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Contents

BLUE ECONOMY

Since the turn of the twenty-first century, the concept of the "blue economy" has become increasingly popular as it is divided into three economic forms: the economy that deals with the global water crisis, the innovative development economy, and the development of the marine economy. The blue economy is also considered a political tool or a means to boost economic growth, provide job opportunities, and reduce unemployment rates in coastal countries. Marine industrial activities focus on economic revitalization, transportation, mineral resource development, shipbuilding, communication cables, sustainable energy from waves and ocean currents, coastal recreational tourism, fisheries and aquaculture. In addition to traditional marine development activities, marine information and science sectors are playing an increasingly stronger role in promoting the development of the blue economy.

The blue economy needs to comply with the Sustainable Development Goals, with a focus on conserving and sustainably using the oceans, seas and marine resources. As the core is to achieve socio-economic development and dynamic balance of resources and the environment. The approaches to embracing the "blue economy" have been highlighted by the United Nations Commission on Sustainable Development and believes that they are in line with the core contents of the Rio+20 Summit. The green economy mentioned in the Rio+20 negotiations also represents a paradigm shift in economic development. Hence, the international community tends to refer the blue economy to the green economy or the green development model in the development and management of oceans and coastal areas.

Based on the analysis of marine industrial activities and the health of the marine ecosystem, we must maintain a healthy marine and terrestrial ecosystem, solve pollution problems such as marine transportation waste and plastic litter, mitigate the effects of global change, and build a blue economy a sustainable management model based on maintaining a healthy ecosystem. Also, the United Nations Environment Program and other international organizations derive the blue economy from the green economy. It promotes tackling climate change through shipping, fishing, marine tourism, and low-carbon, resource-efficient offshore renewable energy industries. That is, the blue economy is a model of sustainable marine economic development that is based on a new development mindset and its core is to develop the marine economy while protecting the marine ecosystem well and finally achieving the sustainable use of resources.

Editorial Board

Legal Aspects for Submarine Cables' Protection

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Abstract:

Submarine cables have increasingly become a vital element to international communication, and its strategic importance for the global economy is well known, particularly, with the spread of COVID 19 pandemic, as it forms the backbone of an international network. Since the first submarine communication cables were laid, the development and use of submarine cables as a means of communication coincided with an increasing international concern for their protection. These cables are frequently damaged due to marine activities, especially those involving fishing and anchoring as well as natural hazards and intentional breakage including theft. This paper examined the legal regime for submarine cables and whether the existing legal regulations are sufficient for the protection and security of the huge number of cables that laid on the ocean floor, and therefore the security of the world's communications networks. Part I clarified the importance of submarine cables. While, Part II discussed the threats to submarine cables. Part III examined the legal regime which providing framework for submarine cables protection, while Part IV presented recommendations to enhance the safety and security of Submarine cable.

Keywords: Submarine Cables; International convention for the protection of telegraph submarine cables; Law of the Sea Conventions.

1- Introduction

Communications play an important role in modern society, connecting people and the world. Governments, private sectors, and individuals from different parts of the world can conduct business with partners from other parts of the world. Internet and telephony, text and voice messages, international videoconferences and banking transactions, as well as other traffic data that runs daily around the world, requires modern technology and reliable infrastructure ready to transmit a vast amount of information with a high speed. Modern submarine cables ensure and provide the world with stable communications.

The importance of submarine cables to the international community cannot be overstated. It is no exaggeration to say that submarine cables have become the foundation of our modern digital society, as well as one of the most important drivers of globalisation (Tara Davenport, 2015).

The global telecommunications network and E-commerce rely mainly on submarine cables as do the world's financial systems (Robert Beckman, 2010). The intercontinental network of undersea fiber-optic cables transmits daily approximately $10 trillion in financial transactions data throughout the global economy (The National Bureau of Asian Research, 2021). More than 95 percent of international communications are linked through submarine cables (Douglas Burnett et al. 2014). Therefore, these cables act as pillars to the world's international telecommunications network and making them a critical resource for world economy. The sole objective of submarine cables is to serve communication interests, especially with increasing need for virtual interactions resulting from the ongoing COVID-19 pandemic. Cables are also important in military applications, as the US Department of Defense's net-centric warfare and Global Information Grid rely on undersea cables (Michael Sechrist, 2010).

In the event of a break or damage to a submarine cable, disruptions can affect large territories and cause interruptions in the communications for millions of people and organizations around the world (Maura Conway et al. 2017). The statistics show that about 100 fiber-optic submarine cables are damaged every year (Submarine Cable Map, 2021), given that the total amount of in service submarine telecommunications cables currently existing on the seabed of the World Ocean is around 426, extent more than 700.000 nautical miles worldwide (Submarine Cable Map, 2021).

Owing to the crucial role of submarine cables to the economies and security of all countries, international co-operation was necessary to devise measures for protecting submarine cables laid on the ocean floor in the area of high sea from damage. Today's COVID 19 Pandemic highlights submarine cables as critical infrastructure and make the safety and structural integrity of these cables a major security concern (Harry Baldock, 2020). Yet at present, what are the vulnerabilities of submarine cables infrastructure? What real threats hang over it? While increasing, maritime activities have always carried risks to this infrastructure, the seas and oceans can now be counted among the major victims of cyber-attacks. The cable network, closely associated with cyber- space, is therefore also susceptible to this scourge (Camille Morel, 2016). However, negligible attention has been paid to the international legal framework in place to deal with damage caused to these cables, which serve as the world's internet's backbone.

International law, specifically the law of the sea, contains provisions that impose specific obligations on states to protect submarine cables. Many workshops (Beijing 2009; Singapore 2010) have been held to discuss the issues of submarine cable protection, which have emphasized the inadequacy of existing protections for submarine cable networks, as well as the complicated domestic bureaucracies that can significantly delay cable-related activities (Robert Beckman, Tara Maria Davenport, 2010).

The results of these workshops noted by Secretary-General of the United Nations and he agreed that the current legal regime is not adequate, especially Article 113 of UNCLOS 82, which obligate states to punish any act resulting in damage to a submarine cable (U.N. Secretary-General Report, 2010). As a result, the United Nations General Assembly (UNGA) adopted a resolution calling upon states to take measures to protect submarine cables (UNGA. Res. A/65/69, 2010).

This paper examined the existing international legal regime applicable to submarine cables,

through analyzing the provisions of the international conventions governing the laying, repairing and protecting such cables. In particular, the analysis concerns the protection of submarine cables and before to do so, first the threats to submarine cables have been explored.

2-Threats to Submarine Cables

As Yincon and others (2018) elaborated in their writing, human-caused submarine cable damage accounts for more than two-thirds of total submarine cable damages, with fishing and anchoring accounting for the majority, while other activities account for only a small portion. Every year, between 150 and 200 damaged submarine cables are registered (Burnett et al., 2013). Natural disaster like earthquakes also causes the cables' fault. But, less commonly, underwater components can cause damage to submarine cables. While, cables' damage from deliberate sabotage and shark bites are exceedingly rare (Submarine Cable Map, 2021). Therefore, the main threat to submarine cables is human activity, including unintentional damage by fishermen or anchors (The Center for international Law of the Nautical University of Singapore, 2009), as well as intentional damage resulting from theft and, possibly, terrorist attack.

2.1 Fishing activities

Fishing activities, especially beam trawlers and scalpers, causes harm to submarine cables, while long lining and stow net fishing also cause severe damage to cables in some areas (Ian Douglas, 2011). Bottom trawling, remain the biggest contributor to cable damage, they have caused two-thirds of all cable damaged (Submarine Cable Map, 2021).

Trawl net fishing is the most common form of fishing in coastal or shallow sea areas, and it necessitates the use of one or more high-powered boats to drag the fishing gear. Trawler vessel usually drag a bottom trawl along the seabed behind her, which is a cone-shaped consist of lines and netting, it has a steel and or wooden doors panels rigged ahead of the net on each side. The reason is to provide weight in order to keep the trawl completely touches the sea bed and maintain the net mouth open by creating horizontal spreading force. Small trawler otter boards can weigh less than 100 kg, whereas large trawler otter boards may weigh more than 8 tons per panel. (Carter Lonel et al. 2009). The bottom line of the net is usually rigged with rollers, chains, rubber discs or steel bobbin. Contact between fishing gears and cables can occur when a heavy trawl door falls on a cable that is lying on rocks or another hard bottom, causing cable damage.

Also, during a cable ship's operation, it is important for the ship to remain stationary while laying or repairing a cable, as cables surround the ship in the water column. In such situation, it is important for fishing vessels to maintain a suitable distance from the operation to avoid entanglement between the cables and the fishing gear, as both are under the water's surface and cannot be completely controlled due to other oceanographic factors .

Fishermen activity interference may include fishermen blocking the cable ships by circling them with nets to keep them from making a repair unless extortion money is first paid to the fishermen (Haryo Nugroho, 2013). Furthermore, capsizing can occur if a fishing ship tries by force to recover fishing gear or an anchor that is entangled by cable (Ian Douglas, 2011).

2.2 Anchoring Operations

Aside from fishing, the most common cause of submarine cable damage is vessel anchoring operations. It accounts for roughly 30 % of all cable damages caused by human factors (Ye Yincan et al., 2018). Presently, as a result of increasing number of ships and its tonnage as well as the coastal ports and berths, the ship's anchoring operations are increased significantly, leads to submarine cable damage caused by ship's anchoring increased.

When a ship with 5000 tones tonnage and have a 4 tons' anchor laying that anchor at sea bed, it will penetrate soft sediment to depth of 5 meters (Shapiro et al. 1997), if such an anchor is laid on or drags a submarine cable, it will cause damage to that cable. According to Yincan, the reason for submarine cable damage caused by ship anchoring is primarily that the optical cable is compressed, pierced, and broken as a result of the anchor penetrating the seabed, and the severity of cable damage is primarily

determined by the depth of the anchor penetration of the seabed and the structure performance of the submarine cable itself (Ye Yincan et al. 2018).

According to historical data, most submarine cable damage occurred due to anchoring in water depths less than 200 m. The majority of them occur in sea areas with water depths of less than 50 meters, and the minority occur in sea areas with water depths of less than 10 meters. It indicates that the heavy hazardous anchoring area is offshore (Ye Yincan et al., 2018). As a result, cable routes should be planned to avoid charted anchorage areas, and vessels should avoid anchoring in uncharted zones.

2.3 Theft and Other Security Threats

Cables and other related equipment, including buoys and mooring lines, are also targets of theft (Stephen Drew, 2011). In 2007, there was a case well-known in which approximately 100 km of cables and optical amplifiers were stolen off the coast of Vietnam (Robert Beckman and Tara Davenport, 2009). Vietnam Telecom international, one of the members of the consortium who owns the cable, reportedly suffered a four million U.S. dollars loss from the theft (Haryo Budi Nugroho, 2013).

Other security threats, such as sabotage or even terrorism, also result in submarine cable failures. In March 2013, three scuba divers were apprehended off the coast of Egypt by Egyptian naval forces for allegedly attempting to cut an undersea cable off the port of Alexandria, which provides one-third of all internet capacity between Europe and Egypt. However, the navy that apprehended the men had no explanation for the divers' motivations (The Guardian, 2013).

Considering the impact of submarine cable damage, it is not unreasonable to predict that submarine cables could be a target for a terrorist attack. So far, there has been no mid-ocean terrorist attack reported on cables. However, the possibilities are there.

2.4 Natural causes

Natural disasters, like earthquakes, tsunamis, typhoons, and subsea landslides, pose significant threats to undersea cable networks. Submarine cables laid on ocean floor are vulnerable to earthquakes and their concomitant submarine landslides and turbidity flows, which can break them and cutting global communications. Numerous cable damages are reportedly caused by natural disasters.

The analysis of damaged submarine cables caused by multiple earthquakes revealed that the primary causes of such damage were; first, when a massive earthquake wave forms, causing the cable to be bent, twisted, and stretched, resulting in cable damage; second, when seabed strata dislocation, soil collapse, landslides, and ground deformation, among other phenomena, directly damage the submarine cable; and third, if an earthquake causes a tsunami that destroys the coastline, the cable in the landing section will be damaged (Ye Yincan et al. 2018).

There have been numerous documented incidents of earthquakes causing damage to submarine cables throughout history. Taiwan's earthquake in 2006 resulted in 22 cable breaks (Carter et al., 2014), while Algeria's earthquake in 2003 resulted in 29 cable breaks (Cattaneo et al. 2012). The earthquakes that struck Taiwan in the Bus Strait, with magnitudes of 7.2 and 6.7, respectively, at 8-minute intervals, have disrupted international communications (Carter et al. 2014). In 2015, a typhoon is believed to have severed Mariana Island's only undersea fiber-optic cable, resulting in a complete loss of communications with the outside world, financial services such as credit cards and ATM machines, and telephone connections to emergency services (The National Bureau of Asian Research, 2021).

3- The prevailing Legal Regime for submarine cables' protection

The Convention for the Protection of Submarine Telegraph Cables 1884, the 1958 Geneva conventions, and the 1982 United Nations Convention on the Law of the Sea all provide international protection for submarine cables in their broadest sense, including protection during and from interference with cable laying, maintenance, and repair (UNCLOS). Furthermore, the 1972 Convention on International Regulations for the Prevention of Collisions at Sea (COLREGs) includes some provisions for the protection of cable laying

ships. The following are a summary of the treaty provisions on submarine cable protection:

3.1 The 1884 Convention for the Protection of Submarine Telegraph Cables.

The 1884 Convention was the first international treaty governing submarine cables, and it addresses submarine cable protection on the high seas. In 1879, the Institute de Droit International began the process of establishing a convention to protect submarine cables. Although it only consisted of seventeen articles, the basic principles of cable protection, including criminalization of damage to submarine cables, indemnity, and responsibility to respect previously laid cables, were found in this convention. There are two interesting points raised by Article I. First, it specifies that the convention applies beyond the territorial sea. As a result, it acknowledged the coastal state's full sovereignty within its territorial waters, including the authority to regulate submarine cable issues. Second, the convention contained no internationally agreed-upon standard for the limits of the territorial sea. Nevertheless, the convention focused on submarine cable high seas protection and a flag state enforcement mechanism.

The convention provided that wilful or culpable negligence that caused injury or breakage of submarine cable was a punishable offense (Convention 1884, article II). This provision did not exclude civil action for damages, including damages caused by a cable owner that injured another cable during laying or repairing his cable (Convention 1884, article IV). Saving lives or ships was the only exception, after taking all necessary precautions to avoid injury, for this offense. (Convention 1884, article II). The convention further mandated criminalization for ships which violated the safety requirement regarding minimum distance from a ship engaging in laying or repairing cable, as well as minimum distance from cable buoys (Convention 1884, article XI).

The convention further provided mechanisms for investigation by allowing, through law enforcement of one of the high contracting parties to investigate a ship suspected of breaking the cables, by asking for the ship registration and collecting facts surrounding the incidents (Convention 1884, article X). The convention specified that the tribunal which will be competent to take action is either the flag state of violating ship or the state in which the offender is a national (Convention 1884, article VIII). Furthermore, the convention stated that the above-mentioned procedure shall be conducted under applicable laws and regulations (Convention 1884, article XI).

The 1884 convention also provided guidelines for states to impose minimum safety measures relating to submarine cables. First, it obliged states to impose safety standards before granting permission for installing a cable (Convention 1884, article III). Second, it mandated that the high contracting parties agree on regulations regarding signals for collision prevention for ships engaged in laying the cables (Convention 1884, article V). There is a one nautical mile distance requirement for other ships when passing near cable ships, and fishing equipment must also be kept at the same distance. Third, the convention mandated a one-quarter mile minimum distance for ships and fishing gear with respect to the buoys indicating where cable-related activities are being carried out (Convention 1884, article VI).

Finally, the convention provided that if ship owners can demonstrate that they sacrificed their anchor or fishing gear to avoid damaging a submarine cable, they will be compensated by the cable owner (Convention 1884, article VII). The master of the ship then must file the claim within 24 hours after his arrival in the next port, and the port authorities would communicate this claim to the consular authority to which the owner of the cable belongs (Convention 1884, article VII).

The provisions of the1884 convention specifically refers to telegraph cables, as such cable, at that time, only exist. The 1884 convention was developed in the time period during which the international law of the sea had not yet been well established. It appeared at that time to be a practical solution given the needs of states to protect their submarine cable installations. On the other hand, it gave a clear foundation for criminalizing action that caused disruption to the cables and provided

a mechanism for prosecution and indemnification. But, on the other hand, the convention had two shortcomings. The first is on the applicability of the convention, since the limit of the territorial sea was not established. The second is that, while focusing on the protection of the laid submarine cable, the convention did not address limits of state' rights to regulate permits for laying cables.

3.2 The 1958 Geneva Conventions

The first United Nations conference on the law of the sea, held in 1958, resulted in the adoption of four conventions. This set of conventions is one of the most important pillars of the international law commission established by the United Nations General Assembly (Tullio Treves, 2008). The 1958 Geneva conventions were the first achievement of the codification effort for the law of the sea. All four conventions entered into force and with the exception of the fisheries convention, the conventions are relevant to submarine cable issues.

3.2.1 The Territorial Sea Convention

The Territorial sea convention emphasized states' sovereignty over their territorial sea (Article I). Thus, all activities, including submarine cable-related activities, are subject to the coastal state's laws. However, the maximum breadth of the territorial sea was not limited by this convention. Because the convention stated that the contiguous zone adjacent to the territorial sea should not exceed 12 nautical miles, there is an inference that the maximum breadth shall not exceed twelve nautical miles from the baseline (Article 24). This convention did not completely resolve the question about which part of the ocean the 1884 convention applied to, but it suggested that it would be applied, at the minimum, beyond the 12 nautical mile limits.

3.2.2 The continental Shelf Convention

The continental shelf regime first emerged through a unilateral proclamation known as the Truman Proclamation. The international community's main concern was freedom on the high seas, including the freedom to lay submarine cables (International Law Commission, 1956). The convention prescribed that a coastal state had sovereign rights over the exploration and exploitation of continental shelf resources, and it limited the coastal state's authority only to the extent of exercising its sovereign rights.

