Human Error Accidents Encountered by Maritime Student Apprentices Onboard

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Abstract

The study was conducted to find out the human error accidents encountered by maritime student apprentices onboard and the causes of these accidents. To meet the objectives of the study, the researchers used the descriptive research design. Data were analyzed using the frequency. Results revealed that the common human error accidents onboard encountered by BSMT student apprentices were slipping/tripping, burn, physical and mental injury, eye injuries, and falling. Whereas, the common human error accidents for the BSMarE were burns, falling, slipping/tripping, contact with moving parts of machinery, and chemical-related accidents. If taken altogether, the common human error accidents were slipping/tripping, burns, falling, contact with moving parts of machinery, and chemical-related accidents. The common causes of the accidents mentioned above were poor communication, fatigue/stress, entering enclosed spaces without permission, inappropriate clothing during work, and overconfidence. The precautionary strategies to be employed by the shipping management may include risk assessment, safety training and certification, safety and quality management system, and audits. The researchers recommended that the school administration should conduct more training on safety on board. The school must offer a compulsory pre-educational program on safety matters before students have to proceed to onboard training to give them a clearer view of safety.

Keywords: maritime safety, on board training, descriptive research, Philippines

INTRODUCTION

Safety and protection of human life at sea have always been a central aspect of humankind's efforts to engage in maritime travel. That is why safety management is developed and has been vital to every marine company to establish briefing on safety rules and management to their crew before going on board. However, though safety measures have been laid to crews before going on board, it is undeniable that human errors occur, and eventually, results in accidents. According to Dr. Anita M. Rothblum (2007), the shipping commerce has focused on improving ship construction and the reliability of ship systems to reduce casualties and increase efficiency and productivity. People have seen improvements in hull design, stability systems, propulsion systems, and navigational equipment. Today's ship systems are technologically advanced and highly reliable. Nevertheless, the maritime system is still a people system, and human errors figure prominently in casualty situations.

Moreover, human error is a part of the ordinary spectrum of human behavior. Therefore, human errors are natural to men, but it can also be prevented by developing a safety culture and self-awareness to minimize the occurrence of disasters. Human errors are caused by technologies, environments, and organizations which are incompatible in some way with optimal human performance. The person in charge of the equipment could make mistakes or commit unintentional errors that can cause accidents on board. These incompatible factors may cause the human operator to make mistakes that can be a threat to the safety of the crew onboard the vessel. Accidents do not simply happen. They, typically have complex causes that may take days, weeks or even years

to develop (Reason, 1990). Thus, in order not to commit mistakes or cause any accident to happen, it is essential for humans to be properly educated about the importance of safety.

One way to identify the causes of human errors relevant to the maritime industry is to study marine accidents and determine how they happen. According to Tow (2007) in his study, the three largest problems were fatigue, inadequate communication and coordination between pilot and bridge crew and inadequate technical knowledge, especially of radar. These factors were believed to have a direct influence on situational awareness among the crew and cargo vessels. Leveson (1995) asserts that safety engineers have developed a range of tools and techniques that can be used to represent and reason about the causes of major accidents onboard the ship.

Further, Buttrey (1998) claims that the effects of maritime mishaps, which include loss of life as well as environmental and economic considerations, are significant. Human error has been extensively studied in a number of fields. Its causes can be found considerable, but the damage may not. It may lead to serious outcomes such as human life loss, fatality, permanent disability, or equipment damage and destructive to such vessel operations.

Despite the danger and accidents on board, the influence of the maritime industry is very evident in almost all aspects throughout the Philippines, making the Philippines the manning capital of the world (Schmidt, 1998).

Since accidents are a major concern in the maritime industry, the researchers are motivated to identify the common errors, the causes, as well as the measures to prevent these accidents from recurring.

Framework

This study was based on the theory of Robert Shiller, a psychologist, called Decision– Making Theories and Human Errors cited in Corbett (2004). This theory proposes three models of people's thinking: descriptive, prescriptive, and normative models.

Normative Models define the best thinking for achieving the thinker's goal; that is, if the decision maker conforms to logically compelling properties, the outcome is predictably an ideal situation. Descriptive Models are theories about how people normally think, solve problems, or make decisions. In real life, people often violate normative principles. Thus, there is a gap between the desired normative principles and the observed descriptive models. Prescriptive Models are gap-bridging two models that "prescribe" or state how people ought to think and provide methods to aid people in conforming to normative models. Because normative models of thinking are often too cognitive demanding to be employed by people in daily decision makings and people's memory and computational capacity are limited, prescriptive models serve as the middle ground between normative and descriptive models. Prescriptive models may consist of descriptive models (Keller, 1989 & Stanovich, 1999).

