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IMPACT OF POOR COMMUNICATION, FATIGUE, AND EXPERIENCE LEVELS ON ACCIDENT RATES: A CASE STUDY OF THE MALAYSIAN MARITIME SHIPPING INDUSTRY

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ABSTRACT

Human error is the primary cause of most accidents, leading to various issues and shipping delays. Previous research has identified three key causes that culminate in human error in the Malaysian shipping industry: poor communication, fatigue, and lack of experience. However, there is limited discussion on effective strategies to mitigate these errors. Therefore, this study aims to propose optimal solutions to reduce human error. Through this study, quantitative research methods were used to obtain important data involving the main objectives of this study. For the quantitative analysis, data was collected through multiple rounds of questionnaires distributed to 25 experts using the Delphi method and analysed using the Statistical Package for the Social Sciences (SPSS). The study stresses the critical factors influencing human error in the industry, with findings identifying fatigue as the primary contributor to accidents. Addressing this issue would help the shipping industry to reduce human errors and accidents, thereby ensuring smoother operations.

Keywords: Shipping industry, poor communication, fatigue, lack of experience, accident rates.

INTRODUCTION

Malaysia has identified itself as a maritime nation grounded in its continental origins, emphasizing the blend of its coastal and inland heritage (Wey, 2021). Malaysia's maritime sector has been instrumental in driving the nation's growth and development, serving as a key gateway for international trade and enhancing economic connectivity across global markets. The peninsular of Malaysia is linked to the vast Eurasian continent through the Isthmus of Kra which is the narrow land bridge that connects the Malay Peninsula to mainland Asia. Meanwhile, the east of Malaysia (Sabah and Sarawak) is positioned within the island of Borneo and shares the landmass with Brunei and Indonesia's region of Kalimantan. Malaysia possesses extensive coastlines, vast marine Exclusive Economic Zones, and a significant continental shelf in the South China Sea and the Sulu Sea. Additionally, it exercises partial control over the strategically vital chokepoints of the Malacca Strait and the Johor Strait. 90 per cent of Malaysia's total trade is from the waterways making Malaysia one of the leading shipping and maritime trading countries globally. The strategic and carefully planned expansion of its seaports is playing a crucial role in facilitating Malaysia's trade performance. In addition, the Maritime Industry of Malaysia contributes roughly 40% of the country's gross domestic product (GDP) (Sekaran, 2022). This is largely due to the strategic positioning of the Malacca Strait and the South China Sea, which enables 90 per cent of Malaysia's trade to be conducted by sea (Sekaran, 2022) and Malaysia has 18 seaports throughout the nation to facilitate efficient sea trade (Mohd Rozar et al., 2023; Razik et al., 2015). Yet, Malaysia's marine industry is still struggling to protect its economic interests and maintain its competitive advantage as a leading maritime nation. Although working in the shipping sector is thrilling and pays well, it also involves working in a dangerous workplace with a high potential for accidents. Globally, 50 per cent of maritime incidents recorded took place within port and terminal with a total of 2400 incidents where 813 incidents were reported when the vessels were docked in ports and harbour. This is followed by 645 cases at sea, 211 at berth, 140 at sea during anchorage and others (Rightship, 2023). In the Straits of Malacca, Maritime accidents showed an increasing trend from 1999 to 2017, with a total of 92 incidents recorded during this period. A key challenge for authorities and policymakers is determining the factors contributing to maritime accidents in order to create a preventive measure (Cakir et al., 2021).