The convention also specifies continental shelf limits of up to 200M isobaths or areas where exploration is feasible (Article I). As a result, there was still freedom to lay cables, and coastal states could impose reasonable measures on the exploration and exploitation of continental shelf resources (Article IV).

The main element, to be applied carefully, is the term "reasonable measures". The convention did not define or further explain the meaning of "reasonable measures". As such, this term leaves ambiguity in interpretation.

The International Law Commission's commentary on draft articles on the continental shelf presented to the United Nations General Assembly specifies: "The coastal state is required to permit the laying of submarine cables on the seabed of its continental shelf; however, in order to avoid unjustified interference with the exploitation of natural resources of the seabed and subsoil, it may impose conditions concerning the route to be followed" (International Law Commission, 1956). Most likely, the coastal state's only "reasonable measures", that permitted to impose, are to regulate the cable route on its continental shelf.

3.2.3 The High Seas convention

Outside territorial waters, the high seas convention applies to all legally established submarine cables laid in the territories, colonies, or possessions of high contracting parties. The freedom to lay submarine cables was mentioned as one of the high seas freedoms that can be exercised by all states as long as the state gives reasonable regard to other states' interest in their use of high seas (High seas Convention, Articles 2 & 26), including existing cables and pipelines (High seas Convention, Article 26). The convention also stated that in the high seas, the flag state is responsible for all ships flying its flags to conform with the safety standards for signal usage and preventing collisions at sea (High seas Convention, Article 10).

The High Seas Convention created new obligations to exercise due regard for previously laid cables when installing a new cable, and also

a requirement that existing cables or pipelines not be jeopardised in their maintenance (High seas Convention, Article 26). Cable owners were not only required to be careful not to break other cables while laying or repairing cable, but they were also required not to jeopardise the future possibility of repairing other cables.

The High Seas convention had three provisions that can be seen as analogous to the 1844 convention. First, it mandated criminalization for breaking or causing injury to submarine cables, but provided a defense when the injury to the cables was caused by legitimate reasons, such as when saving lives or for ships which had taken precautions (High seas Convention, Article 27). The 1958 convention added elements to clarify a state's jurisdiction to "a ship flying its flag or by a person subject to its jurisdiction," making it clear that a state could not take legislative measures against another state's nationals, but only against its own ships or nationals (Myron Nordquist et el.,1995). Second, the high seas convention provided that the person causing the injury to cable shall bear the cost of repair (High seas Convention, Article 28). Third, after taking all necessary precautions by ship owner, the cable owner must compensate for the loss of anchors or fishing gear in order to prevent damage to the cable (High seas Convention, Article 29).

The High Seas convention did not specify how the mechanism for prosecution or making a claim for compensation would occur. It only made a reference that previous conventions agreed upon between the parties will not be affected (High seas Convention, Article 30). Thus, although it did not affect the application of the 1844 convention between parties, the High Seas convention only expanded the basic principle of protecting submarine cables to their members without providing a mechanism to be applied by the state in enforcing them.

3.3- The Current Legal Regulation of Submarine Cable under United Nation Convention for Law of the Sea (UNCLOS) 1982

The United Nation Convention on the Law of the Sea (UNCLOS) 1982 is a consolidated text that prevails over the Geneva Conventions (UNCLOS, Article 311). It has provisions regulating territorial basis since the legal regulation varies depending on the maritime zone where submarine cable is laid. The first are maritime zones that are under the sovereignty of the coastal/archipelagic state and over which it has jurisdiction. The second type of maritime zone is one in which coastal states do not have sovereignty but exercise certain rights (exclusive economic zone and continental shelf). Third, maritime zones not under the jurisdiction of any state reserved for use by any state, including landlocked states (high seas and international seabed area).

3.3.1 Territorial Sea, Contiguous Zone and Straits used for International Navigation

UNCLOS 82 established a maximum territorial sea breadth of 12 NM (UNCLOS, Article 3) and emphasizes states' sovereignty over their territorial sea (UNCLOS, Article 2). It states that the coastal state has the authority to enact laws and regulations governing the exercise of innocent passage, including, among other things, the protection of cables and pipelines (UNCLOS, Article 21). The sovereignty of a state over submarine cables within its territory has two consequences. First, the submarine cable is subject to the State's legal and regulatory control. Second, the State's territorial sovereignty protects such cables. It makes no difference whether it belongs to the government, private entities, or individuals.

Article 21 of UNCLOS 82 regulates submarine cables in the territorial sea in general, and it has multiple aims: to maintain the integrity of cable systems, to avoid communications breakdowns, to protect cables in areas used for navigation, and to protect the marine environment. Thus, unlike its predecessor, UNCLOS 1982 specifies that costal states may act to protect submarine cables.

As a result of UNCLOS 1982, which allows states to claim a territorial sea up to 12 NM wide, more of the straits may become part of territorial water. Therefore, UNCLOS 1982 provides a compromise called the regime of transit passage.

The transit passage regime has no effect on the sovereignty or other legal status of straits that

submarine cables which can be classified on a would otherwise be part of the territorial sea of a coastal state (UNCLOS, Article 34). As a result, coastal states can continue to protect and regulate submarine cables. Furthermore, UNCLOS 1982 specifies that no research or survey activities can be conducted while exercising the right of transit passage (UNCLOS, Article 40), thenceforth, submarine cable survey activities cannot be carried out without coastal state permission.

3.3.2 The Archipelagic Waters

The UNCLOS 1982 provides that archipelagic waters are subject to the sovereignty of the archipelagic state (UNCLOS, Article 2). The UN Convention on the Law of the Sea (UNCLOS) 82 established the regime of archipelagic sea lane passage, which is navigation and overflight in the normal mode solely for the purpose of continuous, expeditious, and unobstructed transit (UNCLOS, Article 53).

In archipelagic waters outside these lanes, the regime of innocent passage still applies (UNCLOS, Article 52). The archipelagic state's sovereignty extends to archipelagic waters, airspace above it, the sea bed and subsoil, and all of its resources, regardless of depth or distance from the coast (UNCLOS, Article 49). This principle makes activities related to submarine cables in archipelagic waters subject to the consent and regulation of the archipelagic state. As this was a new regime, and there existed possibility that before UNCLOS the archipelagic waters were part of the high seas, UNCLOS mandated that the existing cables that had been laid without making landfall must be respected. The UN Convention on the Law of the Sea specifically states that the archipelagic state must allow the maintenance and replacement of such pre-existing cables after receiving due notice of their location and intent to repair or replace them (UNCLOS, Article 51)

3.3.3 The Exclusive Economic Zone and the Continental Shelf

Coastal states have sovereign rights and jurisdiction in the exclusive economic zone (EEZ) (UNCLOS, Article 55), including certain rights concerning submarine cables. Article 58 of UNCLOS states that high seas freedoms apply in the EEZ, including the freedom to lay submarine cables. Nevertheless, these freedoms need to be exercised in accordance with other provisions of UNCLOS 82; in the case of submarine cables, this includes the continental shelf regime .

So, with certain exceptions, EEZ states enjoy the freedoms of the high seas. One of these exceptions is the requirement that states respect the rights and obligations of the coastal state and comply with its laws and regulations when laying submarine cables.

The continental shelf provisions, the most important of which is Article 79, are very similar to Article 4 of the 1958 continental shelf convention. Subject to some limitations, all states entitled to lay submarine cables and pipelines on the continental shelf. First, the coastal state may not impede the laying (of new cables) or maintenance (of new and existing) cables, subject to the coastal state's right to take reasonable measures to explore its shelf and to exploit the natural resources of its shelf, and the reduction and control of pollution from pipeline (but not cables). Second, exercise of the coastal state's rights over the continental shelf "must not" infringe or result in any unjustifiable interference with other's right to lay and maintain cables on its shelf (UNCLOS, Article 79 (2)). Third, existing cables are protected from being interfered with in the laying of new cables; all states required to have 'due regard to cables… already in position', particular care is to be taken to ensure that the possibility of repairing existing cables is not prejudiced (UNCLOS, Article 79 (5)).

In case the coastal state has not established an EEZ, this provision directly applies, inter alia, to all incidents and activates involving cables on the continental shelf. Also, if the continental shelf extending more than 200 miles, incidents and activities involving cables on the extended shelf are covered by the continental shelf provisions.

3.3.4 The High Seas

In accordance with UNCLOS 82 and other international law rules, all states enjoy freedom of the high seas. The freedom of the seas includes, among other things, the ability to lay submarine cables subject to continental shelf

provisions. All states are entitled to lay submarine cables on the bed of the high seas beyond the continental shelf. When exercising the freedom to lay submarine cables, states owe an obligation of due regard to the previously laid cables and pipelines. Although, UNCLOS uses the words 'All States", it should not be read narrowly as it refers to the rights of states and their nationals to lay cables (Myron Nordquist et el.,1995). The protections regarding cables already in position on the continental shelf apply to "the bed of the high seas beyond the continental shelf" (UNCLOS, Articles 87(1) (C), 79 (5), 112).

The provision of UNCLOS 82 regarding the criminalization of breaking or damage to submarine cables are similar to the High Seas Convention 1958.

With regard to the responsibilities of submarine cable owners who damage or injure another's cable while laying or repairing its own cable, UNCLOS 82 also follows the 1958 High Seas Convention closely. The only difference is that UNCLOS 82 uses the wording "laws and regulations" where the High Seas Convention uses the wording "legislative measures". This difference was taken in consideration together with the other articles throughout the convention.

3.4 The Convention on the International Regulations for preventing Collisions at Sea of 1972 (COLREGs 1972)

Generally, CLOREGs provide principles to be followed by vessels for their safety during navigation. The COLREGs provide that a vessel engaged in laying, servicing or picking up of a submarine cable or pipelines is a vessel restricted in her ability to manoeuvre as required by the rules and is, therefore, unable to keep out of the way of another vessel (COLREGs, Rule 3 (g)(i). Other vessels are required to keep out of the way of vessels restricted in their ability to manoeuver (COLREGs, Rule 18). However, unlike the 1884 Convention, COLREGs not specify the minimum distance that these vessels must maintain from cable vessels. The second and third paragraph of article V of the 1884 Convention provides more detailed rules. COLREGs sets out shapes to be displayed, and signals to be used by cable vessels when in operation (CLOREGs, Rules 27 (b), 35 (c). CLOREGs did not provide scheme for enforcement, or set penalties when vessel do not follow a particular rule. Enforcement is up to coastal states and flag states, depending on the maritime zone and the state's competence under UNCLOS 82.

4- Conclusion

In conclusion, the protection of submarine cables from negligence and wilful damage were areas covered by the 1884 convention. This principle was then carried through the 1958 Geneva conventions as well as UNCLOS 1982. Nevertheless, the minimum protection mandated by these conventions was only applied to the high seas. For areas under sovereignty of a coastal state, these conventions relied on the coastal state to regulate without providing a minimum benchmark. The result is varied practice.

The UNCLOS 82 provisions did not specify a minimum standard regarding protection of submarine cables in waters within the sovereignty of coastal states. The 1884 convention which appears to be more specific in regulating procedural matters did not receive wide acceptance among state and it only applies to the high seas and does not include developments in the law of the sea, especially regarding the relatively new regimes of the continental shelf and EEZ. Also, one of the disadvantages of 1884 convention is that it was not open for future innovation beyond telegraph cables. Although this convention is still in force but it has no effect since there are virtually no telegraph cables still in operation at this time .

With regard to the implementation of UNCLOS 1982, not all state parties have incorporated Articles 113-115 which address the protection of submarine cables on the high seas and are based on three articles in the 1884 Cable Convention (Tara Davenport, 2015). Some states, although they criminalize the breaking of submarine cables in their waters, do not extend this criminalization to ships flying their flags or persons subject to their jurisdiction. Therefore, the application of this principle relies on the fact that it would bind a coastal state either as a treaty obligation under UNCLOS 1982 or under customary international law (Tara Davenport, 2015).

There are two problems in the enforcement regime. The application of the protection regime provisions and the amount of compensation for damage. Regarding the former problem, in ideal circumstances, the current legal regimes would be sufficient to protect submarine cables. But, the latter problem, compensation for damages, UNCLOS 82, Article 113, did not specify that an offender who breaks submarine cables should pay for the damage that was caused. UNCLOS 82 only provided that compensation for damages to submarine cables committed by other cable/pipeline owners who break submarine cables when laying or repairing the cables or pipelines (UNCLOS 82, Article 114).

The principle for damages or injury to submarine cable in the high seas was first introduced by the 1884 convention, but it did not carry into UNCLOS 82. In the area under costal state sovereignty, UNCLOS 82 did not mandate such a provision, although states normally would include them in their national legislation. The problem with the current framework is that the punishment for breaking cables would not amount to the actual cost of the cable repair.

As explained above, only 1884 convention provides a minimum safety distance requirement for ships or fishing gear from ships that are carrying cable-related activities or from buoys of cable under repair. Additionally, although COLREGs provides that other ships must keep out of the way of a vessel restricted in her ability to maneuver, which includes cable ships, there is no minimum distance for it. In this regard, it is up to states in their domestic legislation to regulate such safety distances .

Designation of protection zones, restriction zones, or safety zones, in part will serve the goal for a specified safety distance for cable repairing activities because the cable is already there and the protection zones already requires fishing gear to be stowed near the cable. However, this will not be the case for cable-laying activities, due to the fact that the protection zone is yet to be designated after the cable is laid .

As a result, it is recommended that states increase security measures to help prevent cable damages by designating protection zones and increasing enforcement authority to protect cables. Second, align their domestic legislation with UNCLOS 82. Third, modify relevant COLREGs provisions pertaining to safety distances. Fourth, incorporate best practices principles into domestic legislation in order to be consistent with international law and cable friendly and finally, actively participate in international organizations, maximizing their roles in submarine cable protection.

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A study of Mental Ill-Health as an Influencing Factor in Human Error among Seafarers

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Abstract:

The human factor is the main cause of 80% of all marine accidents. Where seafarers work in a difficult work environment with many difficulties and challenges that cause mental ill-health, especially depression, which results in human error and marine accidents.

The study investigates the causes of mental ill-health, especially depression, through a survey involving 373 officers and engineers working onboard ships to examine the psychological state (Depression) of seafarers via PATIENT HEALTH QUESTIONNAIRE-9 (PHQ-9), to assessing the impact of sea service, the duration that seafarers spend on board on their mental health.

The results showed a statistically significant relationship between mental health and marine service (p-value <0.05), as mental health deterioration increases with longer periods in the marine service. The T-test of independent samples of the difference in the mental health of the seafarers proved a significant difference based on the time spent onboard or on vacation. P-value less than 0.05 wherein the health and mental ability is better in the latter than in the first: The average vacation is above average on board. Therefore the ergonomics affect the mental health of seafarers, as a result of the long duration spent at marine service and long stay on board.

1- Introduction

Despite the interest of the International Maritime Organization (IMO) to issue and amend many international conventions to train and qualify workers in the maritime transport industry to raise the sense of safety and maintain the health of seafarers, the accident rate continued to rise until (2018) and then decreased very slightly during (2019) according to statistics. Issued by European Maritime Safety Agency (EMSA) (2020), as shown in Figure (1). The human factor is still responsible for the largest proportion of the causes of accidents, and statistics have been monitored in the past five years that the human factor is responsible for more than 85% of the causes of marine accidents. Kassar & Malt (2018).

Seafarers work in an environment, that is one of the most dangerous working environments, are exposed in this environment are exposed to many physical health and mental health problems, due to they spend considerable periods of time away from their families, moreover working long hours without getting enough sleep, and exposure to piracy risks in some regions of the world, all these leads to anxiety, depression, and seafarers are exposed to many other health and occupational hazards onboard ships. Iversen (2012).

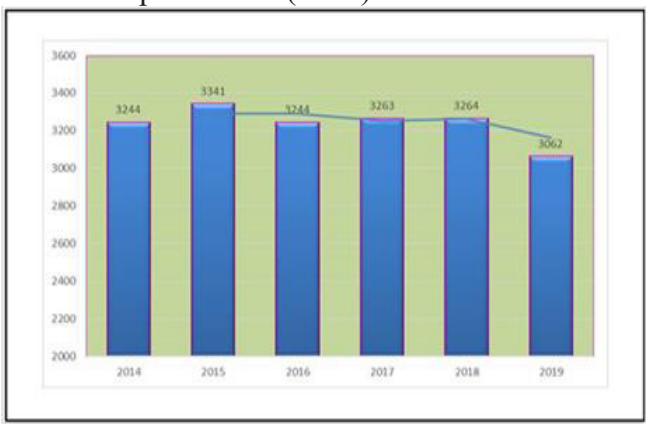

Figure (1): Number of reported marine casualties and incidents
Source: Maritime Safety Agency.EMSA (2020)

As indicated in studies there is a significant relationship between the deterioration of mental health and the psychological, social and physical pressures on the seafarers due to many factors, mainly the feeling of loneliness, fatigue, multi-nationalism, sleep deprivation and the absence of Recreational activities and sports onboard ships. Carotenuto & et al (2012).

All these pressures can lead to injury, death and sometimes suicide, where suicidal data have shown that the mental health of seafarers in many cases remains extremely poor and often fatal. The Protection and Indemnity Club (P&I) reported that suicide deaths among seafarers more than tripled from 4.4% in 2014 to 15.3% in (2015). (ITF 2019).

The shipboard working environment is considered one of the most difficult and critical working environments, the shipboard working environment is a living, working and even entertainment environment in which seafarers stay onboard for months and even years, the shipboard working environment might affect to a certain degree the mental and intellectual capabilities of seafarers.

Researchers always interest in apparent causes of human error, such as fatigue, sleep disorders, loneliness, long-term separation from home and family, lack of vacation time for periods of work, rest and sleep. however previous studies have shown that many of the most effective reasons have not been addressed, such as psychological and mental problems resulting from the nature of working environments, which is one of the most common causes of human error. (Jeżewska & Iversen 2012).

These factors lead to the suffering of the human element by hidden factors due to the psychological pressure imposed on seafarers as a result of the difficult work environment in which they work, this afflicts seafarers with many problems in the mental health, sometimes leading to depression and suicide. Mental health problems affect the intellectual capability of seafarers and make them unable to focus and make decisions.

2. The mental health

The concept of health must be clarified in general before starting to define mental health. Health must be defined from an organic (physical) perspective and a psychological perspective, as each is related to the other. WHO defines health as "a state of integration of physical, psychological and social feelings, and not only a state of freedom from disease and disability." (Radwan, 2007).