Empirical observation of people's decision making found that people's thinking, reasoning and decision making (descriptive models) constantly deviate from normative models. People systematically make different kinds of by biases and heuristics includes conjunction fallacy, anchoring, availability, familiarity, based-rate neglect, hindsight, contextualization, and overconfidence. People's attention also can be manipulated by verbal statements as reflected by framing effect and reference point effect (Baron, 2000).

The mind is the key master to all movements and actions that happen to human life, particularly to seafarers. Professors on maritime schools find human errors alarming to future seafarers.

In the Philippines, aside from the three-year academic education, students are required to undergo Basic and Advance Training Courses on the Naval Reserve Officer Training Corps (NROTC), a military exercise to practice and promote physical and mental alertness aside from ship familiarization, navigational trips and engine/deck simulator training. Upon completing the academic requirements (CAR) students are required to under twelve months Shipboard Training to apply their theoretical knowledge on board, acquire and develop their skills to complete the requirements for the Bachelors Degree and be able to take the Professional Regulations Commission Examination as Marine or Deck Officers.

Adverse working conditions on board the vessels can reduce human performance, efficiency, and safety. A comprehensive approach to the human element is essential for safe ship operations. The declining number of well-qualified seafarers is recognized as a problem, particularly in terms of the loss of knowledge to the maritime industry as a whole. This issue needs to be tackled by increasing job attractiveness (Johnson, 2007).

Distractions usually affect human performance by causing people to omit procedural steps, forget to complete tasks, and take shortcuts that may not be for the better (Latino, 2004). In the idea presented above by J. Latino, it is very evident that since people nowadays were engaged to the third wave technology, everyone is considered having their gadgets particularly phones. Seafarers agreed to own this kind of gadget, more importantly, they need this tool to obtain communication with their families and loved ones. In this connection,

seafarers on board were prone to emotional distractions expectedly during at work. The temptation of using phones otherwise can also be possible.

Slip and physical injuries are among the visible and recorded human error accidents onboard the ship which put seafarers' life in danger. These issues are the reasons why maritime student apprentice have been given tremendous lecture and training on safety to avoid or lessen the errors committed or accidents. Aside from the excellent education young seafarers had while they were in school, they were subjected to rigid training programs that hone their navigational and ship handling skills. Primarily, shipping companies demand young seafarers various certifications which attest their competence in their chosen career. This excellent move is the answer to eradicating human errors accidents onboard (Stanovich, 1999).

Building from the theory and the rest of the concepts presented in this study, the researchers in this investigation assume that every seafarer has to be a good decision maker to ensure safety onboard. Judging on what to do as one faces an impending danger is not an easy task for a seafarer, in fact, it defines how educated, careful, and wise a seafarer is. Thus, the apprentice has to maintain good judgment in every decision he makes to uphold safety and to avoid the occurrence of human errors while at work. Human errors have been accountable for many accidents which mean that if those human errors had not occurred, the chain of events would not have happened. Therefore, if people can find ways to prevent some of these human errors or at least, increase the probability that such errors will be noticed and corrected, we can achieve greater marine safety and fewer casualties.
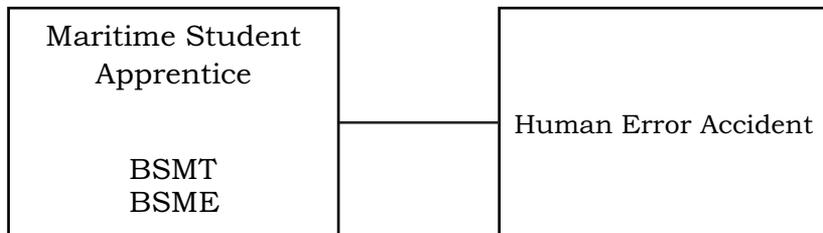
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┌─────────────────────────┐          ┌─────────────────────────┐
│   Maritime Student      │          │                         │
│     Apprentice          │──────────│  Human Error Accident   │
│                         │          │                         │
│        BSMT             │          │                         │
│        BSME             │          │                         │
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Figure 1 Schematic Diagram of the Study

Objectives

The main purpose of this study was to determine the common human error accidents onboard the ship, the causes of these human error accidents, and the precautionary measures employed by the shipping companies to address this problem.

