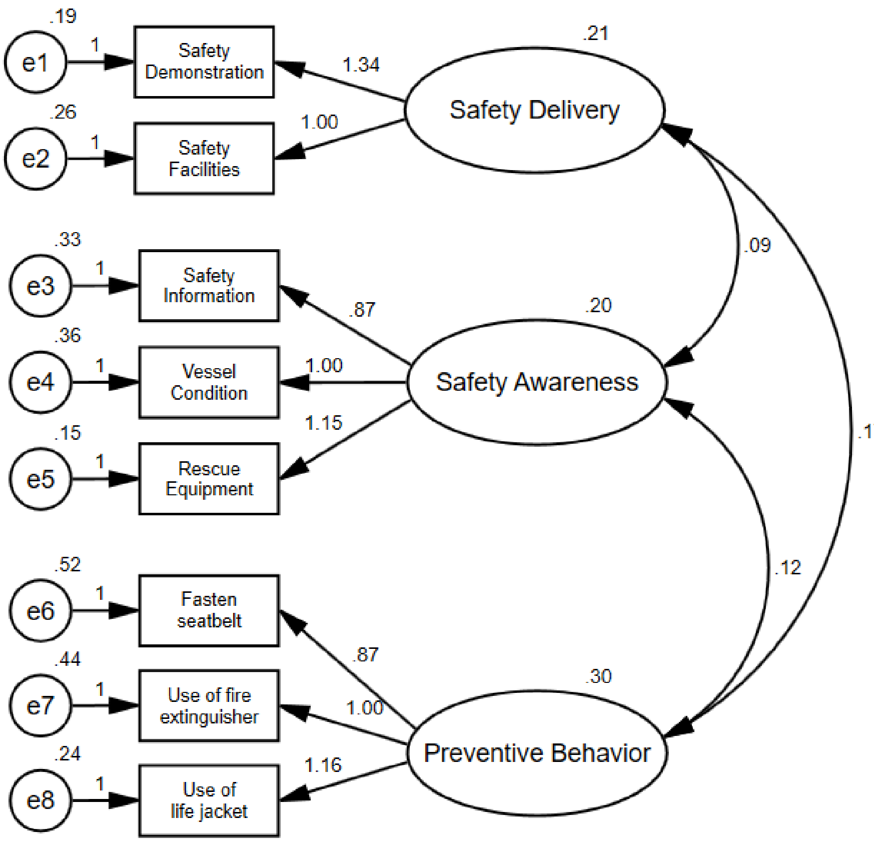

Figure 2. Confirmatory factor analysis

Note: $\chi 2/df$ = 2.988, GFI = 0.972; AGFI = 0.940; CFI = 0.958; AGFI = 0.940; RMR = 0.023; RMSEA = 0.069; NFI= 0.939; TLI = 0.931