Health has also been defined as "a state of subjective and objective sense of a person, and this state exists when the areas of physical, psychological and social development of the person are proportional to his capabilities, abilities and goals that he sets for himself and with the objective conditions of life." (Hurrelmann 1995).

Social and economic conditions, culture and the environment form a framework for the possibility of developing health for individuals, and thus the health status reflects the ability of the human being to how to confront and overcome the social and environmental conditions facing. It is a state of balance that must be achieved in every moment of life, Then comes the importance of mental health for the fullest functioning of the body, and there are many definitions of mental health as *"Mental health is a dynamic state of internal equilibrium which enables individuals to use their abilities in harmony with universal values of society. Basic cognitive and social skills; ability to recognize, express and modulate one's own emotions, as well as empathize with others; flexibility and ability to cope with adverse life events and function in social roles; and harmonious relationship between body and mind represent important components of mental health which contribute, to varying degrees, to the state of internal equilibrium." (Galderisi, Silvana, et al 2017).*

Most of the previous definitions of mental health agree on one basic concept, which is the ability of a person to deal with everything that revolves around him, such as social life and its pressures, and to adapt to it and manage it in a satisfactory manner. These capabilities enhance the individual's achievement of his tasks well, it also shows the importance of good mental health and its link and impact on the physical health of an individual.

The nature of life and the work environment affect the psychological and physical health of seafarers, exposing them to various psychological and social pressures. These pressures affect the mental health and behavior of seafarers. This part will explain what mental health is, and what are the social and environmental factors that lead to the mental health problems of seafarers. (Kassar, A,A,& Elmalt, A,M. 2018).

Where Sampson & Ellis, (2020) has shown that seafarers have increased depression and anxiety, and they are exposed to emotional exhaustion, and they are happier when they are in their homes, and their feeling of loneliness increases when they are onboard the ship, on the part of employers, they do not realize the importance of mental health. And marine philanthropic societies and stakeholders stated that separation from the family and fear of losing a job, isolation and loneliness are all factors that lead to mental health problems.

They also mentioned that employers and seafarers are aware of the importance of mental well-being to face living and working conditions onboard ships, some shipowners have begun to take measures to improve the mental health of seafarers and improve the quality of life onboard ships, but the majority of ship owners, 55% of those surveyed, did not take measures to improve the mental health of seafarers.

WHO (2018) declared that mental health issues are one of the most important public health problems in the world and the leading cause of disability, without good mental health, people feel unable or unwilling to conduct their everyday tasks, including self-care, schooling, work and involvement in social life, on other hand, good mental health is a pillar of building and sustaining a good life, mental wellbeing can be seen as a positive source of human resources or well-being in society, we all need good mental health to survive, to take care of ourselves and to connect with others, so it is important not only to address the needs of people with identified mental illnesses but also to protect and encourage the mental health of all people and to consider their inherent value.

3. Causes and factors leading to mental ill-health for seafarers

a. Isolation and Loneliness

The profession of seafarers is considered one of the most isolated professions from the world due to the scarcity of contact with others, and this isolation may lead to despair and depression. Seafarers try to compensate for the feeling of loneliness and isolation by excessive smoking and alcohol consumption, (Jepsen, et al, 2015).

Approximately 80% of the global merchant fleet is equipped with crews of different nationalities. Significantly, the multinational enhances the Loneliness and social isolation of seafarers, due to the multiculturalism and speaking of different languages. Long periods spent by seafarer's onboard ships lead to increased social isolation and affect social relations, unlike seafarers who spend short periods onboard ships, and this is clearly evident from the high suicides of ship crews who spend long periods on sailing extending to weeks and months, and the matter increased. (Oldenburg, et al, 2009).

Reducing ship crew numbers by owners, and long-term separation from the family and friends, thus have a detrimental effect on the mental health of seafarers. Separation from life on land for months helps to feel the social isolation that is a challenge to the mental health of seafarers, there is no doubt that loneliness causes a lot of problems for seafarers. The Brazilian priest Mario Belby said, "Loneliness is the heaviest cross for seafarers," because many seafarers are away from their homes for a period of up to 10 months, so they always think about their family. Especially at night when the seafarers are alone and all he sees is darkness. Therefore, being away from home for a long period results in major psychological problems. (Mellbye, et al 2017) and, (Iversen 2012).

b. Distance from the family

An, Ji, et al. (2020) conducted a study to evaluate the impacts of work-family conflicts, work stress and job satisfaction on seafarers' efficiency, and they found out that work-family disputes and labour pressures adversely impact the self-reported performance of seafarers. The study also indicates that satisfaction with one's job has a moderating role in the ties between work-family conflicts, labour excesses and the performance of seafarers .

Along the same lines, which considers that the lack of family contact has a negative impact on the psychological health of the Seafarers, (Sun, Ling, et al. 2020) in a study explored aspects of professional life, family, work environment, rights, and interests. Only 6.62% of the respondents are satisfied with their jobs while 90.61% of the respondents believe that their home policy does not give importance to the crews. The majority of the respondents believe that their role is missing in the family, not to mention that most staff members do not receive good medical care.

Also, M. Patchiappane (2018) stated that motivated and fulfilled seafarers appear to contribute more in terms of corporate productivity, and maintaining their loyalty to employers' satisfaction, the research analysed the large contours of various variables responsible for the satisfaction of Indian seafarers and the various ways in which the satisfaction of Indian seafarers can be maximised. The study assessed job satisfaction, efficiency and the increased level of job satisfaction on the part of Indian seafarers while carrying out their jobs, The study concluded that the working atmosphere, long distance from home, conflict, mental stress to fulfil the given tasks, lack of incentives for achievement and self-confidence for work can affect the sense of responsibility, and the morale of the seafarers, and that a good working environment, good working conditions, good understanding, and help with the organisation will improve the job satisfaction levels within the organisation.

c. Duration onboard

A study of 320 seafarers who have been living and working on a ship for more than six months has been conducted by (Kim, J. and Jang, S 2018). Questions regarding organisational culture and help, self-efficacy, perceived exhaustion, and the quality of work-life were included in the questionnaire. This research showed that self-efficacy, which has both direct and indirect effects is important for the quality of life of seafarers. Furthermore, the main intervention point for the relaxation of perceived fatigue and self-efficiency will prove to be of operational assistance to increase the quality of life at work .

However, (Doyle, N. et al., 2015) study examined the effect of the length of time seafarers spend onboard ships and the rate of fatigue. They indicated that the first 6 months that seafarers spend do not cause them to suffer

from chronic stress. (Sliskovic et al. 2015) conducted a review of previous studies, indicating that the main stressors on seafarers are long separation from family and home, feelings of isolation, work pressures resulting from long working hours, heavy workload, and environmental pressures related to life onboard. The researchers have offered guidelines for further studies, as well as suggestions for reducing the harmful impact of workplace stressors on the welfare of seafarers.

The goal of Sąlyga & Marijona (2012) was to identify factors causing psycho-emotional pressure and exhaustion among Lithuanian seafarers, and the connection of these factors to marine health complaints. The study found that older seafarers between 35 and 54 years of age were more likely to feel psycho-emotional pressure. Long working hours in harmful environments and improved eye preparation were also correlated with psycho-emotional pressure among seafarers in the first study

Christodoulou, et al, (2019) aimed to assess the impact of the maritime profession on the psychosomatic status of seafarers, identify possible causes that trigger medical conditions, and possible ways to address or minimise their impact on the working navy. They concluded that spending a long time in the workplace plays a major role in the lives of most seafarers due to the difficult nature of work onboard ships, and the presence of risks rarely found in other professions. In order to overcome these difficulties and risks, seafarers need to know how to deal with and combat them.

d. Lack of shore leave

The terrorist attacks on September 11, 2001, contributed to targeting all transport sectors, including ships, with strict security controls, and this resulted in an increase in strict procedures and controls. The Seafarers were affected by receiving strong and continuous surveillance, and the time to go ashore was shortened, and some countries prevented seafarers from visiting the ashore or, allow them to visit with restricted conditions and a specific time after spending a long time in the procedures and they are monitored by the maritime or security authorities. All this helps greatly to increase the psychological pressure.

It cannot be overlooked that shore leave has a psychological effect, it has an effect on the quality of work and then affects safety and security, and that the feeling of isolation and lack of shore leave leads to a decline in the psychological state and reduces the enthusiasm and focus of the seafarers. (Graham, 2009).

In order to maintain the health and vitality of the seafarers, they should be encouraged and allowed to visit the shore when they are at rest, they must be given this opportunity to renew their activity and vitality. This is the best treatment for many of the mental illnesses that afflict them, as staying crowded in a confined space for periods and eating non-fresh foods. Makes them need to breathe in the free air and eat fresh food, undoubtedly, preventing seafarers from visiting the shore after days and weeks of sailing is a violation of basic human rights. Relaxing away from the ship is a very important thing so that the work continues well, so seafarers cannot live imprisoned onboard ships, as this weakens their competence and determination and foretells a great danger to seafarers. (Hubilla, 2009).

e. Piracy

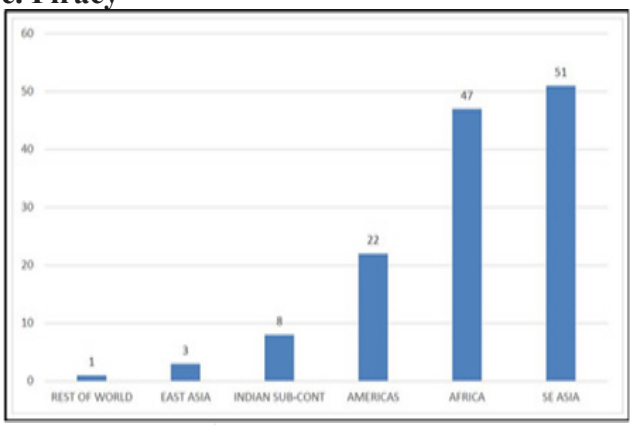

Figure (2): Total piracy incident as per Regions of the world January – September 2020
Source: ICC-IMB 2020

The mental and physical health of seafarers is affected by the danger of piracy that threatens them continuously when the piracy activity increases, the physical health of the seafarers deteriorates and fear, tension, and anxiety persist, more than 6,000 seafarers have been detained by pirates in the past decade, and

research has shown that these seafarers may need longer recovery times. (Seyle, et al. 2017).
Especially during the years that the piracy activity has increased dramatically, Figure No (2) shows the number of piracy incidents, which reached 132 during the period from January to September 2020 in several regions of the world, and the figure shows a clear increase in the number of incidents in Southeast Asia and Africa and an average rate in the US and the percentage of accidents decreases in the rest of the regions. Seafarers are always at risk of being kidnapped and taken hostage, piracy attacks expose seafarers to the risk of death or injury and the psychological effect is terrifying, as they know that if they are kidnapped, they will be subjected to detention and severe abuse. (Seyle & Hurlburt, 2012).

f. regular work hours

Seafarers who work at night and sleep during the day suffer from a decrease in the level of alertness due to the natural tendency of the body to get sleep due to circadian rhythms, and sleep during the day is not beneficial because the body tries to be awake during the day. The body can adapt to this change but it takes a few days, If a sudden change occurs in the duty schedule, it puts the body in a problem of incompatibility with circadian rhythms. It is the normal body rhythm and repeats approximately every 24 hours, it is also called the internal body clock, and the circadian rhythm affects many body functions such as body temperature, digestion, hormone levels and the most important sleep behavior. In general the functions of the human body organs work during the day and sleep at night. Most of the functions of the human body are at their maximum activity during the day and least activity during the night, all this affects the mental health of seafarers due to the unstable working and sleeping times. (Reddy, et al 2020).

4. Method

The purpose of this survey is to investigate the state of mental health, specifically depression by PHQ-9 which is a valid and reliable tool in the English and Arabic version to screen mental health problems such as depression, (Zhang et al., 2013).and (AlHadi et al., 2017). for seafarers (officers and engineers) in different situations. First, while they work onboard ships and while they are on vacations; second, the duration of their service at sea; hence presenting mental health.
The questionnaires were sent by the researcher to the first group by sending the link on Google Drive via e-mail to the shipping companies to send it to the officers and engineers working onboard their ships, and the link was also sent directly to some officers and engineers by social media. Hard copy questionnaires were distributed by the researcher to the second group who are on vacations to renew certificates of all ranks of the Institute of Maritime Upgrading Studies, Maritime Safety Institute and Integrated simulator complex at Arab Academy for Science, Technology and Maritime Transport, and to officers and engineers during rest in their homes by e-mail.
This study uses four techniques to analyze the data of the study which are: descriptive analysis, regression analysis, correlation analysis, and the Analysis of variance (ANOVA) test. Descriptive analysis can be defined as a tool that provides a clear explanation and understanding of the characteristics of the collected data of the study.

5. Empirical Study and Findings

A normality test is used to determine whether sample data has been drawn from a normally distributed population. Many statistical tests, such as the t-test and the one-way and two-way ANOVA require a normally distributed sample population. Therefore, it could be claimed that the normality of data should be verified as a preliminary step for inferential analysis as it determines whether the researcher could use parametric or non-parametric tests to respond to the research hypotheses. One of the most common methods to check the normality of a data set is the Kolmogorov-Smirnov test of normality, which tests the normality assumption for samples greater than 50 observations. It assumes that the data is normally distributed if the P-value is greater than 0.05. It is called the formal test of normality.
An informal test could be used to detect the approximate normality, which is called Rule of

Thumb. It is called the informal test of normality, which claims that a variable is reasonably close to normal if its Skewness and kurtosis values are between –1 and +1 and this rule could be applied only if the sample size is greater than 150. Table (1) shows the informal test of normality, where it

could be shown that Skewness and kurtosis values of all the research variables under study are all between the ranges of ±1. Therefore, all the research variables under study are close to normal.

Table (1) Informal Testing of Normality

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Sea Service	373	.579	.126	-.220	.252
Mental Health	373	.558	.126	-.406	.252
Age	373	.786	.126	.285	.252
Rank	373	.837	.126	.367	.252

The relationship between sea service and mental health

Table (2) shows results revealed that there is a significant difference in mental health according to sea service as P-value less than 0.05 (P value= 0.019).

Table (2) One-way ANOVA of mental health according to Sea service

		Sum of Squares	df	Mean Square	F	Sig.
Mental Health	Between Groups	491.138	6	81.856	2.564	.019
	Within Groups	11684.760	366	31.926		
	Total	12175.898	372			

Furthermore, table (3) shows the descriptive analysis for Mental ill-health, where the highest in Mental ill-health is over 30 with mean equals 12.10, the second in the rank is from 16 to 20 with mean equal 11.87, the third in rank is from 21 to 25 with mean equal 11.53, the fourth in rank is from 26 to 30 with mean equal 10.20, the fifth in rank is less than 5 with mean equals 9.59, the sixth in rank is from 6 to 10 with mean equals 9.33 and the lowest one is from 11 to 15 with mean equals 9.02.

Table (3) Descriptive table of mental health according to sea service

	Sea Service	N	Mean	Std. Deviation	Minimum	Maximum
Mental Health	Less than 5	76	9.59	5.660	0	23
	From 6 To 10	73	9.33	5.475	0	24
	From 11 To 15	93	9.02	4.401	0	20
	From 16 To 20	77	11.87	6.290	0	23
	From 21 To 25	19	11.53	7.996	1	27
	From 26 To 30	25	10.20	6.178	1	22
	Over 30	10	12.10	5.466	6	22
	Total	373	10.08	5.721	0	27

The relationship between the case of seafarers (onboard and on vacation), and their mental health.

There is a significant relationship between Mental Health according to seafarer's (onboard and on vacation). Table (4) shows independent samples T-Test, as the results revealed that there is a significant difference in mental health according to the case of onboard and on vacation as P-value is less than 0.05 (p-value= 0.00).

Table (4) Independent Samples T-Test Means of Mental Health and Intellectual Capability according to seafarer's (Onboard and on vacation).

	t-test for Equality of Means				
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Mental ill-health	5.759	371	.000	3.334	.579
	5.470	263.125	.000	3.334	.610

Table (5) shows that mental health is better in the case of on vacation than onboard as mean of Onboard (12.06) is more than mean of vacation (8.73).

Table (5) Group Statistics of Mental Health according to seafarer's (onboard and on vacation).

	Seafarers Case	N	Mean	Std. Deviation	Std. Error Mean
Mental health	Onboard	151	12.06	6.349	.517
	On vacation (rest)	222	8.73	4.818	.323

6. Discussion

According to the above results, there is a significant relationship between difference Mental Health according to sea service" is fully

supported. Based on the above results, the results are consistent with Sąlyga and Marijona (2011); Jepsen (2015); Doyle et al. (2015); Sliskovic et al. (2015).

Those previous researches are consistent as far as their studies' results are concerned as they all proved a significant relationship between different mental health according to sea service. On the other hand, the difference in those researches is represented in the sample and the countries the data is collected from.

The independent-samples T-Test of the difference of mental health of seafarers showed a significant difference in mental health according to the case of onboard and on vacation as P-value is less than 0.05 where mental health is better in the case of on vacation than onboard as the mean of onboard is higher than mean of on vacation.

According to the above results, which is "There is a significant relationship between difference Mental Health according to seafarer's (onboard and on vacation)" is fully supported. Based on the above results, the results are consistent with Sliskovic et al. (2015); Sliskovic et al. (2016); Kim and Jang (2018); Christodoulou et al. (2019); and Sun et al. (2020).

Those previous researches are consistent as far as their studies' results are concerned as they all proved a significant relationship between the different mental health of seafarers (onboard and on vacation). On the other hand, the difference in those researches is represented in the sample and the countries the data is collected from. (Kim and Jang, 2018) collected the data from 320 seafarers who have been living and working on a ship for more than six months by making a questionnaire. Furthermore, (Christodoulou et al., 2019) collected the data through a survey questionnaire required from 900 Greek seafarers.

