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Journal of The Arab Institute of Navigation

Semi Annual Scientific Journal
Volume 37– July 2018
ISSN (2090-8202)

Contents

The History of GPS

GPS, originally designed for military and intelligence applications at the height of the Cold War in the 1960s, with inspiration coming from the launch of the Soviet spacecraft Sputnik in 1957, the Global Positioning System (GPS) - is a network of satellites that orbit the earth at fixed points above the planet and beam down signals to anyone on the earth with a GPS receiver. These signals carry a time code and geographical data point that allows the users to pinpoint their exact position, speed and time anywhere on the planet.

Transit was the first satellite system launched by the USA and tested by the US Navy in 1960. Just five satellites orbiting the earth allowed ships to fix their position on the seas once every hour. In 1967 Transit was succeeded by the Timation satellite, which demonstrated that highly accurate atomic clocks could be operated in space. GPS developed quickly for military purposes thereafter with a total of 11 "Block" satellites being launched between 1978 and 1985.

However, it wasn't until the USSR shot down a Korean passenger jet - flight 007 - in 1983 that the Reagan Administration in the US had the incentive to open up GPS for civilian applications so that aircraft, shipping, and transport the world over could fix their positions and avoid straying into restricted foreign territory.

Upgrading the GPS was delayed by NASA space shuttle SS Challenger disaster in 1986 and it was not until 1989 that the first Block II satellites were launched. By the summer of 1993, the US launched their 24th Navistar satellite into orbit, which completed the modern GPS constellation of satellites - a network of 24 - familiar now as the Global Positioning System, or GPS. 21 of the constellation of satellites were active at any one time; the other 3 satellites were spares; in 1995 it was declared fully operational.

The current GPS network has around 30 active satellites in the GPS constellation, Today GPS is used for many of navigation applications, route finding for drivers, map-making, earthquake research, climate studies, and an outdoor treasure-hunting game and many other social application known as geocaching.

A Review of Risk of Marine Pollution and Methods of Environmental Protection: Case Study of the Gulf of Suez Canal

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Abstract

This paper aims to investigate the oil pollution as the main reason of pollution in the Gulf of Suez Canal region. It also investigates the maritime traffic in transferring oil containers and tanks through the study area. In addition, new developed methods and systems for oil pollution monitoring will be developed accordingly. Finally, the current paper recommends effective and sustainable management of coastal and marine environment from local to international and global scale to ensure a sustained and best possible utilization of the resources for broader interest of mankind.

المستخلص:

تهدف هذه الورقة إلى التحقيق في التلوث النفطي باعتباره السبب الرئيسي للتلوث في منطقة خليج السويس. كما تقوم بالتحقيق في حركة الملاحة البحرية في نقل حاويات النفط والدبابات من خلال منطقة الدراسة. وبالإضافة إلى ذلك، سيتم تطوير أساليب وأنظمة جديدة لرصد التلوث النفطي وفقا لذلك. وأخيرا، توصي الورقة الحالية بالإدارة الفعالة والمستدامة للبيئة الساحلية والبحرية من المستوى المحلي إلى المستوى الدولي والعالمي لضمان الاستخدام المستدام والأفضل على نحو أفضل للموارد من أجل تحقيق مصلحة أوسع للبشرية.

1. Introduction

The marine environment has been affected by growing population and industrial pressures in the coastal zone. Activities such as dumping of waste, construction of harbors, dredging, and extraction processes all contribute to changes in environmental quality of the coastal zone. To assess the impacts of these activities and instigate appropriate remedial actions where needed, it is necessary to monitor a wide range of properties of the marine environment (Mills & Fones, 2012). The coast is a zone or strip of land extending from the coastline, which borders the sea to where the land rises inland. Its limit is marked by the level of high tide. The coastline is the triple interface of air, land and sea.

Pollution of such region becomes an important issue in the last decades as it has several implications on human being either directly or indirectly. Thus, it becomes important to discuss the main factors causing risk of pollution, as well as the methods and procedures to avoid such pollution and achieve environmental protection (Li, et al., 2017).

The definition of coastal pollution by the World Health Organization goes like this "*The introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects such as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and*

other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities." (Li, et al., 2017).

Pollution in marine coastal areas is also considered from point and non-point land-based sources, such as rivers, drainage ditches, submarine outfalls and coastal cities. The portion of pollutants in coastal regions is determined by the combination of three mechanisms: (a) Advection by currents, (b) Turbulent diffusion and (c) Chemical, biological or other interactions (Li, et al., 2017).