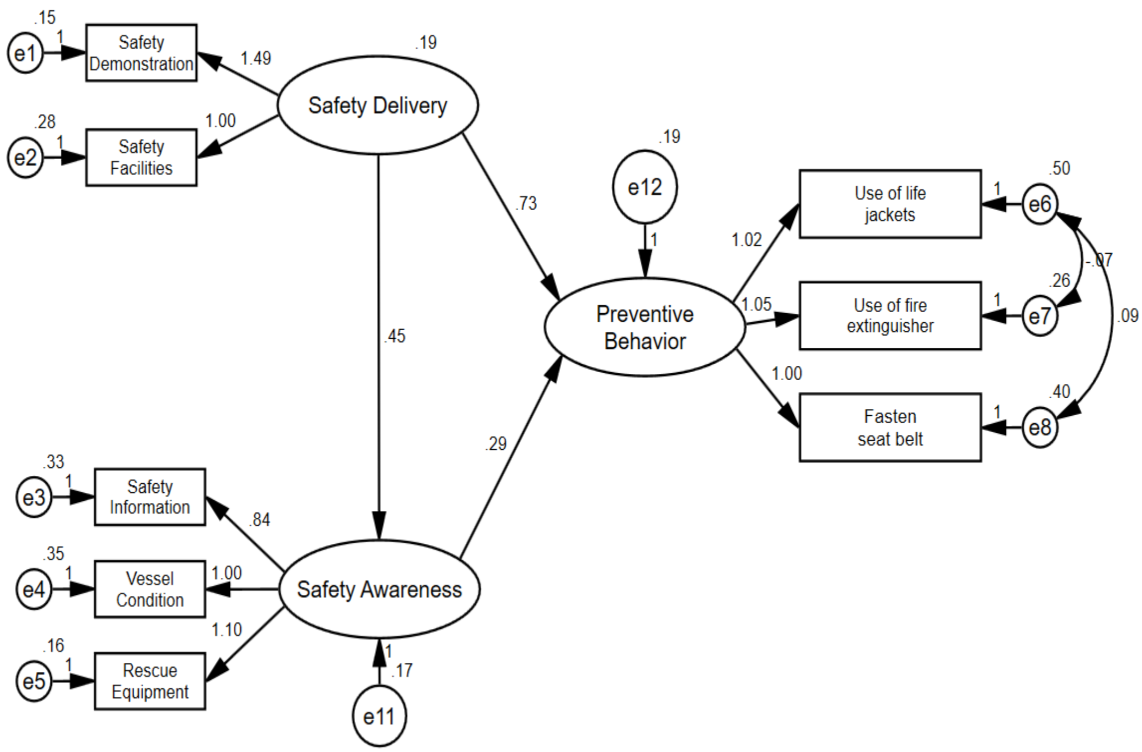

Figure 3. Structure equation model result

Note: Chi-square = 42.280; Degrees of freedom = 15; Probability level = 0.00; GFI = 0.973; AGFI = 0.936; CFI = 0.964; NFI= 0.948; TLI = 0.933; RMR = 0.021; RMSEA = 0.070.

Table 1. Profile of respondents

Demographics	Number of respondents	Percentage
Gender		
Male	189	44.0
Female	233	56.0
Types of occupation		
Student	158	37.4
Employee	264	62.6
Age		
Below 18 years	22	5.2
18-30 years	180	42.7
31-40 years	96	22.7
41-50 years	83	19.7
51-60 years	31	7.3
Above 61 years	10	2.4
Degree of education		
Lower secondary level	30	7.1
Upper secondary level	134	31.8
Sub-degree level	97	23
Undergraduates	132	31.3
Postgraduates	25	5.9
Doctoral degree	4	0.9

Table 1. Profile of respondents (continued)

Item	Number of respondents	Percentage
Where do you mainly embark in Macao pier?		
• Outer Harbor Ferry Terminal	270	64.0
• Taipa Ferry Terminal	152	36.0
Where do you mainly disembark in Macao pier?		
• Outer Harbor Ferry Terminal	261	61.8
• Taipa Ferry Terminal	161	38.2
What the most important reason for choosing Macao pier to both embark and disembark?		
• Traffic	177	41.9
• Hotel	113	26.8
• Sailing	98	23.2
• Ferry terminal facilities	8	1.9
• Customs clearance time	26	6.2
What is your major purpose of taking Macau ferry?		
• Travel	299	70.9
• Family	43	10.2
• Home	4	0.9
• Business	23	5.5
• Resident	4	0.9
• Leisure/Gambling	48	11.4
How many times have you taken between Hong Kong and Macao ferry routing in the last year?		
• 1-5 times	376	89.1
• above 5 times	46	10.9