7. Conclusion

Human error is one of the main causes of accidents. We seek to reduce them through seafarers' mental health measures. The efforts made to take care of the physical and psychological health of seafarers are undeniable. However, in order to improve seafarers' mental health, constant follow-up is always required so that its problems can be discovered and mitigated. Efforts should be made to improve the marine work environment and reduce the factors that cause mental health problems and eliminate simple problems that have a negative impact and can be eliminated easily. Poor mental health does not affect seafarers only but also affects maritime transport in general. Therefore, improving seafarers' mental health will help ensure success in reducing marine accidents.

In addition, in order to maintain proper intellectual capacity and obtain satisfactory performance when making decisions and carrying out tasks, many international conventions and local legislations have been issued to regulate working hours and hours of rest onboard ships, providing means of safety and comfort, and maintaining physical and psychological health. However, there has been little research done discussing the impact of the marine work environment on mental health and intellectual capacity. Finally, the trend towards improving mental health will have positive effects on seafarers.

8. Recommendations

Based on the results of the current research, this section provides some recommendations for manning officials in shipping companies and decision-makers in the field of maritime transport and marine institutes.

The study is recommended that decision-makers reduce the work stress that seafarers are commonly subject to in order to maintain their mental and intellectual health. That is done by:

Increasing the number of crew members, Reducing stays on ships, Facilitating port visit procedures, Providing entertainment onboard ships and Providing Internet and means of communicating with the family.

Given the need of the maritime transport industry for rapid intervention to address the mental health problems of seafarers, maritime education and training institutes have an important role in this regard. They can provide an appropriate set of mental health awareness courses and how to enhance it, starting from students.

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The Impact of Maritime Education and Training Development on the Marketing of Qualified Seafarers Globally

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Abstract:

Shipping is a crucial milestone of the global economy. Without shipping, intercontinental trade, the bulk transport of raw materials, and the import/ export of affordable food and manufactured goods would simply not be possible. The Maritime Industry in recent years has become extremely concerned about the human element. The training and education of the human element is paramount for an effective and efficient global Maritime Industry. Consequently, practical strategies are approached in order to sustain the industry. Interestingly, earlier in the Baltic International Maritime Council (BIMCO)/International Shipping Federation (ISF) 2015 report, the shortage of seafaring had already been identified as a global issue. The most recent BIMCO/ISF 2020 report highlighted that tight labor market would lead to recurrent shortages for officers and therefore, crewing would likely be a future challenge. This paper introduces a proposal to enhance the efficiency of the shipping industry and its associated seafaring career. The paper studies the shortage of seafarers globally and proposes to overcome such problem utilizing the excess labor in Egypt. This approach should attract and hence increase the supply of qualified global seafarers. Collaboration between maritime governing bodies, training institutions and shipping management companies essential to such plan. For that reason, this paper clarifies the role of governments and international institutions in the marketing of seafarers.

Key words: Seafarers, Autonomous Ships, Demand & Supply, Maritime Industry, International Labor Market.

1- Introduction

Maritime transport has been the backbone of world trade and globalization. Around 80 % of global trade by volume and over 70 % by value is carried by sea and is handled by ports worldwide (UNCTAD, 2018). These shares are even higher in most developing countries. The maritime industry consists of a broad palette of professionals; seafarers, technical superintendents, ship owners and forwarders. This palette of professionals represents a vast knowledge base about maritime transport that is based on many years of history and tradition. Safety in the maritime industry is crucial and standards are set at an international levels. Consequently, maritime education and training at all levels play a key role in asserting the need for consistency and awareness. Education at all levels is the most effective tool to overcome challenges related to the competence and commitment of the human element. Against that background the International Maritime Organization (IMO) has highlighted the need of attracting, retaining and training qualified seafarers (IMO, 2018). To underpin a successful, influential and impactful industry that attracts the caliber of people capable to take the industry to the next level, early education and training is most crucial.

To better understand the prospects of the future demand/supply of seafarers in the development of the unmanned vessel industry, a detailed study is required on how the various changes in world economy influence the maritime industry. Due to the aforementioned circumstances, it has become a global agenda to overcome the global shortage of seafarers so that maritime stakeholders can better secure the necessary quantity of high caliber young seafarers.

The IMO has already launched the —Go to Sea Campaign since 2008 in cooperation with some key members of maritime stakeholders as part of this agenda. In the —Go to Sea Campaign, it is pointed out that fewer young people are interested in seafaring profession and young seafarers are more attracted to land-based jobs. The potential for greater female participation in the maritime business and the role of Corporate Social Responsibility are also addressed as potential countermeasures.

2. Seafarers Skills Requirements for Global Maritime Industry

In 2016, 5,800 new vessels were entered in service, which translated to 58,000 new jobs, of which the Philippines could contribute with 25% of crew deployed globally. The maritime industry requires skilled workers—seafarers with relevant skills and competencies, including green skills given the increased commercial interest in building and operating cleaner, more efficient fleets. The role of education and training is crucial given the growing sophistication of vessels that includes new design, power plants and on-board satellite driven navigation systems, and computer-based cargo handling equipment.

The industry is also calling for establishing an independent quality audit system for education, training, assessment, and certification of maritime professionals in line with international standards. Through combined efforts of the government and industry, qualified and competent maritime professionals can pursue promising maritime careers. This will reinforce existing programs of training of seafarers at different occupational levels. The industry seeks to develop an economic intelligence program that will profile supply and demand in the shipping industry. The maritime industry is advocating public– private partnerships to create a maritime training cluster that can promote development of skills required in ship repair, ship building, or financial support activities in an integrated fashion (Borromeo, 2012).

Studies and researches on competencies have mainly concentrates on different approach, competency and required skills for future seafarers that can be described as follow:

1. Technical Competency
2. Technological awareness
3. Adaptability and flexibility
4. Communication skills
5. Teamwork
6. Leadership
7. Discipline
8. Sustainability awareness
9. Self-development skills
10. Complicity and critical thinking

11. **Language ability**
12. **Professionalism**
13. **Responsibility; and**
14. **Social Skills**

3. Maritime Education and Training

Maritime Education and Training (MET) has been riding on a wave of globalization. This has begun since the adoption of the International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW78, as amended) and accelerated by its amendment in 2010, which clearly identify requirements in Code A and B of the Convention. According to STCW78, as amended, each party implements standards maintains related maritime law taking account of the standards associated with the convention and codes.

Those requirements influenced both Maritime Administration and MET institutions staff for their views on what to teach, how to teach and how to manage institutions. Verifying MET staff activities such as curriculum development, teaching methodology, assessment and examination as well as quality standards systems are introduced in MET institutions. Such international networks for Maritime lecturers as well as Maritime institutions are really essential for dealing with issues related to globalization of MET.

3.1.MET and Development of STCW78, as amended and Innovation

Within the context of the education of engine and deck officers, MET systems in the wake of IMO requirements are subject to crucial updates especially in regards to developments in computer technology. The STCW78, as amended in 2010, have created new requirements and placed new demands for administrations, ship- owners and maritime academies. At the same time, new concepts in maritime training have seen a shift from a knowledge-based to competency-based orientation in the development of ships' personnel. Innovative concepts of marine education, a shift from a knowledge-based to a competency-based training, and the need for constant professional updating and recertification have brought maritime training institutions out from under the shadows of the maritime administration and industry.

Maritime institutions must implement their course syllabi effectively guided by the IMO Model Courses; they must improve standards of teaching staff, facilities and equipment. Simulators used for training or assessing competence are required to comply with provisions contained in Section A-I/12 of the STCW Code, which is especially devoted to the use of simulators. The STCW Code requires that all seafarers should be properly qualified for the position that they hold on board, and the International Safety Management (ISM) Code requires the Company to define the responsibility, authority and level of competence required of each crew member. Instructors, supervisors and assessors are required to be 'appropriately qualified.' But these are minimum requirements and are not sufficient to cope with the systems aboard requirements of today's ships. It is therefore incumbent on the ship owner or ship manager to adopt best industry standards in respect of the recruitment and training of seafarers; and to ensure that they receive the training necessary for them to carry out their duties - including the operation and/or maintenance of technically complex and multidiscipline systems (Wu et al, 2015).

3.2. Development of MET Methods and Tools

Training facilities and educational institutions for seafarers can be found in the traditional seafaring countries and in the labor supplying countries. They can be divided into two main categories:

- **Training centers**
- **Academic institutions**

Training centers that provide rather practical training, such as basic safety training for seamen, and the Academic institutions that provide more theoretical background for navigational and engineering officers. The training schemes and the syllabi of the training facilities and educational institutions were different from country to another since they mostly followed national regulations. However, with the STCW78, as amended in 2010, and its

updates, the syllabi became more internationally and more harmonized. The concept of training has also significantly changed. While before, training was mainly classroom based teaching of theoretical knowledge, nowadays, more emphasis is put on practical knowledge. Many training centers, and especially those owned and controlled by ship management companies, are equipped by simulators and other sophisticated professional equipment. Special workshops and seminars to provide the students with basic hands-on knowledge to be conducted. It is also worth mentioning that once they join a vessel, further training is provided to trainees-students by qualified and experienced crewmembers.

In an effort to overcome the shortage of qualified and highly trained personnel, an increasing number of ship management companies have, during recent years, invested in their own training facilities and are now successfully running quite sophisticated in-house training centers in the main labor supplying countries.

Analyzing the effects of new technologies on the human element, the main ones seem to be caused by navigation and communication related technologies. The effects of technologies related to navigation support and communication (as well as management) support are very similar. The main difference is that the development in information systems on-board a ship for navigation support may lead to more decision-making on board, while the development of external information systems may lead to less individual decision-making on-board.

4. Worldwide Populations of Seafarers

According to the latest ICS and BIMCO Report, the global supply of seafarers in 2020 was estimated at 1,647,500 of which about 774,000 are officers and 873,500 are ratings. Encouragingly, the worldwide supply of officers is estimated to have increased considerably since 2010 was 624,000 officers and 747,000 ratings, with the supply of ratings increasing too (BIMCO, 2020).

The global demand for seafarers is estimated at 1,545,000, with the industry requiring approximately 790,500 officers and 754,500 ratings. This indicates that the demand for officers Has increased by around 24.1%, while the demand for ratings has increased by around 1.0%. The current supply-demand situation highlights a shortage of approximately 16,500 officers and a surplus of around 119,000 ratings (ICS, 2020).

While the global supply of officers is forecast to increase steadily, this trend is expected to be outpaced by increasing demand. The forecast growth in the world merchant fleet over the next ten years, and its anticipated demand for seafarers, will likely continue the trend of an overall shortage in the supply of officers. This is despite improved recruitment and training levels and reductions in officer wastage rates over the past five years.

Future outlook indicates that the industry and relevant stakeholders should not expect there to be an abundant supply of qualified and competent seafarers without concerted efforts and measures to address key manpower issues, through promotion of careers at sea, enhancement of maritime education and training worldwide, addressing the retention of seafarers. Based on the numbers holding STCW certificates and is therefore somewhat broader and not directly comparable to estimate in previous studies.

It reflects significant increases in seafarer supply in some countries, notably in China, India and the Philippines, as well as in several European nations. Global demand estimates are based on a detailed review of the number, size and type of ships in the world fleet, and revised estimates of manning levels and back-up ratios currently applicable to different national fleets. The initial demand estimate combines fleet size and information on manning scales. Major seafarer supply countries are: Philippines, Indonesia, China, Russia, USA, Japan, and South Korea. According to Accreditation of Seafarer Manning Agencies (APEC) estimates from 2003, in addition to Philippines, Indonesia, China and Russia, the other big suppliers of seafarers are countries: Turkey and India. Therefore, the major sources of seafarers are the developing countries (Table 1). The reason for the decline

of seafarers from developed countries, and an increase of seafarers from developing countries in the first place depends on the price of labor. Salary, of course, is one of the main factors, but there are other factors that ultimately influence the choice of certain nationalities. Some of these factors are:

- The current relationship between supply and demand,
- Training.
- Loyalty and reliability.
- Statistics of accidents and irregularities during the cruise.
- The possibility of education and training and the number of potential candidates.
- Maritime tradition.
- Distance of the ship (fleet) of residence.
- National restrictions, and
- Trade unions and other protection of seamen.

(Table 1) Percentage of all officers and ratings from major seafarer suppliers

Seafarer Supplier	All Officers (%)	All Ratings (%)
Phillipines	12,39	21,86
Indonesia	3,84	8,26
China	8,47	5,81
Russia	5,37	4,13
Turkey	5,03	4,03
India	4,87	3.56
USA	4,77	3,26
Japan	4,66	1,48
Korea	2,35	0,85
Canada	1,13	1,22
Malaysia	1,05	1,03
APEC total	44,03	44,9
World total	100	100

Source: APEC, 2015

4.1. Seafarers Shortage and Officers demand

The growing shortage of seafarers has become an issue of global concern. This is especially evident in light of the recent rapid growth of the maritime industry. According to the influential BIMCO/ISF Manpower Update 2005 an anticipated shortage of some 27,000 maritime officers worldwide is forecasted by the year 2015. Various factors have been observed in the world economy between 2005-2010, which have influenced the future supply of seafarers, first is the increase in the number of ships needed to handle the increased Global cargo movement due to new emerging economies, such as China and India. Second, an easing up in the supply-demand situation due to such factors as cancellation of shipbuilding contracts and acceleration of ship scrapping following the Lehman economic shock in 2008.

Table 2: Estimated Supply Demand for Officers

Estimated Supply Demand for Officers			
	2015	2020	2025
Supply	774,000	789,500	805,000
Demand	790,500	881,500	952,500
Shortage/Surplus	-16,500	-92,000	-147,500
%	2.1 %	11.7 %	18.3 %

Source: BIMCO, 2015

Therefore the total amount of world commercial fleets has expanded successively from 2005 to 2010, although certain shipping companies took actions such as cancellations of new ships (primarily on ships completed on and after 2011), acceleration of scrapping aged ships, lay-up, and low speed operation, responding to the crisis.

Unless seafarer training levels are increased significantly, the growth in demand for seafarers could generate a serious shortage in the total supply of officers as the latest five- year BIMCO/ICS Manpower Report forecasts that an additional 147,500 officers will be required by 2025 to service the world merchant fleet (Table 2).

Launched at the IMO, the reports identifies that the current shortfall stands at amounting to some 16,500 officers, while some officer categories are in a really short supply, including engineer officers at management level and officers needed for specialized ships such as chemical, LNG and LPG carriers. Although the global supply of officers is forecast to increase steadily, this is predicted to be outpaced by increasing demand. In the past five years the industry has made good progress with increasing recruitment and training levels and reducing officer wastage, as the report estimates that there is a current surplus of 15.8%, about 119,000 ratings, with demand only having increased by about 1% since 2010.

Table 3: Setting of standard manning numbers by ship type and size

Ship Type		Officer		Rating			Total
		Deck	Engine	Deck	Engine	Catering	
2,000-7,999GT		4	4	4	4	2	18
8,000 GT and over	VLCC	5	5	6	7	3	26
	LNG Tanker	5	6	8	8	3	30
	LPG/Chemical/Product Tanker	4	5	5	5	3	22
	Other Tanker	4	5	5	5	3	22
	Bulk Carrier	4	4	5	5	3	21
	Container	4	5	5	6	3	23
	Other Dry Cargo	4	4	5	5	3	21

Source: JITI, 2010

However, unless training levels rise, a shortage in total supply of officers could emerge.

The Manpower Report should act as a wake-up call for the industry to address the issue of the accelerating shortage of seafarers, according to Inter Manager. As a result of seeking the optimal relationship between a quality crew and a cheap crew, the rule is that currently, on most ships, there is a multinational crew, especially when it comes to the officers. Under these conditions, there will always be some problems: language difficulties, lack of mutual understanding, cultural and ideological differences, which will, ultimately, have a negative effect on the overall safety of maritime transport.

Table 4: Total Number of Ships

	2012	2013	2014	2015	2016	2017
Ships	84709	86484	87954	90470	92095	93161
D.W	1033929	1091590	1132606	1175110	1219817	1257440

Source: UNCTAD STAT, 2017

The demand for seafarers was articulated by the IMO Secretary General at the Sub- Committee on Human Element, Training and Watch keeping (HTW), 2nd session, 2-6 February 2015:

"Take a look at 15 years ahead, 2030, what will the volume of trade be in 2030? Obviously nobody can tell, but amongst the approximately half million officers available today, probably 150,000 would have left by 2030 due to retirement. Just to maintain the current workforce of officers, 10,000 new officers must be trained and provided every year to fill the gap created by retiring officers. If seaborne trade expands by 70% by 2030 then we need to train and produce 40,000 officers every year. If seaborne trade expands just by 35% by 2030, we will still need to train and produce 25,000 new officers every year. Maritime training is absolutely fundamental for sustainable shipping" (Sekimizu, 2015).

4.2. Seafarers escape the work at Sea

Every year, maritime institutes around the world churn out thousands of fresh deck cadets and marine engineers. Each of these young graduate has high hopes of making it big in the maritime field by becoming a first-rate seafarer someday. With their newly attained knowledge and training, those officers embark on-board ships with reputed shipping companies, work for few years, and attempt to upgrade their ranks. However, in spite of highly lucrative job offers, adventurous working environment, and a "globetrotting" lifestyle, most of these seafarers suddenly decide to quit their ship jobs by accepting opportunities onshore. This trend is on the rise and is now being seen in several countries around the world.

Some of the reasons addressed that found common and obvious; there are a few new and surprising ones as well.

1. Unsettled Lifestyle
2. Hectic Life
3. Onboard politics
4. Lack of Social Life
5. Away from the Family
6. Personal/ Family Problems
7. Rise in Maritime Piracy
8. Health Issues
9. Reducing shore leaves
10. Lack of Shore Jobs
11. Reducing crew members
12. Stringent Maritime Laws

Apart from the above mentioned reasons, seafarers have stated several other factors which force them to quit sailing. However, the above mentioned ones are the most commonly stated ones by professionals across all ranks (Marine insight, 2017).

Therefore, the marketing and image of seafaring must be improved, so that those who serve in this industry that can have a rewarding, fulfilling career while meeting the demand of tomorrow. Maritime institutes could also increase up their capacity of students in order to respond to a possible increase in the demand for seafarers as necessary.