Williams (1996) criticized the division of pollution into categories (e.g., air, water, land) and commented that there is only one pollution' because every pollutant, whether in the air, or on land tends to end up in the ocean. Production and emissions of pollutants are usually derived from human settlements, resource uses and interventions, such as infrastructural development and construction, agricultural activities, industrial developments, urbanization, tourism etc. Contaminants of major concerns include persistent organic pollutants, nutrients, oils, radionuclides, heavy metals, pathogens, sediments, litters and debris etc. (Williams, 1996).

It was believed that the industrially developed nations produce most of the pollution loads in coastal and marine environments. However, the industrially developed countries are those which are usually characterized by most waste treatment and safest disposal facilities and also by environmental management systems (Boudouresque & Verlaque, 2002). Therefore, these countries are less likely to produce critical pollution loads. On the other hand, recent trends suggest that the least developed and the developing nations are more likely to produce threshold levels of environmental pollution due to their poor capacity to treat or recycle waste, poor legislation and regulation and poor management and protective measures. This issue is very important because least developed and developing nations comprise the major part of the world. Unfortunately, neither the issues of the developing nations have been considered critically nor they have effective representation in global environmental protection and management programs (Islam & Tanaka, 2004).

In general, most of the coastal areas of the world have been reported to be damaged from pollution, significantly affecting commercial coastal and marine fisheries. Therefore, control of aquatic pollution has been identified as an immediate need for sustained management and conservation of the existing fisheries and aquatic resources. Unfortunately, the pollution problem, as described by Williams (1996), is characterized by interconnectedness, complicated interactions, uncertainty, conflicts and constraints, making it difficult to control the problem (Islam & Tanaka, 2004). Moreover, because scientific knowledge on marine pollution is patchy, knowledge gaps have been identified as one of the major problems in introducing effective management strategies for its control.

Considering Egypt as a developing country, a wider gap is found in the Gulf of Suez Canal region as one of the important marine environments. Thus, this paper aims at reviewing the literature for oil pollution in marine environment, specifically the Gulf of Suez Canal, as well as discussing proposed solutions for marine environment management. The paper will focus on oil pollution as it is the main reason of pollution in the study area and the country is known by its maritime traffic in transferring oil containers and tanks. The paper is

divided into several sections, where next section is discussing the oil pollution in marine environment, while the third section will focus on oil pollution in the Gulf of Suez Canal area. The fourth section will introduce new developed methods and systems for oil pollution monitoring. Finally, the fifth section will present a conclusion for the points the researcher considered in the current paper.

2. Oil Pollution in Marine Environment

Oil spill hazard is defined as an incident, which occurs in a sudden manner, and is complex in its nature. It causes loss of animal lives, damage to property or natural environment and has a serious effect on local activities. Such an incident needs a management that involves extensive resources, equipment, skills and man power from many agencies with an efficient coordination that demand complex action and would take a long time. Large parts of coastal areas are exposed to such hazards, which may cause significant disruption to socio-economies and life of communities in coastal area and thereby lead to loss of properties and environmental damage (Assilzadeh & Gao, 2010). Oil is the fastest source of deterioration to the ocean, being far more harmful than trash and waste. Oil spills suffocate marine life to death, and leads to behavioral changes and a breakdown in thermal insulation to those that do survive. It essentially changes the entire ecosystem of an affected area, such as a long coastline or deep ocean (Li, et al., 2017).

The principal cause of marine pollution with oil is shipping. Traditionally shipping is considered to be “a polluting industry” (De Gennaro, 2004). Ocean is polluted by oil on a daily basis from oil spills, routine shipping, runoffs and dumping. Oil spills make up about 12% of the oil that enters the ocean. The rest comes from shipping travel, drains and dumping. An oil spill from a tanker is a severe problem because there is such a huge quantity of oil being spilt into one place. Oil spills causes a much-localized problem but can be disastrous to local marine wildlife such as fish, birds and sea others. Oil cannot dissolve in water and forms a thick sludge in the water (Li, et al., 2017).

Just an instance, On March 24, 1989, the Tanker Vessel Exxon Valdez ran aground 25 miles out of Valdez, Alaska. The impact tore open eight of the ship’s eleven cargo tanks, spewing out 10.8 million gallons of oil into Prince William Sound. Oil impacted hundreds of miles of pristine shoreline, inundating national forest and national park wilderness parcels. The spill wreaked havoc among sensitive coastal ecosystems, killing tens-of-thousands of waterfowl and other wildlife. The affected shoreline also contained significant archeological treasures (Li, et al., 2017).