METHODOLOGY

The researchers used the descriptive research design. This design was described by Ardales (2008) as appropriate for behavioral studies which aim to find out what prevails at present such as conditions, held opinions and beliefs, processes and effects, and developing trends. This design goes beyond mere gathering of data to familiarize oneself with those things as the process involves classification, measurement, evaluation, comparison, and establishing the relationship between or among variables. It also explores causes of phenomena, test hypotheses, and develop generalizations, principles, and theories as offshoots of analyzed data.

The respondents of this study were 91 maritime student apprentices who underwent onboard training during the school year 2011- 2012. Specifically, these student apprentices were composed of 56 deck cadets and 35 engine cadets who responded to the survey questionnaire used in this investigation.

A checklist which had four important parts was used to obtain the needed data for this study. Part 1 was designed to gather personal data from the respondents which included the name, department, course, and year. Part II contained ten items that identified the common human error accidents encountered onboard; Part III with ten items for the possible causes, and Part IV with ten items for the identification of precautionary strategies. Directions were also carefully provided to guide the respondents of the study.

The instrument was presented to three experts for critical review and validity testing using the criteria developed for evaluating survey questionnaire set forth by Carter V. Good and Douglas B. Scates. Their comments were carefully considered and reflected in the revised copy of the instrument. A test for reliability using Cronbach's Alpha obtained a coefficient of 0.936 which indicates a highly reliable data gathering instrument.

RESULTS AND DISCUSSION

Human Error Accidents According to Department

Table 1 shows the human error accidents encountered by the student apprentices on board are categorized according to department (deck or engine). Data gathered from the deck student apprentices identified "slipping/tripping" as the most common human error accident encountered on board showing a frequency count of 27; while data from engine student apprentices identified " burns " as most occurring with 48. This finding supports other data of the most common accidents on board involving slips or trips or falls because of slippery patches, obstructions on deck, trailing leads and unguarded openings (healthwatch@triley.co.uk). Thus, it is the shipping management's and crews ' responsibility to report, secure or stow away all loose equipment, clean up

spillages and spread sand over icy or slippery areas, and wear proper industrial footwear with slip-resistant soles and reinforced toe caps. Further, casual shoes such as sandals, moccasins, and flip-flops are dangerous on board because they offer little protection and add to the risk of tripping or slipping on ladders.

Burns are also common among people working in engine rooms. Hence, seafarers must wear proper equipment such as gloves when working with hot surfaces or machinery as this can avoid accidents like burns and contact with moving parts of machinery that may affect their health and jobs.

Table 1. Common Human Error Accidents according to Course

BSMT 5 Most Common Human Error Accidents	f	BSMarE 5 Most Common Human Error Accidents	f
Slipping/Tripping	27	Burns	48
Burns	24	Falling	47
Physical Injury	21	Slipping/Tripping	473
Eye Injuries	19	Contact with Moving Parts of Machinery	38
Falling	16	Chemical-related Accidents	26

Human Error Accidents when Data are Taken Altogether

Table 2 unveils the human error accidents when data are taken all together. Result verifies that "slipping/tripping" was the topmost human error accident encountered by maritime student apprentices on board and "chemical-related accident" was the least among the five human error accidents identified in this investigation.

Slipping/tripping has been the most common human error accidents on board due to instances that most seafarers forget or in the worst scenario ignore to secure equipment, repair leakage, mend broken stairways, and install signage that leads to slips or trips. Furthermore, some seafarers onboard are not very particular with the ship's safety practices or they are not

taking the rules on safety seriously such as wearing appropriate safety shoes to prevent from falling on slippery surfaces especially when the floor is wet.

The chemical-related accident appeared as the least among the five human error accidents. This issue is because chemicals are highly destructive substance that hinders ship's operation when lightly taken. Shipping management is therefore in full vigilance of chemical handling and transport to avoid accidents that may involve the loss of the important cargoes - the lives of seafarers onboard. Because of severe damage chemicals may cause, extra attention and care have been given to the strict implementation of health and safety practices.