The application of new technologies in maritime shipping industry should be observed in two ways. On the one hand, the new solutions make work easier or even eliminate the need of performing routine chores, thus making some of the traditional skills redundant. On the other, new technologies require new knowledge and additional competences in operating complex systems and devices, processing of large amounts of data, developing new communication skills, and responding fast to new solutions and regulations. Moreover, one cannot overlook the sociological aspects, familiarization with new environments and acting within complex relationships between man and man, and man and machine. Some of the expected specific education features in digital maritime industries include (Nguyen, 2018):

- Simulator-based and computer-based training.
- Use of 3D simulation and gamification, which also allow seafarers to train and practice on board,
- Training that is absolutely tailored to the individual needs.
- Training provided for the seafarers should be, to a certain extent, similar to the training provided for nearly all other technical industries, in particular STEM competences (science, technology, engineering and math).
- Advance knowledge in leadership and managing people, associated with management in the sector.
- Preparing the young for the life at sea.
- Education of personnel who will control future autonomous ships and their driving systems, whether from on board or remotely, whether as deck officers, marine engineers, or electro-technicians.

5. Impact of Autonomous Ships on the maritime industry

For hundreds of years, the shipping industry has relied on knowledge and experience of ship crews. Today, autonomous technology is poised to reshape the maritime sector with unmanned vessels. Small unmanned crafts have already begun service, while the technology for larger vessels is under development. It is time for the maritime industry to embrace autonomy with many challenges and to understand how autonomy will shape the future industry and how best to utilize it. Maritime Autonomous Surface Ships (MASS) will have an impact on ship design, shipbuilding, port infrastructure including services and interfaces. Automation will transform on-shore elements of shipping from port infrastructure and cargo handling through to the land-based logistics and transportation chain. One of the goals of the logistic industry is a timely service that allows shippers and customers to instantaneously tailor dispatches and receive deliveries from this autonomous logistics transport chain (Lloyds Register (LR) 2017). For a successful introduction of the MASS to the maritime industry, communication and cooperation of its stakeholders based on mutual understanding will be vital. Main stakeholders and their relationship are depicted in Figure 1. Seafarers onboard/onshore; insurance company; cargo and bunkering companies; research institution; university; and training center in the maritime sector would be stakeholders.

Additionally, autonomous vessels will contribute to transforming the existing industries into new innovative types of industries that can improve the existing vessels; system integration and control; system management and maintenance; shore control center (SCC) operation and management; fleet management; cyber security; big data analysis; smart sensor; and communication. Moreover, for the successful introduction of the MASS which may takes time to clear effect on the seafarers demand, system development, amendment, and interpretation of maritime rules and regulations together with communication and cooperation of the stakeholders are also required to make the autonomous ships efficient and reliable. Although the use of the autonomous vessels in the first phase will be limited in many ways, education system should respond in time.

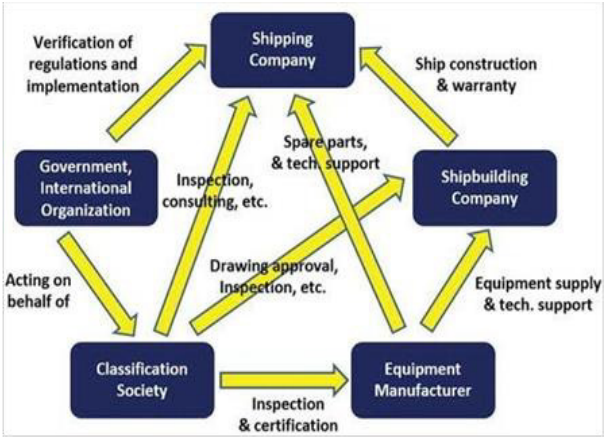

Figure 1: Main Stakeholders of Ships
Source: Kim et al, 2020

In order to timely respond to the new challenges, maritime education and training centers have to develop adequate curricula and syllabi, and start implementing them as soon as possible, according to the market requirements (Zvonimir Lušić et al, 2020).

6. The role of governments and international institutions in the marketing of seafarers.

There is no doubt that some countries particularly Egypt, which suffers from difficulties in providing onboard jobs for seafarers, where the number of seafarers is increasing annually with job vacancies decreasing. This gap increases over the years to no avail, which requires rapid intervention to change the regulations and an amendment to the internal regulations and policies of some countries, as well as benefit from previous international experience that has proved a remarkable success in this regard. Thus, it may contribute to the generation of programs of regional and international cooperation with the parties and governments to make way to address such crisis. For that reason, this section introduces the significant role of each concerned party.

6.1.The role of recognized maritime institutes in Egypt:

1- To submit a proposal to the Egyptian maritime authorities to obligate the Egyptian shipping Companies to activate the ministerial decree that obligate a presence of Cadets on board ships.

2- The maritime institutes shall maintain a strategic relations and under the auspices of the Egyptian Ministry of Transport to conclude a protocol of cooperation with shipping companies for the operation of seafarers by announcing an invitation to hold an international maritime forum including several shipping companies in return for providing some services and facilities.

3- Call for conferences and seminars for the marketing of seafarers with the provision of some material facilities in educational programs or scientific services.

6.2.The role of the Egyptian Ministry of Transport:

1- Encouraging the registration of vessels in Egypt to raise the Egyptian flag after amendment of maritime legislations.

2- To seek the accreditations, recognitions or equivalence of Egyptian maritime certificates (officers and engineers) from the largest number of European countries to open the field of work for Egyptian seafarers in these countries or foreign companies.

3- Add an item on the list and regulations of the Suez Canal Authority to reduce the costs of crossing vessels and guidance percentage by the presence of a number of Egyptian seafarers on board ships in transit.

4- Apply a percentage of discounts and exemptions for foreign vessels on which an Egyptian crew is located when they are going to Egyptian ports.

5- The Ministry of Transport in cooperation with all maritime sectors in Egypt shall study the possibility of establishing a central and unified maritime administration with an integrated database for all Egyptian seafarers managed by the Ministry and other association together with specific mechanisms concerned with the management of seafarers' affairs and dealing with shipping companies, Such as India, Indonesia and Philippines or ratification of the Maritime Labor Convention (MLC 2006).

6- To submit a proposal for marketing seafarers during the presents of IMO meeting.

6.3. Role of International Association of Maritime University and International Maritime Organization- :

1. The International Association of Maritime Universities (IAMU) is the global network of leading maritime universities providing Maritime Education and Training (MET) of seafarers for the global shipping industry. IAMU can create and maintain a global network of members with other maritime associations and the United Nations agencies to building human capacity and marketing global high quality professional seafarers in the maritime sector.

2. The IMO, through its regular meetings, which includes 174 countries of the world, must solve the problem of the shortage of seafarers in many European countries and surplus in other countries.

3. The ITF represents seafarers on bodies such as the (IMO) and the International Labour Organization which can set global standards for employment conditions, recruitment, training and safety at sea. The International Transport Fedration and the affiliated unions must working together to ensure that employers meet these standards, and that they emphasize skills training and professionalism to recruit.

4. Draft a framework for cooperation and conditions for the recognition or equivalence of maritime certificates between States.

7. Conclusion

The attraction of seafarers as a vocation is higher in major supplying seafarer's countries and falling down in traditional shipping countries. Supply of seafarers is tightly associated with the scale of the world fleets which is linked with world economy's climates, and it is very difficult to anticipate that the supply will get over the demand unless rapid diminution in scale of world commercial fleets continues for several years. This is caused by a time lag between a transition of the supply and that of their elements such as the world economy and the scale of world economy. Therefore it is considered that the supply of seafarers usually follows changes in demand and will be adjusted gradually. The capacity of cadets in the world relies on each shipping company's strategy on human resource management and there is a large gap between both numbers of employed cadets and graduates from maritime institutes. Global Maritime traffic is increasing, and the risk of collision is increasing along with it. The cause of such accidents and disasters in most cases is the human factor, which is related to competence and expertise. Requirements of the maritime market are huge and because of that, there is a great lack of seafarers in the world today. To get a good staff. The seafaring industry like all others is in need for refinement, as the service quality of the industry is ultimately dependent on the quality of its human resources. It is increasingly difficult to attract and retain the right caliber of entrants into the seafaring career.

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A Comparative Study between national and open Ship

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Abstract:

This paper studied the reasons behind the decreasing in numbers of ships flying National flag. This decreasing causes negative impacts on the maritime industry, such as increasing numbers of substandard ships, the lower demand for national seafarers and the declining of national maritime expertise. It can be noted that a vibrant ship registry could significantly affect the country's standing in the maritime community and boost the economy as it provides more prospects for foreign and local investments and job opportunities for national citizens.

The author conducted number of interviews with a sample of the stockholders in Maritime industry and national shipping companies to find out the hidden reasons behind the declination of national flagged ships. On the other hand, the researcher extracted the main results of interviews and conduct Qualitative analysis for the reasons of choice foreign flag to estimate the most probable recommendations and suggestion to promote the National flag Administration such as the need to update national legislation, developing a ship registration or flagging out strategy and promote flag state implementation for the improvement of the system.

Key words: Ship Registration, Open Registry, National Registry, Competitive, Performance, Attractive, Strategy, Flag State Duties.

1- Introduction

Maritime transport is the backbone of global trade and global economy and the most important part of this backbone is ship registration. Ship registration plays an important function towards safety and security of the maritime transport and significantly contributes towards the protection of marine environment. Ship registration is the general mechanism and the process of documentation for establishing a ship's nationality and regulating shipping. By linking a ship to a State, ship registration system indicates that State has the right to protect that ship in international law (IMO, 2020a).

Currently, there is no compulsory international framework to regulate the registration of ships process itself. The (1986) United Nation (UN) Convention on Conditions for Registration of Ships establishes international standards for the registration of vessels in a national registry, including references to the genuine link, registration, ownership, management, accountability and the role of the flag state. However, the Convention has not entered into force (IMO, 2020a).

Each country shall set its own laws and regulations on the registration of ships. Some countries only register vessels owned, operated and managed by nationals of that country. These registries known as "National or closed registries". Other countries allow ship owners of other nationalities to flag and operate ships under their flag. These are Known as "open registry". Others just choose not to allow the use of their flag for international trade at all (IMO, 2020a).

Open registries fleets are continuously increased around the world, but the problem of this type of registration that there is always no genuine link between ship and its flag state. Some of these registers have poor safety and training standards and place no restriction on the nationality of the crew, so International Maritime Organization (IMO) has focused on a strategic approach to ensuring that flag states adequately assume jurisdiction and control in administrative, technical and social matters over ships flying its flag in accordance with article 94 of United Nations Convention for the Law Of the Sea (UNCLOS) (IMO, 2020a).

Due to unexpected growth of Open Registries (ORs), it is important to understand the advantage and disadvantages of the open registration and studying the reasons which make national companies prefer open registration rather than national registration.

2.Ship Registration

As per international regulations, every ship should be registered under a flag state. The purposes of ship registration are to provide ships with documentary evidence of their nationality, a certificate of registry is merely a prima facie evidence rather than conclusive proof of a ship's nationality. Likewise, a certificate of registry is regarded as only a prima facie evidence of ownership of the ship and of the tonnage of the ship, and it must always be carried on board the vessel (Odeke, 1998).

Registration of a vessel also proves who is the legal owner registration which provides an important function both internally and externally. A registered ship or share therein can be made in order to security for a loan, and any such mortgage registered at the Port of Registry of the ship becomes a marine mortgage, with certain duties and privileges not normally associated with a mortgage. Other benefits arise from registering a ship such as the granting of a unique name, being able to apply for a radio call sign, ship radio station license and limitation of liability in case of a marine disaster and entitlement to use the national flag. In addition to prove the ship's nationality and ownership, registration provides an excellent means of identification, not only for general reference purposes, but in court actions as well (Odeke, 1998).

Table1: Leading flags of registration by dead-weight tonnage, 2020

No	Flag of registration	Number of vessels	Share of world vessel (percentage)	Dead-weight tonnage (thousand DWT)
1	Panama	7 886	8	328 950
2	Liberia	3 716	4	274 786
3	Marshall Islands	3 683	4	261 806
4	Hong Kong, China	2 694	3	201 361
5	Singapore	3 420	3	140 333
6	Malta	2 207	2	115 879
7	China	6 192	6	100 086
8	Bahamas	1 381	1	77 869
9	Greece	1 294	1	68 632
10	Japan	5 041	5	40 323

Source: United Nations Conference on Trade and Development (UNCTAD, 2020)

2.1Types of ship registration

There are various types of ship registration as follows:

2.1.1 Closed registry

The close registry is regarded as a traditional or national registry, traditional registers are ship registers that are administered by public administration as a national registry for the registration of their own ships flying their own flag, owned, operated and managed by nationals of that country. The vessel under this regime are subjected to the jurisdiction and control of the flag state, which ensure that its flag ship complies with the international treaties ratified by the state, at least (Manaadiar, 2018).

2.1.2 International registry

The traditional maritime states turned into creating their own international registries. The purpose of this was to attract back their shipowners, by establishing a second or parallel shipping register, that would offer many of the advantages of open registries such as less operating cost for the ship owners, but which would not also permit or condone the lax practices and procedures associated with normal open registries of ships. Traditional maritime nations that preferred to open and operate the second registries, most did in their offshore territories. Examples are, the United Kingdom (UK) in its offshore territories of Isle of Man, Bermuda, Cayman Islands, and Gibraltar; France on its Antarctic Territory of Kerguelen Island; Spain on the Canary Islands; the Netherlands in the Netherlands Antilles; and countries of Norway, Denmark, and German opened a new separate international ship registers within their territories (Watt & Coles, 2019).

2.1.3Open registry

Open registers are state of registration that allow ship owners of other nationalities to flag and operate ships under their flag. The main reasons for these types of registries attracting foreign ships relates to the avoidance of fiscal obligation, the stringent terms, and conditions for registration, terms of engagement that would have been applicable if their tonnage was entered in the register of their own country.

There are several countries registering vessels in the form of Open Registries, it began in Panama which offers the advantages of easier registration (often online registration), no income taxes and the ability to employ cheaper foreign labour, followed by Liberia and Marshall Islands which implementing flexible registration policies. The commercial and financial impact of open registries caused apprehension among traditional maritime powers only after the (1940), when the shipping industry experienced an immense transfer of tonnage from long-established national registries towards open registries (Salum, 2019).

2.2 Open registry

At present shipping companies have to work hard in order to win the fierce competition with the deteriorating freight rates in the international shipping market, either by reducing cost, or increasing quality of service or both. One way to reduce cost is to flag-out from their traditional ship register and find a registry called open registry that is conducive to their operations, so that it will be possible to hire crew at lower costs and pay lower taxes. Thus, ship owners find it attractive to choose a flag that gives them freedom.

Many countries are practicing an open registry system as a means of generating income to cover their budget deficits. As a result, the competition between countries of open ship registries has become so fierce that each is trying to under-cut the other so as to remain stronger. For new countries wishing to penetrate the market, they require heavy investment in building a competent MARAD with a well-qualified administrative staff and surveyors, and at the initial stage this costs a lot of money in publicity and advertisements. Along with this, countries must comply with international conventions and regulations (Amanuel, 2000).
More than 70 percent Dead Weight Tonnage (DWT) of the world fleet sail under foreign flag (UNCTAD, 2019). Which mean shipowners register ships in foreign countries other than their countries. As a result, most countries with

traditional registries suffering from this.
As shown in table 2, Some national flags such as Greece, Germany, japan and Norway has a large shipping fleet, but most of its ships are flagged in other states as shown in table 2, which if registered under the national flag will increase the total tonnage registered under the national flag and increase the annual yield. Thus, increase the contribution of national fleet in providing international shipping service and become a powerful member of the global shipping industry.

Table 2: Ownership of national fleet ranked by dead-weight tonnage (2020)

	Country or territory of ownership	Number of vessels			Dead-weight tonnage				
		National flag	Foreign flag	Total	National flag	Foreign flag	Total	Foreign flag as a percentage of total	Total as a percentage of total
1	Greece	671	3977	4648	60,827,479	303,026,753	363,854,232	83.28	17.77
2	Japan	909	3001	3910	36,805,225	196,329,652	233,134,877	84.21	11.38
3	China	4569	2300	6869	99,484,023	128,892,849	228,376,872	56.44	11.15
4	Germany	205	2299	2504	8,340,596	81,062,481	89,403,077	90.67	4.37
5	Korea	778	837	1615	14,402,899	66,179,736	80,582,635	82.13	3.93
6	Norway	383	1660	2043	1,884,535	62,051,275	63,935,810	97.05	3.12
7	Premuda	13	529	542	324,902	60,088,969	60,413,871	99.46	2.95
8	United states	799	1131	1930	10,237,585	46,979,245	57,216,830	82.11	2.79
9	United Kingdom	317	1131	1344	6,835,508	46,355,337	53,190,845	87.15	2.60
10	Denmark	25	921	946	31 435	42,683,049	42,714,484	99.93	2.09

Source: United Nations Conference on Trade and Development (UNCTAD, 2020)

Also, table 3 show that ORs account for about 53.40 percent of the world's gross shipping tonnage. From Table 3 it is obvious that Panama dominates the world fleet in terms of GT by country of registration.

Table 3: The top 10 leading open Registries flags Ranked by Gross Tonnage (2019)

No	Rank country of registry	Gross Tonnage	% World Tonnage
1	Panama	226,576,732	15.80
2	Liberia	185,133,153	12.91
3	Marshall Islands	167,326,945	11.67
4	Malta	81,890,145	5.71
5	Bahamas	59,774,630	4.17
6	Cyprus	23,173,523	1.62
7	Bermuda (United Kingdom)	10,336,939	0.72
8	FIS (France)	5,065,410	0.35
9	Antigua and Barbuda	4,797,447	0.33
10	Cayman Islands (UK)	1,654,232	0.12
	ORs Total	765,729,156	53.40
	World Total	1,433,895,532	

Source: Global Integrated Shipping Information System (GISIS, 2020a)

2.2.1The development of open registries

The modern open registry, while designed to provide maximum economic benefits to the ship owner or operator, also affords some very minor levels of protection as a flag in general. The flag state offering the registry is still required to abide by certain levels of responsibility and obligations, but these levels and the duties undertaken by the various states are what can set one state apart from the others in terms of cost, regulation and benefit to seafarers. As could be expected, the development of tighter regulations within some flag states was not a choice. it was mostly the result of pressure from other states (Gregory, 2012).
Until about the mid twentieth century, there was a Genuine Link between vessel owner nationality and vessel flag state, and the seafarers were almost an extension of their nation-states in the case of national shipping. Once this began to change in the industry as owners sought to circumvent the regulations of their home state, certain states became more prominent as open registries for their relaxed tax, safety standards and labor regulations (Gregory, 2012).
For the purpose of this study, the following figure shows the development of the open registry in the maritime business in terms of the total gross tonnage and their acquisition of a large proportion of the world fleet, and this percentage continues to increase steadily as a result of the owners' reluctance to register their ships in their country of origin.
It is clear from the figure1 that open registration flags constitute half of the highest registration flag.