Coastal refineries are defined as obvious risks of continuous oil pollution after Tanker accidents. This is because millions of gallons of crude oil and its fractions are processed and stored there. Crude oil is purified and processed in refineries to produce a variety of fuels, lubricants and solvents. During these operations, continuous small-scale pollution occurs through leakages, spills, breakages etc. Water is used in many processes and inevitably become contaminated with oil and derivatives and when discharged, carries appreciable oil loads (Islam & Tanaka, 2004). In a report published in 2002 by the U.S. National Academy of Sciences, the average total

worldwide annual release of petroleum (oils) from all known sources to the sea has been estimated at 1.3 million tons.

According to the report, the main categories of oil pollution sources contribute to the total input as shown in Figure 1.

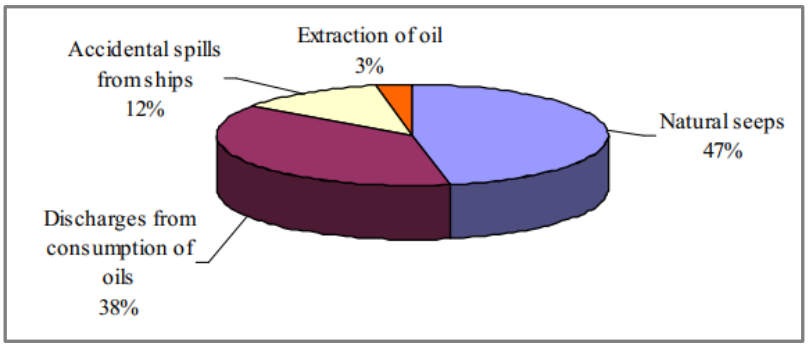

Figure 1 Contribution Sources of Oil Pollution in World
Source Anyanova, 2012

International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL)10 was adopted in London on 12 May 1954. This convention became the first international treaty dealing with the oil pollution. It addressed the discharge of oil and wastes into the water. OILPOL`54 prohibited the intentional discharge of oil and mixtures from certain vessels in specified ocean areas. The ballast discharges have to be made in the permitted areas with a special record in an oil record book. This book shall be inspected at regular intervals. The enforcement of the convention had to be fulfilled by the flag state. The Convention became a significant achievement at that time. In the preamble of the later adopted MARPOL convention it is stressed that OILPOL was the first multilateral instrument to be concluded with the prime objective of protecting the environment (Anyanova, 2012).

Several international conventions had been constructed to face the challenges proposed by the oil pollution in marine environment. Such conventions are like International convention on the prevention of marine pollution by the dumping of wastes or other matter (London Convention), 1972; the International Convention for the prevention of pollution from ships (MARPOL), 1973/1978; Convention for the prevention of marine pollution from land-based sources23 done at Paris on 4 June 1974 in Art; International Convention Relating to the Limitation of the Liability of Owners of Sea-going Ships, 1957 and several other ones (Anyanova, 2012). Despite this number of actions taken to face the problem, oil pollution is still representing a great challenge in marine environment with the increasing maritime traffic. The problem is much more complicated in the developing countries where such regulations are not well monitored internally. The problem happens when laws and regulations are not applied internally within the country just like out board applications. The following section will try to investigate the problem in the

Gulf of Suez Canal, as one of the about 90 % of the coral reef fish are

developing regions which is monitored internally and not through the international regulations and conventions.

3. Oil Pollution in the Gulf of Suez Canal as One of the Main Marine Environment

The study area is part of a major transport route, due to the Gulf of Suez Canal, and is also a key location for petroleum and natural gas production including coastal oil platforms, offshore platforms and underwater pipelines. It contains unique environmental ecosystems and biodiversity in addition to the attraction factors for tourism activities and rich fishing areas. The coastal areas are fringed with extensive coral reef systems which are developed mainly from the low freshwater run-off from land. The corals have great diversity with about 6 % of the species are only found in this area and unique to the area. The tourism activities in the region, which are mainly based on marine sports and recreation, utilize a big number of employee and different types of cruising ships (Abdel-Hameed, 2016).

According to the Egyptian Naval Hydrography department, the average annual

atmospheric temperature is about 24°C which increases in summer and the average annual relative humidity is about 50%. Winds blow mainly from the NNW direction throughout the year. The temperature is considered one of the main factors affecting the weathering of oil at sea. High temperature / kind of oil spilled / wave direction increases the rate of spreading of the oil on water and increases its viscosity (Abdel-Hameed, 2016).