Additionally, most accidents occurrence are usually due to human error. Human error can be defined as the impact or consequence of human acts, the cause of an accident, a purposeful infringement, and the genuine actions of a human, driven by those behaviours (Che Ishak et al., 2019). Human error accounts for 80% of maritime mishaps, with a minor fire leading to a large explosion (Sanchez-Beaskoetxea et al., 2021; Che Ishak et al., 2019; Berg et al., 2013). Human factors are widely recognized as major contributors to the shortcomings of accident prevention systems within the maritime industry (Coraddu et al., 2020, Kim and Na, 2017, Othman et al., 2015). Additionally, the elements of humanity are a multifaceted topic that would make better or compromise maritime safety, security, and marine environmental preservation. This type of element encompasses the complete range of human activities done by ship crews, shore-based management, regulatory organizations, and others. To properly solve human element difficulties, all parties must work together. Fan et al. (2020) stated that most accidents were caused by one or more of the following factors including insufficient crew competency, fatigue, poor communication, improper maintenance, a failure to follow safety culture and protocols or other procedures, insufficient training, poor situation assessment, and stress. In addition, once this mistake occurred, everything went from bad to worse, resulting in a terrible accident (Che Ishak et al., 2019). Besides that, Dominguez-Pery et al. (2021) pointed out that numerous studies highlight that direct or indirect human error is a major contributor to maritime accidents, leading to critical, unresolved questions about effective strategies to prevent severe human errors in marine environments. Ramos et al. (2018) stated that despite full automation of a vessel

or its systems, human error continues to influence both the design and operational aspects of the ship and its systems. Ceyhum (2014) added that marine accidents negatively impact humans, the marine environment, and assets and operations both on ships and onshore in various ways and to differing extents. These incidents can lead to outcomes ranging from minor injuries to fatalities, alongside a spectrum of environmental and property damage from mild to severe.

Malaysia is a maritime nation that is surrounded by sea and home to the Malacca Straits which are one of the busiest straits in the world, thence susceptible to maritime incidents. The previous studies have discussed human error in the maritime industry but lack the details of some of the human errors namely poor communication, fatigue, and lack of experience as the major contributors to the occurrence of accidents in the Malaysian shipping industry. In addition, there is also a lack of impact and discussion on the alternative solutions to reduce errors. Therefore, the objectives of this study are to address the issue of human error specifically poor communication, fatigue, and lack of experience and its impact on accident rates within the Malaysian shipping industry. Next, to analyse the impact of accidents caused by poor communication, fatigue, and lack of experience in the Malaysian shipping industry and to propose the best alternative to reduce the human error that contributes to an accident in the Malaysian shipping industry.

LITERATURE REVIEW

This section summarizes a variety of contexts of the Shipping industry. This section also elaborates on the contexts of poor communication, fatigue, and lack of experience as an outcome of the study and the Delphi method as the methodology of this study.

Shipping Industry

The shipping industry facilitates the transport of goods and cargo via ships, playing a vital role in international trade and connecting regions globally. As an essential part of the global supply chain, it enables the movement of diverse products, from raw materials to finished goods, across vast distances. The industry focuses on the transportation of freight primarily by sea, must prioritize maritime safety concerning the exclusive characteristics and challenges of the sector. The shipping industry encompasses multiple stakeholders, including shipping companies, port operators, cargo owners, and intermediaries like freight forwarders. Shipping companies manage and operate vessels, while port operators handle the infrastructure for cargo loading and unloading. Cargo owners are the entities that own the transported goods, and shipping intermediaries coordinate and facilitate the logistics of goods movement. Due to the substantial increase in transportation needs over the past thirty years, the shipping industry has undergone rapid growth (Weng & Li, 2017). Due to the shipping industry's quick development, huge ships must be used to transport heavy loads (Wang & Yang, 2018). Furthermore, the greater the importance of shipping in international trade, the larger the economic impact of marine accidents (Md Hanafiah et al., 2022). Next, one of the most worldwide communication industries, shipping, especially sea transportation, is essential to supporting global trade since it is a practical way to convey vast quantities of merchandise. One of the primary determinants influencing the expansion of the global economy is the shipping sector, which accounts for over 70% of global trade value and more than 80% of its volume (Karakasnaki et al., 2018). In addition, a developing economy like Hong Kong, which was once a little fishing village, is now a well-established participant in the global economy thanks to the shipping sector (Lai et al., 2011). The industry consistently faced elevated relative risks of illness, injury, and fatality for its workforce (Bloor et al., 2000). Many shipping accidents happen at sea as well as in restricted seas since the shipping industry operates in complicated and high-risk environments and therefore shipping companies need to comply with several

rules that strive for safety and quality enhancement within the maritime sector, thereby ensuring the reliable and secure transportation of goods (Weng et al., 2015).