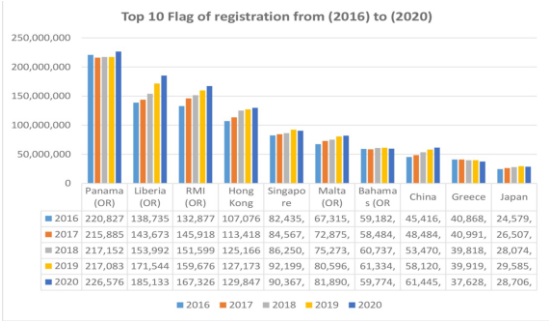

Figure 1. Top 10 Flag of registration from (2016) to (2020)
Source: Global Integrated Shipping Information System (GISIS, 2020a)

2.2.2 Factors for preferring open registry

Open Registry is competitive and attractive because, for the shipowner, this type of registry seems a bit easy in terms of controls and represents a savings in terms of money for manning of the vessels.

Closed or National registries typically require that a ship be owned and constructed by national interests, and at least partially crewed by its nationals. Open registries do not have such requirements; some offer on-line registration, sometimes guaranteeing completion in less than a day.

There are specific advantages for using Open Registry flags instead of the closed flag registries the most important of which are the following:

2.2.2.1 Higher flexibility

Shipowners can register their vessels in any of these states without any requirements for citizenship or the owning company to be incorporated under the laws of its state or presence of the (actual) shareholders or the (actual) company. Also, they are free to change the vessel's registry at any time without any restriction, and without a prior-registration survey (HUB, 2020).

2.2.2.2Lower operating costs

Shipowners who use Open Registry flags can save costs mainly on the crew wages and the maintenance costs. Open Registry flags do not have any requirements in regards with the nationality of the crew members, terms of employment or management and are not subject to minimum wage scales (HUB, 2020).

2.2.2.3 Political aspect

From a political perspective the appearance of ORs provides to the vessel operators the ability to trade internationally without any prohibition as a consequence of the flag that the vessel is flying .

Similarly, the vessel under a flag from an ORs system is a major advantage to sail. ORs allow a vessel to cruise all countries without the risk its transit being prohibited. The syndrome of discrimination against a particular flag is not an issue that impact the ORs (Odeke, 1998).

2.2.2.4 Anonymity

In order for a shipowner to register a vessel under open Registry, the only he needs is just a PO Box or a virtual company and the actual shareholders in these jurisdictions may not be reported at all. This might be important in order to avoid liabilities which might arise from the operation of the vessels (HUB, 2020).

2.2.3 The inconveniences of open registry flags

2.2.3.1 Pollution

The system of Open Registry flags is often considered to be a major obstacle to mitigating the problem of maritime pollution, due to the system's lack of regulatory enforcement and untrained crews (Shaughnessy and Tobin, 2006).

2.2.3.2 Seafarer rights

Seafarers who are employed on ORs ships are often denied their basic human and trade union rights since ORs do not enforce minimum social standards. This makes the flag very attractive to shipowners. The home countries of the crew can do little to protect them because the rules that apply on board are often those of the country of registration. As a result, most OR seafarers are not members of a trade union. For those who are, the union is often powerless to influence what happens on board (ITF, 2020).

2.2.3.3 Maritime and land security

While the severity of the inconvenience problems is not to be underestimated, the most pressing and far-reaching maritime issues today concern national and international security, both on land and at sea. Dangerous cargo and a lack of transparency regarding ship ownership and crew members, combined with the lack of regulations by ORs states constitute a grave transnational threat. The transportation of weapons or terrorists by OR flagged ships, or the use of those ships to implement an attack against maritime targets, are disasters which would not and could not be confined by political boundaries (Shaughnessy and Tobin, 2006).

Table 4 shows the advantages and disadvantages of open registration, although the advantages constitute an economic importance to

shipowner, the defects of open registration may also constitute an economic burden on the owner in the event that the ship is detained by the port state control and repetition of this detention more than once, which leads to costing the owner huge amounts and reduce the value of ship in shipping market and the ship may not meet the suitability of some ports around the world.

Table 4: Advantage and disadvantage of open registry

Advantages	Disadvantages
Low registration fee and tax cost	Difficulty in identifying the real ship owner
Operation cost reduction	Lack of safety policies for seafarers
Digitalization Maritime services	Usage of old or out of data ships
Owner can register ship in a foreign territory without being established in that country	ORs doesn't necessitate their basic rights
Low formation costs in states where required	Lower standards of working conditions
The benefits of ownership remain anonymous	The risk of unknowingly being dragged into illegal trade
Low or no taxation	Lower pay
No limitations on the nationality or employment conditions of the crew including the age limits	Insufficient compensation for injuries due to accidents at sea. A lack of regulation puts mariners at an even greater risk of an accident.
Dual registration may be allowed	Challenging work schedules that don't allow seafarers the proper amount of rest
Fast and easy registration procedures, sometimes online	Uncertain career choices for the future. Some seafarers suffer from the uncertainty of not knowing what situation they will get into next

Source: organized by the research (2020)

2.3 Qualitative analysis the reasons of choice foreign flag

Flag selection is a high-level decision usually made, on a ship by ship basis, at the time of vessel acquisition and is usually based on experience (Bergantino and Marlow, 1998). During the interviews, it became clear that different companies perceived different factors as being important to their decision on flag. It is noted that most of ships which owned by national companies are managed and operated by foreign companies. So, these companies preferred to register these vessels under the flags they are deal with. And some companies stated that, having flagged out previously, they would now prefer to flag back in but were prevented from doing so by the high cost of compliance to meet the requirements of the flag and some concerns were raised regarding Law for registering, ownership transfer and or deletion of the vessels.

A flag might be chosen for political reasons, to avoid trading restrictions, for public relations reasons, for historical reasons, because of directives from financial institutions, or for reasons related to the trade routes of the vessel or to its characteristics. Hence it is possible for companies to flag out some of their vessels while retaining others under the national flag. Eight of the respondents were in this category (i.e. some of their vessels are registered under the national flag while others are flagged out) and this reinforces the view that each vessel is considered individually and is the focus of a separate decision.

As shown in figure 2, Those companies which had chosen not to use the national flag gave no trading restriction, ease of registration and provide technical support 24/7 in respect of urgent matters as the most common privileges provided by foreign flag over national flag. Other factors which had influenced them were to escape bureaucratic control; high costs of compliance with standards of the national flag and fiscal reasons.

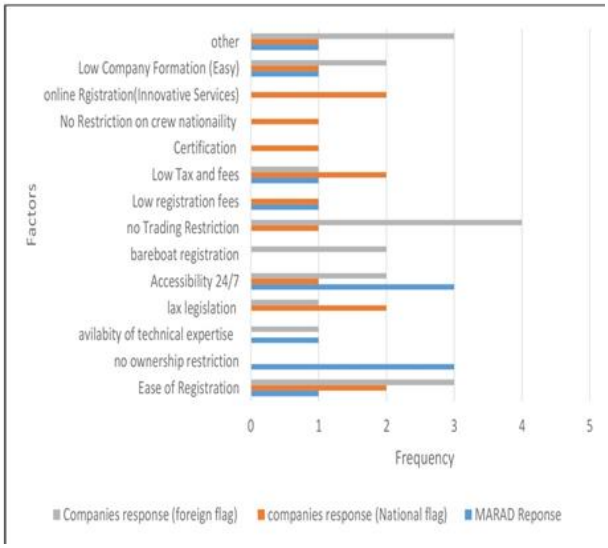

Figure 2: Privileges provided by foreign flag over national flag.

Source: Organized by the research depending on the interviews results (2020)

Those companies which had chosen to use the national flag gave relaxed legislation, ease of registration and online registration as the most common privileges provided by foreign flag over nation flag.

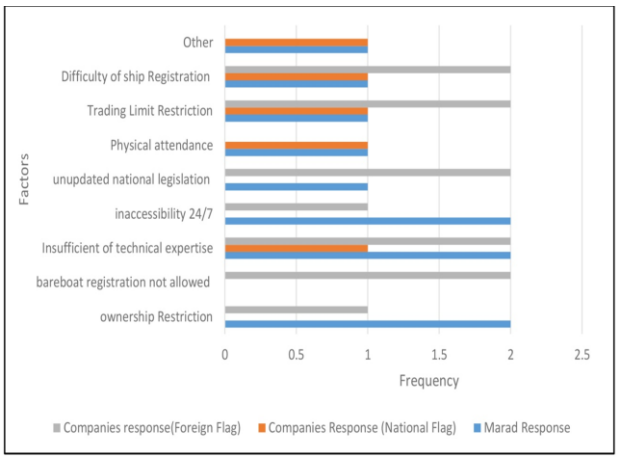

Figure 3: Restriction in flying national flag
Source: Organized by the research depending on the interviews results (2020)

From Figures 3, it is clear that no one reason acts in isolation and that the decision on choice of flag is a subtle amalgam of factors. In addition to, its shown that companies choosing a foreign flag and for companies choosing the national flag gave insufficient of technical expertise, trading restriction limit and the difficult of registration as the most national flag restriction or difficulties.

Conclusion

A proper maritime legislation must be built up to support the development of a proper national registry system which will be convenient for the shipping industry. Once established the proper maritime legislation, there should be an efficient and competent maritime Administration which will control the policies for registration of ships. Those polices should be oriented to the economic benefits of the country and shipowners. However, such policies should not be lower than minimum international standards which are settled by international organizations.

Developing a ship registration strategy in order to remain competitive in the worldwide market by achieve the below goals: Establishment and maintenance of competent and qualified duty officers capable of responding on a 24/7 basis;

Providing competent technical and administrative advice on all issues relevant to achieving and maintaining national and international regulatory compliance; Provides an established and efficient Administration of the registration process for ships that correspond to the operation their vessels; and Is capable and willing to act decisively and responsively whenever or wherever necessary.

National flag administrations shall take quick step to launch online web portals to support the growth of the local shipping registry. Online ship registration will provide a more professional, dynamic and user-friendly experience to users and enhance the territory's maritime sector offering. Marine services will be so much more accessible globally.

Moreover, the most important element in the development of a proper national registry is that the Administration must be manned by people who have enough knowledge of polices and minimum safety standards protect safety of life at sea and prevention of pollution. Therefore, the Administration should attract many students to study marine science and engineering and urging them to complete postgraduate studies

Ship registration services shall be Shipowner focused and highly responsive like vessel and mortgage registration in twenty-four hours, provided all documentation received and flexibility in providing services outside of normal business.

As a partial solution to address those shortcomings, some recommendations and solutions have been proposed. It was also concluded that complacency is the enemy of progress and this progress and the required changes will not be materialized in the absence of commitment and dedication from the higher management.

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Improving Performance of Ship Handling through Providing Training on Manual Ship Handling

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Abstract:

Lack of training is a significant factor that affects the manual ship handling, which leads to many marine accidents. Therefore, this research aims to study the impact of Training (Formal Plan, Needs, Objectives and Evaluation) on performance. The deductive approach is used as well as the quantitative method in collecting data, through a questionnaire distributed among 230 seafarers working in the shipping sector and 120 complete responses were collected. Additionally, data analysis was done through using some statistical methods such as normality test, correlation and regression. The results of analysis have proved a positive significant impact of training with its dimensions (Formal Plan, Needs, Objectives and Evaluation) on manual ship handling performance.

Key Words: Training, Performance, Manual-Ship Handling.

1- Introduction

Manual handling could be generally defined as any human activity that requires usage of force to lift, carry, push, pull, hold or restrain a person, animal or an object. Depending on this definition if the tasks are not cared successfully, it may lead to occurrence of accidents and injuries. Therefore, the manual handling training is designed by any corporate aiming to reduce the probability of accidents occurrence (Clemes et al., 2010).

Training is defined as a planned learning experience that aimed to improve the organizational performance through making permanent changes in the individual knowledge, attitudes which leads to improve the technical and developmental skills of employees. In other words, training could be defined as a planned intervention that aimed to improve the job performance of individuals (Bhat and Rainayee, 2019). Moreover, performance could be defined as the success of the individual (employee) in achieving the required tasks and responsibilities, putting in consideration the quality of this work and the time taken to made this work (Suryadi et al., 2021).

Despite there are many researches were investigated the impact of training on the performance, few studies have tackled the issue at the shipping sectors. Therefore, this research aimed to investigate the attitudes of employees towards the training of dynamic positioning operation on manual ship handling and its impact on the performance and situational awareness of the seafarers. Therefore, it examined the impact of Training (Formal Plan, Needs, Objectives and Evaluation) on performance.

2. Research Background

Training was measured by Formal Plan, Needs, Objectives and Evaluation. Vessels usually navigate depending on computer system, but any errors occurred in those systems require the usage of manual ship handling. In the same regard, the lack of experience appears among seafarers (van Diggelen et al., 2017).

Many studies (Al-Mzary et al., 2015; Dong et al., 2016) had analyzed the reasons behind occurrence of marine accidents. One of the main reasons was the lack in training. After investigating the reasons for accidents occur in certain organizations, the results proved that the reason behind the occurrence of 7 out of 9 accidents were the lack in training, lack of operational procedure and lack of inspection regime.

Finally, the findings of analysis proved that each of training dimensions; Formal Plan, Needs, Objectives and Evaluation has a positive significant relationship with the manual ship handling performance among seafarers. Therefore, training is a significant factor that enhance the performance.

3. Literature Review

Normally ship officers have to steer the ships based on their mental model of the ships motion characteristics only. This mental model has been developed during the education, training in ship handling simulator in real time simulation and most important during their sea time practice (Benedict et al., 2014). The problem appears when officers are forced to use manual ship handling rather than depending on dynamic positioning tools. To overcome such problem, the research proposes training of officers within the required dimensions to achieve the required manual handling of ship performance, without facing problems and having risk of accidents. This section deals with the relationship between training and performance through some studies. Several trainings might come with different results, but at the end of this section the main dimensions of training have been introduced that could keep the optimal level of manual ship handling performance.

Wu et al. (2010) measured the effect of formal plan training on performance. The data was collected from twenty-one subjects, which were randomly assigned either to the control group or to a training group that performed 8 weeks of training. The results found that there was a significant relationship between training and performance. In addition, Khan et al. (2011) focused to understand the effect of training and development on performance and results revealed that training and developments had a significant effect on performance. It meant that it increased the overall performance.

Saeed and Asghar (2012) aimed to investigate the relationship between training, motivation and performance. Results found that there was a significant relationship between training, when considering objectives achievement, motivation

And performance. However, Chetambe (2013) aimed to investigate the effect of training of principals on performance. Data was collected using structured questionnaires. Results established that training had a little impact on performance.

The more training provided to officers, the more satisfaction they feel and the more productivity and profitability achieved. Taufek and Mustafa (2018) clarified that each corporate has to determine the suitable type of training that officers need. Moreover, the impact of training and development on employees' performance is investigated. To examine this impact a questionnaire targeted employees working at Proton Tanjung Malim in Malaysia. The collected data were analyzed by utilizing correlation and regression analysis. The results proved that training and development had positive influence on performance. In addition, training design had proved to have a significant impact on performance.

The dynamic environment of work leads to continuous changes in the work tasks, which required learning new knowledge and skills by the employees aiming to improve the work performance and efficiency. Bhat and Rainayee (2019) claimed to examine the relation between training and performance. In addition, it was aimed to examine the moderating effect of job fit in the above relation. A questionnaire is used to collect data about the variables. The targeted sample consisted of 171 civil service officers. Both Structural Equation Models (SEM) and Partial Least Squares (PLS) were utilized in the data analysis. The findings proved that both training and job fit had direct effect on performance.

Kwon (2019) clarified that human capital literature did not prove a direct impact of both training and development on performance, but may instead create effects that were realized over time. In addition, most existing cross-sectional research explained the influence of training and development investment on performance while overlooking training and development investments' long-term effects. Therefore, the relation between training and development and performance over time is studied using longitudinal data. The results of analysis proved a positive relation between training and development and performance.

Rozikin and Purwono (2020) aimed to analyze the impact of training and education on performance in Indonesia. A questionnaire had conducted to collect data about the required variables. Findings had proved that the performance has not been optimal through both education and training, as improving the performance required other factors besides those two factors. Finally, education had proved to have more contribution than training toward performance. However, Putra and Riyanto (2020) defined the process of education and training as a process that work on transferring particular knowledge and skills to seafarers aiming to increase their efficiency in order to improve their performance. After analyzing the data, the findings indicated a significant positive influence of education and training towards the competencies and performance.

Suryadi et al. (2021) studied the relation between training and performance in Indonesia. Primary data was collected through a questionnaire. The analysis had proved positive significant relation between training and performance. Finally, it was suggested that in the managing performance context, the decision makers have to arrange their aims and targets in quality and quantity. In addition, decision makers have to provide the suitable training for each task.

Based on the previous studies that have been circulated, it could be assumed that there is a statistically significant relationship between Training and performance. Also, training has several dimensions, but the ones that proved their significance are formal plan, needs, objectives and evaluation.

The following section investigates the effect of the four dimensions of training observed from previous studies on manual ship handling performance through a questionnaire directed to officers to investigate their needs.

4. Research Methodology

To test the goal of this study, the deductive approach is used through quantitative data issued from the questionnaire distributed to

collect the required data from the sample to finally arrive at a study of the effect of training on performance. The data collected from 120 complete questionnaires gathered from seafarer. The variables used in this study can be categorized into two main types, which are; the independent and dependent variables.

Research Hypotheses

This section identifies the variables of the study, framework and hypotheses, where the variables are represented as following:

Independent Variable: Training (Formal Plan, Needs, Objectives and Evaluation).

Dependent Variable: Performance.