Figure 2 Study Area Map
Source Abdel-Hameed, 2016

One of the main sources of marine pollution in the Gulf of Suez is from ship-based sources. Transport of oil continues to play a critical role in marine pollution in the northern Gulf of Suez. This transport traffic results in chronic marine pollution from discharges of ballast water and tank washings by vessels, operational spills from vessels loading or unloading at port, accidental spills from foundered vessels, and leaks from vessels in transit in the Suez Bay.

Other forms of ship-generated waste continues to play a critical role in marine

include sludge, bilge water, garbage and marine debris. The harbors in the region have always been an important Egyptian gate on the Red Sea since historical times. Various activities in harbors have led to an increasing rate of urbanization in the whole region. Taking advantage of the site location, several industries have been established all of them along the western coastal stretch of the Suez Bay down to El-Adabiya in the south (Dewina & Yamauchi, 2009).

Extensive oil production operations are taking place in the Gulf of Suez, both inshore

and offshore. About 60% of the total Egyptian oil production occurs in this area. The spills from oil rigs, ships, seabed pipes and other related facilities have severely affected the inter-tidal zone in the central and southern parts of the Gulf of Suez. It has been found that many rocky shores and beaches are blanketed with tar and oil. Drilling operations lead to the discharge of drill mud and rock cuttings during operations results in high turbidity of water probably extending for a few kilometers. The sediment generating from drilling operations causes the death of some corals (Agwa, et al., 2012).

In 2013, around 79 million tons of crude oil per year is shipped through the SUMED

pipeline from Gulf of Suez to Sidi Kerir on the Mediterranean Sea to European countries. In addition, about 159 million tons of crude oil and oil products passed through the Suez Canal in the same year (EIA, 2014). One of the main sources of marine pollution in the Gulf of Suez is from ship-based sources. Transport of oil pollution in the northern Gulf of Suez. This transport traffic results in chronic marine pollution from discharges of ballast water and tank washings by vessels, operational spills from vessels loading or unloading at port, accidental spills from vessels, and leaks from vessels in the Suez Bay. Other forms of ship-generated wastes include sludge, bilge water; garbage and marine debris are also present (Abdel-Hameed, 2016).

The harbors located in the area have been considered an important Egyptian gate on the Red Sea since historical times leading to an increasing rate of urbanization in the whole region. Taking advantage of the site location, several industries have been established along the western coastal stretch of the Suez Bay down to El-Adabiya in the south. The Gulf of Suez accommodates about 10 % of the annual international shipping (Abdel-Hameed, 2016).

The occurrence of oil spills resulting from sustained oil transport traffic is the most recognized potential environmental threat. The risks of oil spill are rated high on about 30 km of the Egyptian coast line from the North of the Strait of Tiran southward which mainly result from the risks of navigation through the strait of Tiran. From 1961 to 1996, 14 incidents have been recorded between Tiran and Nabq, of which 4 produced an oil spill, most notably, the Lania incident in 1987 which resulted in a bunker oil spill of over 700 tons and the Million Hope incident in 1996 which produced a large spill of an unrecorded volume (Dewina & Yamauchi, 2009).

a) The KRITI SEA Incident

In 1996, the KIRITI SEA spilt approximately 50 tons of crude oil in

Suez Canal. Although dispersant was applied and containment and recovery equipment were deployed, the oil entered shores of the Great Bitter Lake and manual shoreline clean-up was done (Dewina & Yamauchi, 2009).

b) ALAGAMY Tanker Collision Incident

In 2003, the ALAGAMY Tanker collided with the SALAM No. 3 in the Gulf of Suez about 58 km from Suez City, resulting into the oil spill of 8 to 20 tons to the sea. The remaining loaded oil was transferred to the other tanker. Red Sea Port Authority responded to this incident and dispersants were used. Many resort areas and beaches were affected by drifting oil slicks which were removed manually from shores (Dewina & Yamauchi, 2009).

c) The AL SAMIDOON Incident

In 2004, the AL SAMIDOON incident occurred due to grounding in the Suez Canal. Approximately 9,000 tons of Kuwait Medium Crude was spilled. The response was handled entirely by the Suez Canal Authority, initially by the application of dispersants. Efforts were made to recover oil using booms and skimmers. The slicks migrated to the north where they appeared in the Mediterranean Sea as sheens and tar-balls (Dewina & Yamauchi, 2009).