Poor Communication

Effective communication is essential for safe and efficient operations across all high-risk industries, as it supports teamwork and facilitates sound decision-making (Hetherington et al., 2006). Communication breakdowns often stem from language barriers, unfamiliar jargon, background noise, or unclear speech, leading to misunderstandings, mistakes, and potentially accidents (Hanzu-Pazara et al., 2008). Next, one of the numerous reasons for dangerous circumstances in maritime transport is improper communication between navigators, and automation of communication procedures, particularly negotiation processes, can assist prevent such situations or, if they do arise, deal with them more quickly and effectively (Pietrzykowski et al., 2016). In addition, Hetherington et al., (2006) state that Situation awareness, communication, teamwork, and leadership are examples of interpersonal and cognitive skills. The interaction among crew members is hindered by communication gaps, often caused by language barriers, particularly within multinational crews (Othman et al., 2015). Therefore, poor communication culminates in linguistic hurdles, or hierarchical barriers making delay in information being relayed (James et al., 2018).

It is often impossible to establish the fundamental cause of an issue when communication fails (Md Hanafiah et al., 2022). Studies have shown that communication breakdowns in the shipping industry can result in a range of negative consequences, such as delays in cargo delivery, increased operational costs, and decreased customer satisfaction. One major challenge in the shipping industry is the lack of standardization in communication processes, leading to confusion and misunderstandings between different parties involved in the shipping process. Furthermore, limited English proficiency contributes to miscommunication, which often leads to maritime incidents and poses risks to safety and security at sea (Yercan et al., 2005). Communication breakdown is a type of human error that is a primary cause of shipping accidents (Mileski et al., 2014). In addition, Fan et al. (2017) stated that communicative inefficiency was identified as the biggest constraint to Chinese sailors serving in the global marine labour market. Out of the eight characteristics influencing Chinese seafarers' employment on international merchant ships, communicative competence was identified as the second most important (Fan et al., 2017). Next, According to Kahveci and Sampson (2001), sailors commonly reported that communication difficulties were the primary drawback of working with a mixed-nationality crew. They also found that misunderstandings could lead to outcomes ranging from mild frustration to the development of potentially hazardous situations.

Fatigue

Fatigue, stress, health, non-technical skills, situation awareness, and cultural variation can all affect an individual's capacity to accomplish specified tasks, potentially resulting in an unsafe situation (Hasanspahić et al., 2021). Employees may favour certain shift patterns that, despite being detrimental, are likely to cause fatigue. Businesses should establish a policy specifically designed to regulate working hours, overtime, and shift-swapping to mitigate fatigue (Che Ishak et al., 2019). Extended working hours, prolonged tasks, limited rest periods, exposure to vibrations, noise, stress, heavy workloads, and ship movement are among the primary factors contributing to fatigue. In addition, when tiredness was thought to be a cause of accidents and groundings, several fatigue behaviours were frequently mentioned: activation issues, which means lower attentiveness and awareness, and perception (and sensory input) restrictions (Houtman et al., 2005). Studies have shown that fatigue is a significant issue in the shipping industry, affecting the safety, health, and well-being of crew members. Long working hours, irregular schedules,

and physical and mental strain associated with working at sea can all contribute to fatigue. Fatigue is associated with numerous adverse outcomes, such as reduced job performance, a higher risk of accidents and errors, and lower morale and job satisfaction. To combat fatigue in the shipping industry, researchers and practitioners have prioritized enhancing working conditions and scheduling. Efforts include reducing working hours, ensuring regular breaks, and improving the physical and mental environment for crew members. Medically, fatigue is a condition of physical and/or mental exhaustion that affects individuals universally, irrespective of occupational or cultural factors. It is also a symptom of numerous medical conditions and one of the leading reasons people seek medical assistance (Jepsen et al., 2015). According to Houtman et al. (2005), fatigue is characterized as a reduction in physical and/or mental capacity due to physical, mental, or emotional strain, impacting various physical abilities such as strength, speed, reaction time, coordination, decision-making, and balance. Research indicates that, within the shipping industry, role conflict and insufficient employee involvement in decisions regarding workplace safety standards contribute to increased job demands and fatigue, resulting in adverse health and safety outcomes for seafarers.