Table 2. Exploratory factor analysis of safety awareness attributes

Attributes	Safety Information	Rescue Equipment	Vessel Condition
P1: I aware of ferry's relevant safety information while taking the ferry	0.879		
P2: I comply with ferry's relevant safety regulations while taking the ferry.	0.847		
P3: I read information on the ferry's safety card in details.	0.595		
P6: I aware of the location of fire extinguisher.		0.738	
P7: I aware of the position of life jackets.		0.746	
P8: I pay attention to ferry's emergency exit routings.		0.817	
P9: I pay attention to the position of life boats.		0.682	
P10: I pay attention to the position of emergency exit doors.		0.684	
P11: I aware of the ferry whether it has been overloaded.			0.807
P12: I aware of the ferry whether it has been over speeded.			0.873
P13: I concern about the captain's and crew member's mental conditions.			0.743
Eigenvalues	4.545	1.548	1.205
Percentage of variance	26.662	21.230	18.462
Mean	3.513	3.424	2.947
Standard Deviation	0.693	0.651	0.754
Cronbach's alpha	0.734	0.838	0.800

Table 3. Exploratory factor analysis of safety delivery attributes

Attributes	Safety Facilities	Safety Demonstration
S1: Life-saving equipment is sufficient.	0.868	
S2: Fire-fighting equipment is sufficient	0.867	
S3: Medical equipment is sufficient.	0.792	
S4: A clear safety demonstration and announcement.		0.886
S5: Initiatives of safety guidance and alertness is clear.		0.837
S6: The poster of safety equipment is clear.		0.742
Eigenvalues	3.529	1.035
Percentage of variance	58.825	17.246
Mean	3.193	3.303
S.D.	0.757	0.684
Cronbach's alpha	0.734	0.855

Table 4. Parameter, estimate, standard errors, critical ratio, and R^2

Factor and scale items	Unstandardized factor loading	Completely standardized factor loading	Standard error [a]	Critical ratio [b]	R^2
Safety Delivery					
SD1	1.344	0.820	0.141	9.523	0.673
SD2	1.000	0.672	-	-	0.451
Safety Awareness					
SA1	0.865	0.564	0.102	8.460	0.318
SA2	1.000	0.599	-	-	0.359
SA3	1.151	0.798	0.130	8.824	0.637
Preventive Behavior					
PB1	0.868	0.551	0.098	8.848	0.304
PB2	1.000	0.635	-	-	0.403
PB3	1.159	0.791	0.111	10.408	0.625

Goodness-of-fits statistics
χ^2/df = 2.988, GFI = 0.972; CFI = 0.958; AGFI = 0.940; RMR = 0.023; RMSEA = 0.069

Note: SD1 = Safety Demonstration, SD2 = Safety Facilities, SA1 = Safety Information, SA2 = Vessel Condition, SA3 = Rescue Equipment, PB1 = Fasten Seat Belt, PB2 = Use of Fire Extinguisher, PB3 = Use of Life Jackets.

a SE is an estimation of the standard error of the covariance

b CR is the critical ratio obtained by dividing the estimate of the covariance by its standard error. A value exceeding 1.96 represents a level of significance of 0.05.

c Indicates a parameter fixed at 1.0 in the original solution.

Table 5. Construct reliability, average variance extracted values, and correlations between safety delivery, safety awareness, and preventive behavior

Dimension	No. of items	Mean [a]	S.D. [b]	Composite reliability [a]	1	2	3
Safety Delivery	2	3.24	0.63	0.718	0.750[d]		
Safety Awareness	3	3.29	0.55	0.695	0.425[e]	0.662[d]	
Preventive Behavior	3	3.28	0.66	0.586	0.820	0.552	0.567[d]

Note:
a The mean score is based on a five-point scale where 1= strongly disagree to 5=strongly agree.
b S.D. = standard deviation
c Internal consistency of the reflective constructs.
d The square root of the AVE.
e Correlation coefficient.
f $p<0.05$

Table 6 Results of Bootstrap methods to test significance of mediation effect

Path/effect	95% Confidence interval (Bootstrap percentile)		
	Lower	Upper	P value
Safety delivery → Preventative behaviour	0.480	1.032	0.001
Safety delivery → Safety awareness	0.238	0.683	0.001
Safety awareness → Preventative behaviour	0.102	0.535	0.002
Safety delivery→ Safety awareness → Preventative behaviour	0.043	0.250	0.002