Figure 1, represents the proposed study model for this research, where the study aimed at the variables:

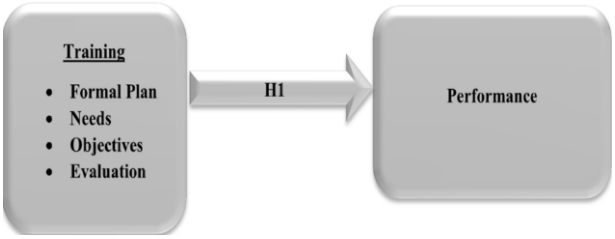

Figure 1 Research Framework

From the above framework, the research hypotheses can be developed as following:

H1: There is a positive significant relationship between Training and Performance

H1.1: There is a positive significant relationship between Formal Plan and Performance

H1.2: There is a positive significant relationship between Needs and Performance

H1.3: There is a positive significant relationship between Objectives and Performance

H1.4: There is a positive significant relationship between Evaluation and Performance

Respondents Profile

This study collects it data through a questionnaire. The population of this questionnaire is seafarer's officers (Master, chief officer, second officers and third officers). A sample of 230 seafarers is selected and questionnaires are distributed, where 170 responses are returned with response rate approximately 74%, and 120 of them are complete responses, in which they are valid for analysis (with final response rate approximately 52%).

Data Analysis Techniques

This study depends on making descriptive analysis, correlation and regression analysis through utilizing SPSS. The descriptive analysis represents a way of analysis used to get a clear explanation regarding collected data characteristics. This explanation introduces in a form of short summaries about the responses of research participants. The descriptive analysis also shows the applied diversification in the representative sample for the population under study (Heeringa et al., 2017).

Correlation analysis is a type of analysis that is used to measure the relation between two variables, correlation uses Pearson and Spearman correlation coefficient which can be measured between +1 and -1, if the correlation is equal to ±1 (the absolute value), this means that there is a strong association between the variables, and if the result is equal to zero this means that there is no correlation between them. Correlation analysis has two types: linear correlation (uses Pearson coefficient) and rank correlation (uses Spearman coefficient) (Silverman, 2003).

The regression analysis is used in determining the relation between dependent variable and one or more independent variable aiming to identify the value of the dependent variable depending on the independent one. Regression analysis has two types linear regression and nonlinear regression. Linear regression could be simple one that depends on a single independent variable or multiple regression that depends on two or more independent variables. On the other hand, the nonlinear regression deals with more complex relationships (Shi and Conrad, 2009).

SPSS is the Statistical Package for the Social Sciences that developed for the first time at the 1960's. It represents the first trial of developing social scientist software. SPSS is software that is used to analyze quantitative data. This program has the ability to analyze large amount of data and in a short period of time, this analysis can be done using different ways. SPSS program is also characterized by its ability to analyze complex

and complicated data (Bryman and Cramer, 2002).

5. Results and Findings

This section introduces the empirical study with the main findings and results after running the data analysis.

Data Testing using Validity and Reliability for the Research Variables

In this section, the validity for the statements used to measure the research variables. The independent variable is Training with its dimensions; Formal Plan, Needs, Objectives and Evaluation. Additionally, the dependent variable is Performance. This section introduces the validity and Reliability of Training, where its dimensions are; Formal Plan, Needs, Objectives and Evaluation. Table 2 shows the factor loading statements and the average variance extract of research variables. It was found that the factor loading of all statements are greater than 0.4. Moreover, the result of AVE was more than 50%, therefore, the research statements are valid to measure their constructs. Regarding the reliability test, Table 1 shows the result of the reliability test. It is observed that the Cronbach Alpha of all research variables is more than 0.7. This means that the statements of research variables are reliable to form this construct.

Table 1: Validity and Reliability Analysis

Statements	Factor-Loading	AVE	Cronbach's Alpha
FP1	0.780	77.962	0.716
FP2	0.780		
N1	0.688	63.947	0.811
N2	0.615		
N3	0.653		
N4	0.601		
O1	0.698	67.111	0.835
O2	0. 656		
O3	0. 608		
O4	0. 723		
EV1	0.602	63.671	0.810
EV2	0.668		
EV3	0.639		
EV4	0.638		
P1	0.665	65.694	0.739
P2	0.653		
P3	0.653		

Descriptive Analysis for the Research Variables

Table 2 illustrates the descriptive analysis for the research variables using the Minimum, Maximum, Mean and Standard Deviation for the research variables. The mean value of Formal Plan is found to be 4.5583 with a standard deviation 0.53130 with minimum and maximum equal to 3.00 and 5.00 respectively. In addition, the mean value of Needs is found to be 4.5750 with a standard deviation 0.54484 with minimum and maximum equal to 3.00 and 5.00 respectively. Moreover, the mean value of Objectives is found to be 4.5833 with a standard deviation 0.55886 with minimum and maximum equal to 3.00 and 5.00 respectively. The mean value of Evaluation is found to be 4.6417 with a standard deviation 0.48152 with minimum and maximum equal to 4.00 and 5.00 respectively. Finally, the mean value of Performance is found to be 4.5750 with a standard deviation 0.54484 with minimum and maximum equal to 3.00 and 5.00 respectively.

Table 2: Descriptive Analysis for Research Variables

Variables	Mean	Std. Deviation	Minimum	Maximum
Formal Plan	4.5583	0.53130	3.00	5.00
Needs	4.5750	0.54484	3.00	5.00
Objectives	4.5833	0.55886	3.00	5.00
Evaluation	4.6417	0.48152	4.00	5.00
Performance	4.5750	0.54484	3.00	5.00

Normality Test for the Research Variable

Normality is one of the assumptions that have to be verified to determine if a data set is normal. In order to check the normality for the data, two types of tests are conducted: formal and informal. The formal testing of normality assumption for the research variables was done using the Kolmogorov-Smirnov test of normality as shown in Table 3. It could be observed that the research variables are not normally distributed, as the corresponding P-values are less than 0.05.

Table 3: Formal Testing of Normality for the Research Variables

Variables	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Formal Plan	0.372	120	0.000	0.672	120	0.000
Needs	0.382	120	0.000	0.673	120	0.000
Objectives	0.389	120	0.000	0.672	120	0.000
Evaluation	0.413	120	0.000	0.607	120	0.000
Performance	0.382	120	0.000	0.673	120	0.000

Testing the Research Hypotheses

This section tests the research hypotheses, where the study has one hypothesis, which contains four sub-hypotheses.

This section represents the results of testing the relation between Training and Performance, where the Spearman's correlation is used depending on the results of normality test. Table 4 shows the relation between Training and Performance. It could be observed that there is a significant relation between Formal Plan and Performance, as P-value is less than 0.05 (P-value =0.000). Moreover, a positive relation is proved between Formal Plan and Performance, as the correlation coefficient is more than 0 (r =0.612). Also, it could be observed that there is a significant relation between Needs and Performance, as P-value is less than 0.05 (P-value =0.000). A positive relation is proved between Needs and Performance, as the correlation coefficient is more than 0 (r =0.599). In addition, it could be observed that there is a significant relation between Objectives and Performance as P-value is less than 0.05 (P-value =0.000). A positive relation is proved between Objectives and Performance, as the correlation coefficient is more than 0 (r =0.658). Furthermore, it could be observed that there is a significant relation between Evaluation and Performance, as P-value is less than 0.05 (P-value =0.000). A positive relation is proved between Evaluation and Performance, as the correlation coefficient is more than 0 (r =0.741).

Table 4: Correlation test of Training and Performance

		Formal plan	Needs	Objectives	Evaluation	Performance
1. Formal Plan	r	1.000	.580**	.683**	.731**	.612**
	P-value	.	.000	.000	.000	.000
	n	120	120	120	120	120
2. Needs	R	.580**	1.000	.561**	.775**	.599**
	P-value	.000	.	.000	.000	.000
	N	120	120	120	120	120
3. Objectives	R	.683**	.561**	1.000	.737**	.658**
	P-value	.000	.000	.	.000	.000
	N	120	120	120	120	120
4. Evaluation	R	.731**	.775**	.737**	1.000	.741**
	P-value	.000	.000	.000	.	.000
	N	120	120	120	120	120
5. Performance	R	.612**	.599**	.658**	.741**	1.000
	P-value	.000	.000	.000	.000	.
	N	120	120	120	120	120

Table 5 shows the regression model of the effect of Training on Performance. It could be noticed that there is a positive significant relationship between Formal Plan and Performance, as the regression coefficient is 0.610 ($\beta > 0$) and P-value is 0.000 (P-value < 0.05). Moreover, the R-square is 0.353, which means that 35.3% of the variation of the Performance can be explained by the Formal plan.

Table 5: Regression test of Formal Plan on Performance

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	R-Square	P-value
		B	Std. Error	Beta				
1	(Constant)	1.797	.348		5.157	.000		
	Formal Plan	.610	.076	.594	8.029	.000	.353	.000

According to the above results, the first sub-hypothesis, which is "there is a positive significant relationship between Formal Plan and Performance" is fully supported.

In addition, Table 6 shows the regression model of the relation between Needs and Performance. It could be noticed that there is a positive significant relationship between Needs and Performance, as the regression coefficient is

0.604 (β > 0) and P-value is 0.000 (P-value < 0.05). Moreover, the R-square is 0.364, which means that 36.4% of the variation of the Performance can be explained by the Needs.

Table 6: Regression test of Needs on Performance

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	R-square	P-value
		B	Std. Error	Beta				
1	(Constant)	1.813	.338		5.363	.000	.364	.000
	Needs	.604	.073	.604	8.226	.000		

According to the above results, the second sub-hypothesis, which is "There is a positive significant relationship between Needs and Performance" is fully supported.

Moreover, Table 7 shows the regression model of the relation between Objectives and Performance. It could be noticed that there is a positive significant relationship between Objectives and Performance, as the regression coefficient is 0.612 (β > 0) and P-value is 0.000 (P-value < 0.05). Moreover, the R-square is 0.394, which means that 39.4% of the variation of the Performance can be explained by the Objectives.

Table 7: Regression test of Objectives on Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R-square	P-value
		B	Std. Error	Beta				
1	(Constant)	1.770	.323		5.487	.000	.394	.000
	Objectives	.612	.070	.628	8.763	.000		

According to the above results, the third sub-hypothesis, which is "There is a positive significant relationship between Objectives and Performance" is fully supported.

In addition, Table 8 shows the regression model of the relation between Evaluation and Performance. It could be noticed that there is a positive significant relationship between Evaluation and Performance, as the regression coefficient is 0.824 (β > 0) and P-value is 0.000 (P-value < 0.05). Moreover, the R-square is 0.530, which means that 53% of the variation of the Performance can be explained by the Evaluation.

Table 8: Regression test of Evaluation on Performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	R-square	P-value
		B	Std. Error	Beta				
1	(Constant)	.752	.333		2.256	.026	.530	.000
	Evaluation	.824	.071	.728	11.532	.000		

According to the above results, the fourth sub-hypothesis, which is "There is a positive significant relationship between Evaluation and Performance" is fully supported.

Testing the sub-hypotheses of the research hypothesis proved that the relationship between Training and Performance is fully supported. Table 9 shows a summary for the conducted analysis and the resulting response for the research hypotheses.

Table 9: Results Summary

Hypothesis	Description	Results
H1.1	There is a positive significant relationship between Formal Plan and Performance	Fully supported
H1.2	There is a positive significant relationship between Needs and Performance	Fully supported
H1.3	There is a positive significant relationship between Objectives and Performance	Fully supported
H1.4	There is a positive significant relationship between Evaluation and Performance	Fully supported

6. Conclusion, Recommendations and limitations

This study aims to examine the relation between training (Formal Plan, Needs, Objectives and Evaluation) and performance as previous researches had proved that most of accidents occurred due to the lack of training on Manual Ship Handling Performance. To achieve this aim, quantitative data was collected by making a questionnaire that targeted 120 seafarers. Statistical methods as correlation and regression are used, and results proved a positive significant relationship between training and performance. This research recommends for decision makers to offer the suitable training and courses to the seafarers. In addition, it recommends making periodic evaluation to seafarers in order to examine their ability and efficiency in handling ships manually, where evaluation was found to be the most important dimension of training with respect to performance. Additionally, this

Research has some limitations regarding the timing and the sample. Therefore, this study suggests for future studies to make their researches on a longer period of time and on a larger sample. In addition, the study suggests adding more variables to the current framework to measure the influence of different variables.

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Impact of sleeping disorder on seafarers job performance

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Abstract:

The high number of marine accidents due to wrongful actions by seafarers is one of the main challenges of maritime transport. Those seafarers work in an environment that is one of the most difficult work environments. Not to mention that they are working for long hours without getting enough sleep, which, in turn, is one of the reasons that lead to poor performance and human error. This study evaluates the effect of sleep disturbance among seafarers onboard ships on their job performance, and explores the sleep state among officers and engineers working onboard ships of various types as well as during the different periods they spend onboard ships using a questionnaire distributed via e-mail to (n = 151) Participants.

The data were analyzed using the Spearman correlation showed that there is a statistically significant relationship between sleep status, job performance and the time seafarers spend on board. Job performance was linked to the sleep state of seafarers that sleep disturbance negatively affects job performance of seafarers. Sleep is also affected by the time sailors spend on board and types of ships. From this result, the following model was deduced:

(y * = 1.059 * Sleep + 0.174 * Duration). Through this model, we can predict the difficulty of carrying out the work, given the sleep state and the period on board the ship. Shipowners and maritime organizations must be aware of the importance of sleep for seafarers to improve their work performance, and make an effort to improve the work environment and seafarers' well-being.

1- Introduction

The global economy and trade depend mainly on maritime transport as the latter contributes to the transport of intercontinental trade, and represents the transportation of raw materials, foodstuffs, and manufactured goods. More than 80% of the products are transported around the world and 70% of the global trade value is by ships of all types (Ismail, et al., 2021).

Goods are transported by 60,000 merchant ships around the world, (Deggim, 2021). Due to the importance of the maritime transport industry, international organizations have paid great attention to the problems facing seafarers, whose number is 1,647,500 seafarers, divided into 771,000 officers and engineers, and 873,500 in other jobs (Ismail, et al., 2021). Sleep deprivation is the main approach to highlight the importance of sleep in human performance.

This research documented the harmful effects of sleep disorder on seafarers' job performance. Cumulative sleep disorder has a negative effect on cognitive functions, mood and sleepiness during the day, and an effect on reaction time, learning tasks and memory. It also affects physical performance, heart and breathing performance, and psychomotor tasks that require accuracy and consistent performance (Mah, et al., 2011).

Many studies have generally indicated that longer periods of sleep improve functional performance. Conversely, sleeping for insufficient periods negatively affects performance. When sleeping for basketball players is prolonged, it can potentially be beneficial in reaching peak athletic performance (Mah, et al., 2011). Vice versa, the shorter the sleep period, the greater the cognitive performance deficit. The total sleep duration per 24 hours is the decisive factor for performance (Watson, et al., 2015).

Adults who get 6.75 to 7.5 hours of sleep and less than 6.75 hours are at risk of sleeping during the day compared to adults who get more than 7.5 hours of sleep (Banks et al., 2007). The risk of car accidents also increases when the driver gets less than 6 hours sleep, (Carter, et al., 2003). There is also a strong correlation between short sleep periods (generally less than 6 hours per night) and many diseases such as high blood pressure, cardiovascular disease, overweight and obesity (Knutson KL., 2010).

In addition, the psychological stress resulting from a sleep disorder may lead to impaired job performance (Russo, 2020). Regular and adequate sleep has an important role to maintain the human body and efficiently remove waste from the brain while insufficient sleep harms the functions of the immune system (Obradovich, et al., 2017). Insufficient sleep and prolonged awakening that is not synchronized with circadian rhythms result in a state of mental and physical weakness, which reduces the performance and duties of safety-related seafarers, (IMO, 2019). It also affects the quality and quantity of poor sleep and reduces the ability to respond quickly and think clearly. Sleep-deprived people are prone to making wrong decisions (Foley, 2021). Lack of sleep leads to poor memory and undermines the efficiency of carrying out various tasks (Barnes, et al., 2019). Human performance is affected in many professions due to sleep disturbances, so it is imperative to obtain organizational practices to provide good sleep for working individuals to alleviate performance degradation (Shattuck, et al., 2019).

Normal sleep

Sleep is defined as "the rest and recovery from the wear and tear of wakefulness" (Horne, 1988). Carskadon and Dement (2016) explained that it is a negative behavioral state to withdraw from reality and not respond to it. Sleep is a biological necessity for multicellular organisms and it is a vital necessity for life. According to the many theories that explain the causes of sleep, strong arguments have been made to prove this. Sleep is a way to maintain the consumption of calories, and a means to restore brain energy, and is also a reconciliatory factor for the deterioration of performance that accumulates with wakefulness. Sleep removes toxic by-products of wakefulness, and it also has a role in nerve communication (Shattuck, et al., 2019).

Upon disruption of this system, many of the human physiological functions will be affected by the change in the pattern and order of the hormones that affect the performance of the human being (Horne, 1988). Other studies have reported that it takes 12 days or more to fully acclimatize from day to night (Shattuck, et al., 2019). Sleeping needs vary widely between individuals, with healthy adult humans needing

an average of eight hours per night for full cognitive performance, (Anch, et al., 1988).
In another study, adults should sleep seven hours or more every night on a regular basis to obtain optimum health, and young people may sleep for a longer period (nine hours). Sleeping less than seven hours on a regular basis results in adverse health outcomes that may reach death. Not to mention immune-compromised, poor performance, increased errors, and the risk of accidents. As such, sleep is vital for anyone seeking to improve human performance (Watson et al., 2015).
As per Shattuck, et al., (2019) external and internal factors affect normal sleep patterns and can stop them. In this case, a defect occurs to one of the three requirements associated with normal sleep (duration, quality and timing).