Lack of Experience

The issue of "lack of experience, knowledge, and training" relates to mariners' limited understanding of how automation or computerization operate and the specific conditions they were designed to handle effectively Sulaiman, 2012). Additionally, there is a growing need for advanced training for operators and the development of infrastructure in navigational equipment, 3D modelling, robotics, automation, and other maritime technologies to prepare cadets for Industry 4.0. Sánchez-Beaskoetxea et al. (2021) stated that due to a higher frequency of crew turnover, cargo/passenger ships have more errors due to a lack of technical training and experience than tugs. That research also stated that Misjudgment and overconfidence, as well as abuse of ship equipment, insufficient technical training, and lack of experience of the crew, all contribute to navigation blunders (Sánchez-Beaskoetxea et al., 2021). Studies have shown that a lack of experience can result in decreased job performance, increased likelihood of accidents and errors, and decreased safety in the shipping industry. New or inexperienced crew members may struggle with adapting to the demanding physical and mental demands of working at sea, leading to decreased efficiency and increased risk of incidents. To address the issue of a lack of experience in the shipping industry, many researchers and practitioners have focused on providing training and development opportunities for crew members. This includes providing on-the-job training, access to industry-specific courses and certifications, and opportunities for mentorship and peer support. Experience is essential for minimizing the risk of maritime accidents, highlighting the need to enhance seafarer training, integrate new technologies, and educate crews in emergency management based on past incidents. Research recommends improvements in safety training systems, such as decision-support tools for traffic safety, enhanced ship safety design, safety-prioritized instructions, and appropriate training programs. Additionally, even seafarers with over ten years of experience should continue training to refine their skills and expertise (Chan et al., 2019).

METHODOLOGY

Delphi Method

The Delphi technique is a surveying method that involves repeating a series of actions in a certain sequence. The method is a structured consensus approach used to gauge and build agreement among stakeholders (Humphrey-Murto & de Wit, 2019). The method is a structured group communication process used to gather and integrate expert opinions across fields like management, engineering, healthcare, and social

sciences. It involves multiple rounds of anonymous surveys, where expert responses are aggregated and shared in each round. This method is effective for addressing complex issues, making predictions, and is especially valuable when direct information is scarce or expert consensus is lacking. However, it has limitations, including potential biases from expert selection, risks of groupthink, and a time-intensive design and administration process. The Delphi method was initially designed to improve group communication and enhance forecast accuracy in estimating critical nuclear targets in the United States (Rowe et al., 1991). Online surveys, email, or postal services could all be used. By using the Delphi technique, researchers can get expert guidance on crucial organizational decisions. This method aids experts in reaching a consensus that might be used to implement broad choices or resolve complex issues. It is a structured communication approach originally developed as an interactive forecasting tool that depends on input from a panel of experts. The Delphi method offers several advantages, including its flexibility, the ability to prevent direct confrontation among experts, and a feedback process that encourages participants to re-evaluate their initial judgments across iterations. Additionally, the method provides anonymity to respondents, uses a controlled feedback process, and allows for various statistical techniques to analyse the data. Its suitability for geographically dispersed participants, along with electronic communication, helps maintain confidentiality and minimizes the influence of group dynamics (Fink-Hafner et al., 2019). According to Grime and Wright (2016), there are several recommendations for selecting an expert group in the Delphi method. While the specific circumstances and available pool of specialists may differ, general guidelines for the process include utilizing experts with pertinent subject matter expertise and assembling a diverse panel of ideally 5 to 20 experts. During feedback, it is essential to present both the mean and median estimates of the panel along with the justifications provided by each panelist for their estimates. Delphi polling should continue until the results demonstrate stability, which typically requires three structured rounds. Finally, all expert forecasts should be aggregated and weighted equally to derive the final estimate.

ANALYSIS, RESULT, AND DISCUSSION

This section provides an analysis of the findings derived from the research. A shipping company located on the East Coast of Peninsular Malaysia was selected as the case study. All eligible participants were invited to respond to the survey by providing a link to a Google Form. The data collection process involved gathering necessary information from industry experts. A total of 25 professionals from Malaysia's shipping industry participated, most of whom had at least ten years of experience in the field, while some had less than ten years. The survey was conducted online at the participants' respective locations.