A number of studies emphasized on the hazards present in the study area, so it was clarified the increase in traffic density and oil production in the area of the Gulf of Suez Canal and recommended daily surveillance of Egyptian waters at short time intervals in order to detect any oil spill as soon as it occurs and help to identify the ship responsible for this spill (Abou El-Geit, et al., 2013). Feng et al. (2014) showed the presence of gaps in the baseline studies of different oil spills. It shows that baseline assessments of natural resources and socioeconomic resources in the region are important for developing environmental and economic impact studies and recovery plans and would also facilitate accurate monitoring of a spill.

Gay et al. (2012) deduced that combined use of collected data by different oil spill detection techniques and numerical models aims to optimize response in case of marine oil spill. Radović et al. (2012) emphasized that oil spill surveillance constitutes an important component of oil spill management as it gives near real time sea monitoring and this early detection is important for oil spill response and contingency planning.

4. Oil Pollution Detection Worldwide

The rapid detection of oil pollution in sea water is an essential part of oil pollution prevention and important for minimizing environmental and financial impacts. Thus, a technique is developed based on electrical conductivity to measure oil layer thickness in sea and it monitors sea water pollution continuously and send an alarm if the oil level exceeds a certain limit. This is important for the development of advanced practices for early oil spill detection (Abdul-Wahab, 2006).

Detection of oil pollution is among the most important goals of monitoring of a coastal zone. Public interest in the problem of oil pollution arises mainly during dramatic tanker catastrophes such as “The Sea Empress” (Sant, 1996), “Erica” (France, 1999) and “Prestige”

(Derrik, 2002). However, tanker catastrophes are only one among many causes of oil pollution. Oil and oil product spillages at sea take place all the time, and it would be a delusion to consider tanker accidents the main environmental danger. According to the International Tanker Owners Pollution Federation (ITOPF), over the period of 1974-2002, spillages resulting from collisions, groundings, tanker holes and fires amounted to 52% of total leakages during tanker loading/unloading and bunkering operations (Olga, et al., 2006).

Currently, most of the contingency plans and procedures for oil spill management and relief are systematically based on a computer interface. There is a spectrum of a computer-based oil spill management system (Beegle-Krause, et al., 2007), which reflects the fact that heterogeneous groups need different systems for diverse purposes of an emergency response. Despite this fact, there is no comprehensive computer-based solution in existence for oil spill contingency to cover all aspects of emergency response procedures. All available oil spill management systems are distinctive with different functionalities based on various user perspectives on oil spill contingency planning. An efficient contingency system for oil spill should have access to five main robust components, including database, early warning system, disaster modules, command and control and communication systems (Assilzadeh & Gao, 2010).

A satellite monitoring Italian system was introduced, where one of the main tasks in the ecological monitoring of the Baltic Sea is an operational satellite and aerial detection of oil spillages, determination of their characteristics, establishment of the pollution sources and forecast of probable trajectories of the oil spill transport. Oil pollution monitoring in the Mediterranean, North and Baltic Seas is normally carried out by aircrafts or ships. This is expensive and is constrained by the limited availability of these resources. Aerial surveys over large areas of the seas to check for the presence of oil are limited to the daylight hours in good weather conditions. Satellite imagery can help greatly identifying probable spills over very large areas and then guiding aerial surveys for precise observation of specific locations. The Synthetic Aperture Radar (SAR) instrument, which can collect data independently of weather and light conditions, is an excellent tool to monitor and detect oil on water surfaces (Olga, et al., 2006).

Another system had been designed to evaluate the capability of oil spill disaster players and management personnel through a core administration system at disaster management center and through provision of early warning, detection and monitoring, and mitigation functionality in the event of any oil spill events in coastal areas. The disaster data modeling and analysis will be carried on using available models immediately after a disaster has happened. One of the advantages of this system related to other existing systems is its command and control module for the oil spill disaster management and emergency response. Another advantage of the system is the mutual communication system through the

internet portal. Real time situational data from fields or disaster players can be sent to the administration office for evaluation, updating thematic products and making decisions (Assilzadeh & Gao, 2010).