Table 2. Human Error Accidents when Courses are Taken Altogether

5 Most Common Human Error Accidents	f
1. Slipping/Tripping	70
2. Burn	72
3. Falling	63
4. Contact with Moving Parts of Machinery	59
5. Chemical-related Accidents	38

Causes of Human Errors

Table 3 identifies the five common causes of human error accidents. The result shows that "poor communication" has been the major grounds of human error accidents while "overconfidence" ranked as the least among the five common reasons of human error accidents in this investigation.

In the world of international shipping, with seafarers from many countries sailing on ships trading to all parts of the world, effective communication between those on board and between ship and shore is vitally important (International Maritime Organization, 2002). Hence, it is important that the crew on board must communicate

effectively. For effective communication, seafarers must be subjected to regular education and training that hone their communication skills to prevent miscommunication that leads to accidents.

Accidents could just happen anytime not just because of defective communication but also because of fatigue / stress, entering enclosed spaces without permission, inappropriate clothing during work and overconfidence. It is difficult to concentrate in work when you are suffering from stress. It is obviously one of the major reasons that affect the seafarers' job performance on board.

Some seafarers met accidents because they entered enclosed spaces without permission and some failed to wear appropriate clothing during work. These causes are unmistakably human errors. Shipping management is less to be blamed in this situation because it has been implementing safety protocols and persistently reminds seafarers of their duty to rigidly follow the set of rules onboard. Even maritime schools where seafarers came have not failed to give them quality education and trainings. Therefore, shipping industry must strengthen their hiring and selection process of cadets who are physically, emotionally, and mentally fit go onboard and strategize absolute guidelines to follow.

Table 3. Causes of Human Errors

5 Common Causes of Human Error Accidents	f
1. Poor Communication	63
2. Fatigue/Stress	60
3. Entering Enclosed Spaces without Permission	58
4. Inappropriate Clothing During Work	48
5. Overconfidence	40

Precautionary Strategies

Table 4 shows the 5 precautionary strategies to be employed by the shipping companies to prevent accidents from happening on board their vessels. Result presents that "risk assessment" topped among the other precautionary strategies and "audits" was the least.

The shipowner and the master are responsible for planning, organizing and the carrying out of risk assessments on board. The shipping company needs a risk assessment system at a strategic level to ensure smooth implementation, (www.dieselduck.net). It is important to assess situations which may cause accidents or damage to health to prevent unwanted happenings on board. By systematically mapping different work operations, effective measures may be implemented and serious consequences may be avoided.

Table 4. Precautionary Strategies to be Employed by the Shipping Management

Precautionary Strategies	f
1. Risk Assessment	65
2. Safety Training and certification	62
3. Enforcing Strict Safety Guidelines	60
4. Safety and Quality Management System	57
5. Audits	40

CONCLUSIONS

The topmost human error accident on board in the deck department is slipping/tripping. This type of accident is attributed to complacency and lack of awareness of safety measures onboard. The crews usually take shortcuts that make things easier yet unsafe for them. Poor communication tops the common causes of

human error accidents on board. This finding suggests that an effective communication among seafarers should be achieved and practiced to circumvent further recurrence of accidents onboard. Quality training and excellent education should primarily start from the school where seafarers come. The maritime curriculum should be strengthened and enriched with various learning experiences that target seafarers' communicative competitiveness.

It is important that before seafarers perform a certain task they must think if it is safe. Thus, risk assessment must be implemented. Risk assessment leads to appropriate procedures, identifies the need for protective equipment and safety measures to reduce the risk of personal injury, and requires preparatory and supplementary work. Everyone is responsible for ensuring the best possible working environment at sea. All hands have to pull together.

RECOMMENDATIONS

The following recommendations are advanced in this study:

School administrators should offer more trainings and seminars, specifically on safety practices onboard, to all maritime instructors and students. Awareness on safety practices will ensure the safety of life of every seafarer.

The school must strengthen its safety training program before students could be allowed to proceed to their onboard training. Having a wider range of knowledge on the nature of work environment and safety could positively yield safer and better job performance.

The shipping management should religiously implement policies regarding safety and impose more

trainings and seminars to seafarers. They should also conduct risk assessment as this can be a ticket to safety onboard.

Maritime schools and their curriculum should emphasize the importance of proper communication and target on developing the seafarers' communicative competitiveness.

Maritime students should be consistently reminded of their work attitude especially on being overconfident towards their tasks that may lead to accidents.

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