Table 1

The frequency and percentages of the reason of accident occurrence

REASONS	FREQUENCY	PERCENTAGES
Poor Communication	5	20%
Fatigue	12	48%
Lack of Experience	8	32%

From Table 1, the survey results obtained from the participants of the study indicate that fatigue was identified as the primary cause of accidents by a significant number of participants. Out of 25 experts surveyed, 12 (48%) identified fatigue as the main reason for the accidents. Oluseye and Ogunseye (2016) stated that it is widely accepted that fatigue plays a significant role in maritime accidents as a form of human error, contributing to the high incidence of such incidents within the industry. Fatigue can impair decision-making, reduce attention and reaction times, and ultimately lead to critical mistakes that result in accidents at sea. This shows that fatigue is a prevalent issue in this field and needs to be addressed in order

to prevent future accidents. Additionally, 32% of the participants (8 experts) identified lack of experience as a contributing factor to the accidents. Seafarers who lack sufficient theoretical knowledge and have limited maritime experience are at a higher risk of being involved in serious accidents. (Wang et al., 2018). Lastly, 20% of the participants (5 experts) reported that lack of communication was the cause of the accidents. Improving communication and teamwork within the workplace can potentially mitigate the risks of accidents caused by miscommunication. The significance of communication in preventing accidents is also highlighted by the results of the survey. Improving communication and teamwork within the workplace can help to avoid accidents caused by miscommunication. Oluseye and Ogunseye (2016) emphasized that poor communication at the worksite is a common form of human error that is difficult to eliminate and can lead to marine accidents.

Table 2
The Delphi method results

VARIABLES	1ST ROUND		2ND ROUND	
	MEAN	STANDARD DEVIATION	MEAN	STANDARD DEVIATION
Poor communication	3.16	1.434	3.80	0.866
Fatigue	4.60	0.645	4.60	0.645
Lack of experience	4.40	0.577	4.40	0.577

The data from Table 2 shows that fatigue is the primary factor that has the most significant impact on shipping companies when it comes to accidents. According to the statistics, the mean value of the impact of fatigue on shipping companies is 4.60. This means that on average, fatigue is rated as having a 4.60 level of impact when it comes to accidents in the shipping industry. Additionally, the standard deviation of 0.645 indicates the degree of variability or spread of the data around the mean. The higher the standard deviation, the more spread out the data is. In this case, the standard deviation of 0.645 suggests that the impact of fatigue on shipping companies has a relatively moderate level of variability. Fatigue is a prevalent issue in the shipping industry caused by long hours, demanding work environments, and extended periods away from home. When employees are tired, their ability to make safe and effective decisions is severely impacted, and the risk of accidents increases.

CONCLUSION

In conclusion, human error remains one of the most major challenges faced by the shipping industry in Malaysia, with far-reaching consequences for the companies, their employees, and the environment. In addition, human error has a profound impact on the shipping industry in Malaysia, and its effects cannot be ignored or underestimated. Given the critical role of the shipping industry in the nation's economy, it is imperative to identify strategies to reduce accidents resulting from human error. Although adopting technology is a positive step, it alone is insufficient to fully address the reduction of accidents caused by human error. The industry must take a multi-pronged approach that involves addressing the underlying causes of such accidents, such as poor communication, fatigue, and lack of experience. Only by working together, can the relevant parties develop and implement effective strategies to reduce human error-related accidents in the industry. It is important to acknowledge the benefits of conducting further research on the impact of human error on accident rates in the Malaysian shipping industry. This research can provide valuable insights into the underlying causes of such accidents and inform future decision-making processes.

The findings from this research can assist shipping companies in Malaysia in implementing measures to enhance safety, mitigate accident risks, and improve overall operational efficiency. By adopting these

measures, companies can secure their long-term viability, boost profitability, and contribute positively to the advancement of the industry as a whole. Additionally, this study serves as a valuable reference for future researchers interested in examining the relationship between human error and accident rates in Malaysia's shipping sector. Building upon the insights gained from this research, subsequent studies can deepen our understanding of this intricate issue and formulate more effective strategies for addressing it. Ultimately, the aim of this research is to reduce accidents related to human error within the shipping industry, enhance safety for all stakeholders, and foster the growth and development of the sector in Malaysia.

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