International Regulation

According to International Maritime Organization (IMO) guidelines on fatigue, the human body must obtain the most effective sleep, and sleep is not effective unless it is characterized by the following characteristics. First: Quantity, for adequate and effective performance. It is recommended that a person gets seven to eight hours of sleep every 24 hours, so that the individual feels awake and refreshed. Secondly, Quality; the individual needs deep sleep in order to be able to regain activity. Third, continuity; the individual needs to obtain uninterrupted sleep to maintain its restorative value, and in the case of interrupted sleep, the individual feels tired and that often affects performance and decision-making, and the time spent in deep sleep decreases as he gets older (IMO, 2019).
Similarly, the International Labor Convention No. 180 regulated working hours for seafarers and manning ships, which entered into force in 2002. Working hours should not exceed 14 hours every 24 hours, and 72 hours every 7 days, and the rest hours are not divided into more than two periods. International Labour Organization (ILO) has also issued many other conventions (92, 133, 140, 141 and 147) to regulate the minimum requirements for crew accommodation. This corresponds to the limits of hours of work and hours of rest in the Maritime Labour Convention (MLC) 2006 and the revised Standard of Training, Certification and Watchkeeping (STCW) Code of 2010 (Jepsen, et al., 2017).
According to the International Safety Management (ISM) Code, the master and the company must intervene promptly to clearly clarify? fatigue, excessive working hours, or insufficient rest. The company is responsible for following up on the captains on board and managing the crew's working / rest hours so that they do not suffer from fatigue. It shall also ensure that the captain and crew are properly qualified, experienced, trained and knowledgeable, and that their number is sufficient to operate the vessel safely (Jepsen, et al., 2017).

Causes of seafarers sleeping disorder

Sleeping at inappropriate times, such as sleeping during the biological day, may lead to circadian misalignment or desynchrony, disruption of the circadian rhythm disturbs the sleep-wake cycle (Åkerstedt, 2003). Many factors cause the disturbance of normal sleep patterns; the fragmentation of sleep is one of the causes of sleep disturbance. Psychological and social factors resulting from work and family matters also lead to disturbance of normal sleep. Not to mentrion noise inside or outside the sleeping areas (noise is available in the marine work environment) or high or low temperatures do not meet the conditions necessary for optimal sleep, in addition to malnutrition (Shattuck, 2015).
Excessive intake of stimulants such as coffee and tea also affect normal sleep patterns. Caffeine prevents the brain from releasing the signal that stimulates sleep, thus fooling the body into thinking that it does not need rest. The body needs 6-8 hours to get rid of the effects of caffeine completely. Therefore it is not recommended to drink coffee in the afternoon, for you may be prevented from sleeping at night. Nicotine is considered a stimulant that keeps a person awake, and heavy smokers tend to wake up early because of their need for nicotine. Alcohol consumption prevents deep sleep, and individuals who drink alcohol wake up when the effects of alcohol wear off (U.S. Department of Health and Human Services, 2005).

Long work shifts (like seafarers) have a detrimental effect on the sleep-wake cycle as several studies have shown. This leads to a deterioration in performance (Arnedt, et al., 2005). In addition, Albertsen, et al., (2008) added shift work is also associated with high levels of physical fatigue, especially longer shifts (12 hours), and night shifts.

The causes of sleep problems for seafarers are relatively equal, which result from noise, and the system of work shifts onboard ships, especially for a period of 6 hours - a major problem for seafarers (Hansen, et al., 2011). However, Monk, (1986) clarified that behavioral patterns can be adapted to the surrounding environment as the circadian clock phase is not static, but this is not immediate, for in order to adapt, it needs at least a week to switch from a daily rhythm to a night rhythm.

Seafarers who work at night and sleep during the day suffer from a decrease in the level of alertness due to the natural tendency of the body to get sleep due to circadian rhythms. Sleeping during the day is not beneficial because the body tries to be awake during the day. Moreover, the body can adapt to this change, but it takes a few days. If a sudden change occurs in the duty schedule, it puts the body in a problem of incompatibility with circadian rhythms. Normal body rhythm repeats approximately every 24 hours; it is also called the internal body clock. The circadian rhythm affects many body functions such as body temperature, digestion, hormone levels, and most importantly, sleep behavior. In general, the functions of the human body organs work during the day and sleep at night. Most of the functions of the human body are at their maximum activity during the day and least activity during the night. All this affects seafarers' mental health due to the unstable working and sleeping times (Reddy, et al., 2020). Furthermore, many factors cause sleep disturbance and poor quality, like food, medication and substance use, as well as psychological factors, and operational factors. Some of them can be controlled and others cannot (IMO, 2019).

The effect of lack of sleep

The nature of work onboard ships often requires long periods of work, insufficient periods of rest and sleep. In the past twenty years, an increase in the workload of seafarers occurred as a result of the increase in the number of ships more than four times, and an increase in the workload took place as a result of reducing the number of ships crew members. The introduction of new regulations such as ISM and International Ship and Port Facility Security Code (ISPS) requirements, the increase in administrative work, and the frequent entry of ports to some types of ships caused a clear violation of the minimum hours of rest. Officers sleep in the ports for only about 4 to 4.5 hours, in addition to being responsible for preparing for the next voyage, and preparing the ship for some inspections (Simkuva, et al., 2016).

Sleep is closely connected to mental wellbeing. Deprivation of sleep affects mental and emotional status. Oftentimes, those with mental health conditions are sleep disorders or other sleep disorders. 50% to 80% of those who suffer from mental health problems have sleep problems. According to studies conducted on adults and children, lack of sleep may increase the risk of mental illness and may contribute significantly to its occurrence. If a sleep disorder is treated, this helps reduce mental health problems; therefore, deep sleep at night promotes mental and emotional flexibility, and prevents negative thinking and emotional weakness (Harvard Health Publishing, 2019).

Lack of sleep also directly affects self-energy and psychological performance. People who sleep less than 6 hours a day are exposed to a great risk of performance as in the case for seafarers who work 6 hours and 6 hours rest, or seafarers who work onboard ships that sail short distances, and whose crew cannot get enough time to rest (Campbell, 2017). Physical stress is positively related to one of the causes of stress and that adequate sleep partly helps relieve stress. Seafarers are one of the most stressed out professional groups, and their mental and physical health is affected by many factors such as workload, safety, social circumstances, salary, food, shore leave, nationality and culture, management, and inequality (Mcveigh, et al, 2019).

The relationship between stress and lack of sleep is not clearly visible on ships whose voyages are short, but the effect of lack of sleep appears clearly on seafarers who work for periods longer than 6 months onboard ships and become stressed out. Seafarers working on supply ships also experience fatigue due to lack of sleep (Hystad, et al., 2016).

work performance

There are three components of mental health and other disabilities. Persons who suffer from mental health issues face environmental, institutional, and post-treatment obstacles in obtaining or returning to employment and maintaining careers. Attitudinal barriers and social isolation are perhaps the most daunting hindrances to overcome (Harnois, 2000). Poor safety is a major concern in the maritime transport industry, which is strongly linked to job satisfaction as seafarers are among the most exposed occupational groups to stress, which, in turn, affects mental health. Mental health problems affect seafarers' functional performance, job satisfaction, and good performance of seafarers.

In addition, some other factors that lead to job dissatisfaction such as the quality of wages and getting them on time, good work environment and good dealings of the heads with the subordinates. Job satisfaction is an important factor in maritime organizations (McVeigh, et al, 2019). Job performance and job satisfaction are important matters in organizational behavior. When job satisfaction increases, mistakes decrease onboard ships. The successful completion of the individual's duties at work indicates job satisfaction and a good work environment (An, Ji, et al, 2020).

Method

This research study was designed to analyze the relationship between sleep and job performance onboard among seafarers (marine officers and engineers). A questionnaire was used to measure how difficult is it to do the work when they have trouble sleeping. The seafarers who participated in this study were officers and engineers of different ranks while they were on board ships for periods ranging from less than a month to more than three months.

An online survey based on the Google platform has been sent to formulate the survey questionnaire and shared with seafarers onboard via emails, Facebook and Whatsapp. This questionnaire consisted of statements about sleep status, the period of time spent on board before doing the survey, and the difficulty encountered by seafarers while working on board. The data collection period was five weeks.

SPSS_Statistics 25 was used to perform statistical analyses. The Spearman correlation was used to find the correlation between seafarers' sleep status and the difficulty of carrying out work onboard the ship, as well as the correlation with the period they spent on board the ship before participating in the survey. One of the most common statistical techniques that was used in the current research is the regression analysis. The notion of the regression analysis uses a regression model with some variables to examine to what extent the variables that are included in regression model (Gujarati & Porter, 2009) the researcher used PLUM - Ordinal Probit Regression showed that sleep status was significantly impact on difficulty working. Chi-square test was used to find the relationship between sleeping status and difficulty working, relationship between duration on board and difficulty working and relationship between duration on board and sleeping status.

Results

The sample consists of 151 seafarers (officers and engineers), working onboard various type of ships.

Table (1) Chi-Square Tests relationship between sleeping status and Difficulty working.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	54.821[a]	6	0.000
Likelihood Ratio	60.208	6	0.000
Linear-by-Linear Association	42.283	1	0.000
N of Valid Cases	151		

A chi-square test a showed significant relationship between sleeping status and

Difficulty working,
$\chi 2$ (6, N = 151) = 54.82, p < .001, as shown in Table (1).

Table (2) shows sleep disorder among the seafarers participating in the survey, and shows that (71.5%) have difficulty sleeping, and (61.1%) of the participants suffer from Extremely difficulty in performing their duties, percentage (95.7%). While the percentage of (23.1%) their performance at work is very difficult percentage (71.4%). On the other hand, the seafarers who sleep regularly, representing (26.5%) of the participants, do not find it difficult to perform their duties except in some cases, at a percentage (57.1%).

Table (2): Relationship between Sleeping status and Difficulty working

			Difficulty working				Total
			Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult	
Sleeping status	Sleep more than usual	Count	0	1	1	1	3
		% within sleeping status	0.0%	33.3%	33.3%	33.3%	100.0%
		% within Difficulty working	0.0%	2.4%	2.9%	1.4%	2.0%
	Sleep regularly	Count	5	24	9	2	40
		% within sleeping status	12.5%	60.0%	22.5%	5.0%	100.0%
		% within Difficulty working	100.0%	57.1%	25.7%	2.9%	26.5%
	Having difficulty sleeping	Count	0	17	25	66	108
		% within sleeping status	0.0%	15.7%	23.1%	61.1%	100.0%
		% within Difficulty working	0.0%	40.5%	71.4%	95.7%	71.5%
Total		Count	5	42	35	69	151
		% within sleeping status	3.3%	27.8%	23.2%	45.7%	100.0%
		% within Difficulty working	100.0%	100.0%	100.0%	100.0%	100.0%

Table (3) Chi-square test relationship between Duration on board and Difficulty working.

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	41.063a	12	0.000
Likelihood Ratio	42.939	12	0.000
Linear-by-Linear Association	25.056	1	0.000
N of Valid Cases	151		

As Table (3), chi-square test showed significant relationship between Duration on board and Difficulty working,
$\chi 2$ (12, N = 151) = 41.06, p < .001

Table (4) Relationship between Duration on board and Difficulty working

			Difficulty working				Total
			Not difficult at all	Somewhat difficult	Very difficult	Extremely difficult	
Duration on board	less than a month	Count	1	8	4	1	14
		% within Duration on board	7.1%	57.1%	28.6%	7.1%	100.0%
		% within Difficulty working	20.0%	19.0%	11.4%	1.4%	9.3%
	A Month	Count	2	10	1	1	14
		% within Duration on board	14.3%	71.4%	7.1%	7.1%	100.0%
		% within Difficulty working	40.0%	23.8%	2.9%	1.4%	9.3%
	Two months	Count	0	7	8	12	27
		% within Duration on board	0.0%	25.9%	29.6%	44.4%	100.0%
		% within Difficulty working	0.0%	16.7%	22.9%	17.4%	17.9%
	Three months	Count	0	9	12	23	44
		% within Duration on board	0.0%	20.5%	27.3%	52.3%	100.0%
		% within Difficulty working	0.0%	21.4%	34.3%	33.3%	29.1%
	More than that	Count	2	8	10	32	52
		% within Duration on board	3.8%	15.4%	19.2%	61.5%	100.0%
		% within Difficulty working	40.0%	19.0%	28.6%	46.4%	34.4%
Total		Count	5	42	35	69	151
		% within Duration on board	3.3%	27.8%	23.2%	45.7%	100.0%
		% within Difficulty working	100.0%	100.0%	100.0%	100.0%	100.0%

Table (4) shows the clear relationship between the time seafarers spend onboard and the performance at work. As the duration on board increases, it becomes more difficult to satisfactorily perform duties. When the duration is more than three months, (46.4%) of the participants face extreme difficulty in performing their tasks. The percentage decreases to (33.3%) when the period is only three months, and becomes (1.4%) when the period is less than a month.

Table (5) The Spearman's rho correlation coefficient for sleeping status with Difficulty working and Duration on board

			sleeping status	Difficulty working
Spearman's rho	sleeping status	Correlation Coefficient		
		Sig. (2-tailed)		
	Difficulty working	Correlation Coefficient	.562**	
		Sig. (2-tailed)	0.000	
	Duration on board	Correlation Coefficient	.463**	.376**
		Sig. (2-tailed)	0.000	0.000

Table (5) shows The Spearman's rho correlation coefficient for (sleeping status and Difficulty working), (sleeping status and Duration on board) and (Difficulty working and Duration on board) shows astatistically significant but moderate positive relationship between the two variables, $r(151) = 0.562$, $p < .001$, two-tailed, 0.463, $p < .001$, two-tailed and 0. 376, $p < .001$, two-tailed .

Table (6) also shows a relationship between the type of ship and the state of sleep, a percentage (37.0%) of those who have difficulty sleeping work on board supply ships, which is considered the most common ship where sailors suffer from sleep disturbance on board. Then followed by container ships with a percentage (20.4%).

Table (6) Relationship between the type of ship and the state of sleep

			sleeping status			Total
			Sleep more than usual	Sleep regularly	Having difficulty sleeping	
Type of vessel	Passenger	Count	0	0	4	4
		% within Type of vessel	0.0%	0.0%	100.0%	100.0%
		% within sleeping status	0.0%	0.0%	3.7%	2.6%
	Bulk	Count	1	9	14	24
		% within Type of vessel	4.2%	37.5%	58.3%	100.0%
		% within sleeping status	33.3%	22.5%	13.0%	15.9%
	Tanker	Count	1	4	14	19
		% within Type of vessel	5.3%	21.1%	73.7%	100.0%
		% within sleeping status	33.3%	10.0%	13.0%	12.6%
	Ro-Ro	Count	0	7	2	9
		% within Type of vessel	0.0%	77.8%	22.2%	100.0%
		% within sleeping status	0.0%	17.5%	1.9%	6.0%
	General Cargo	Count	0	4	9	13
		% within Type of vessel	0.0%	30.8%	69.2%	100.0%
		% within sleeping status	0.0%	10.0%	8.3%	8.6%
	Supply Vessels	Count	1	5	40	46
		% within Type of vessel	2.2%	10.9%	87.0%	100.0%
		% within sleeping status	33.3%	12.5%	37.0%	30.5%
	Other	Count	0	2	3	5
		% within Type of vessel	0.0%	40.0%	60.0%	100.0%
		% within sleeping status	0.0%	5.0%	2.8%	3.3%
	Container	Count	0	9	22	31
		% within Type of vessel	0.0%	29.0%	71.0%	100.0%
		% within sleeping status	0.0%	22.5%	20.4%	20.5%
Total		Count	3	40	108	151
		% within Type of vessel	2.0%	26.5%	71.5%	100.0%
		% within sleeping status	100.0%	100.0%	100.0%	100.0%

Regression: Results of the PLUM - Ordinal Probit Regression showed that sleep status was significantly associated with Difficulty working, Location=1.095, Wald (151) =22.60 , $p < .001$. and duration onboard Location = 0.174, Wald (151) =4.254 , sleep status also explained a significant proportion of variance in Difficulty working, Pseudo R-Square (Nagelkerke) = 20.30, Model Fitting Chi-Square(1, 151) = 48.83 ,$p < .001$. as table (7) showed.

Table (7) Association of sleep status with Difficulty working

		Estimate	Std. Error	Wald	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Threshold	[work = 1]	1.040	0.507	4.202	0.040	0.046	2.035
	[work = 2]	2.744	0.545	25.377	0.000	1.677	3.812
	[work = 3]	3.500	0.563	38.618	0.000	2.396	4.604
Location	sleep	1.059	0.223	22.608	0.000	0.623	1.496
	Duration	0.174	0.084	4.254	0.039	0.009	0.340

(y* = 1.059 * Sleep + 0.174 * Duration,
Where y* = Difficulty of working)

The estimation of the threshold parameters (m) and the regression coefficients (b) are done by means of iterative numerical methods. Therefore, the ordered probit regression method enables the estimation of probabilities for Difficulty of working. The effect of the sleeping disorder and Duration on board on Difficulty working can therefore be directly inferred.

Discussion

The purpose of this study was to explore the relationship between sleep behaviour and job performance among seafarers onboard various type of ships. The main finding was that most participants showed difficulty sleeping. This led to difficulties in carrying out tasks at work, and greatly affected job performance, regardless of whether their different ship type and duration onboard. Previous studies have reported the impact of insufficient sleeping and facing

difficulties in sleeping. It negatively affects job performance (Watson, et al., (2015); Russo, (2020); Obradovich, et al., (2017); Barnes, et al., (2019); & Shattuck, et al., (2019)). The findings of the current study support and confirms earlier findings. It also tested the relationship between sleep status and the time spent by seafarers on board the ship, and found it to be positive. This result supports the study conducted by (Hystad, et al., 2016).

Conclusion

This study aimed to objectively assess the impact of sleep status on the job performance of seafarers while aboard ships. The results revealed the effect of sleep disorder and poor sleep quality on their performance while at work and the difficulty that ensues while carrying out their work. The results also showed that there is a positive relationship between the sleep state and the time spent by seafarers on board the ship. In addition to the influence of the type of ship and the nature of its operation as a supply vessel on the state of sleep,that it has a negative impact on the sleep state. From this previous result, this model was deduced: (y* = 1.059 * Sleep + 0.174 * Duration). Through this model, we can predict the difficulty of carrying out the work, given the sleep state and the period onboard the ship. The findings suggest that there is an urgent need to improve the marine work environment to provide adequate deep, and quality sleep among seafarers, to reduce the negative impact on the seafarer job performance. This information could be helpful for determining priorities in the development of worksite health promotion programs for those who spend long periods on board.

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