The above-mentioned systems are examples of the monitoring systems of oil pollution in the marine environment. Such systems are considered as excellent systems of monitoring but they have high cost for the internal ships to use as integrated with their own systems. To solve the internal problems, JICA signed a memorandum of understanding for cooperation with the Regional Organization for the Protection of the Marine Environment (ROPME). JICA and ROPME are supposed to cooperate in the preservation of the marine environment in the Persian Gulf, including the marine ecosystem, biodiversity, preventing pollution caused by economic activities, and preserving water quality. JICA is supporting Egypt and Morocco in providing South-South cooperation to Sub-Saharan African countries in order to effectively utilize the human resources formerly trained by Japanese technical cooperation. Based on the memorandum signed with the Moroccan Agency for International Cooperation (AMCI), JICA is implementing support for capacity development of the agency by dispatching a JICA expert (Dewina & Yamauchi, 2009).

Yet, there is a problem in the Gulf of Suez Canal that it is not receiving that much concern relative to its location importance. Also, it could be claimed that environmental pollution cannot be limited by national territorial boundaries. However, effective environmental management on an international scale was considered rarely. Policy responses included bans on production and use of some substances, regulations to reduce discharges, and the prohibition of ocean dumping, as well as a significant scientific effort to improve the status of knowledge about these pollutants (Islam & Tanaka, 2004).

5. Conclusion

The current research is meant to emphasize the important of integrating a continuous monitoring program in the contingency plan of the area to mitigate the possible impacts of oil spill occurring in it. The study area is considered to be one of the hot spots of oil pollution in the Middle East region due to the highly unstable meteorology of the area with high incidence of gales, high traffic load passing through it and the fringing reefs along its coastline with the presence of numerous islands and offshore oil platforms nearby making the waters difficult to navigate. These characteristics make the study area in great need for a monitoring program including baseline monitoring, pre-spill monitoring and post-monitoring.

The problems of aquatic pollution are likely to exacerbate and pose significant ecological risk/public health risk in the coming years, especially in developing countries. Coastal and marine pollution has already caused major changes in the structure and function of phytoplankton, zooplankton, benthic and fish communities over large areas including impacts on public health. Effective and sustainable management of coastal and

marine environment should be initiated from local to international and global scale to ensure a sustained and best possible utilization of the resources for broader interest of mankind (Islam & Tanaka, 2004).

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Knowledge Sharing in Maritime Education and Training

The Case of ECDIS Training Courses

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1 Abstract

This research aims to develop the role of knowledge sharing in the training provided by Maritime Transport Department of Arab Academy for Science, Technology and Maritime Transport. Using a comparative analysis between ECDIS generic and type-specific training, knowledge sharing antecedents; organization support, organization culture and time are tested and their impact on knowledge sharing is determined. A questionnaire is used to collect data regarding the sample studied and a number of 35 respondents from each course responded to the questionnaire. Results showed a shortage in the time provided to the ECDIS generic training course which shortens the chance for knowledge sharing, while the case was positive for the ECDIS type-specific training. Thus, practical implications include a need to amend the IMO circular "STCW.7/CIRC.24" in February 2017 that stated that seafarers are not required to provide documentation of training.

Keywords: Maritime - Maritime Education and Training - ECDIS training - Knowledge Sharing - Knowledge Sharing Antecedents.

المستخلص

يهدف هذا البحث إلى تطوير دور تبادل المعرفة في التدريب الذي يوفره قطاع النقل البحري في الأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري. وذلك عن طريق إجراء تحليل يقارن بين التدريب "العام" والتدريب "النوعي" لجهاز الخرائط الالكترونية ECDIS. حيث تم إختبار ثلاث عناصر أساسية وهم، الدعم التنظيمي - الثقافة التنظيمية - الوقت، وتحديد آثارهم على تقاسم المعرفة. تم استخدام إستبيان لجمع البيانات المتعلقة بالعينة المدروسة واستجاب عدد ٣٥ مشاركاً فى كل عناصر الإستبيان. وأظهرت النتائج وجود نقص في الوقت المتاح للتدريب "العام" علي جهاز الخرائط الاكترونية، مما يحد من فرصة تبادل المعرفة. في حين كانت الحالة إيجابية بالنسبة للتدريب "النوعي". ومن ثم فإن الآثار العملية تشمل ضرورة تعديل تعميم المنظمة البحرية الدولية"STCW.7 / CIRC.24" في فبراير ٢٠١٧ الذي ينص على أن البحارة غير مطالبين بتقديم وثائق التدريب النوعي لجهاز الخرائط الإلكترونية.

2 Introduction

An important factor in the successful collaborative learning is the active and voluntarily sharing of information among students. Such knowledge exchanges help students answer questions, solve problems, learn new things, increase understanding regarding a particular subject, or merely acts as a means to help one another. These exchanges could be in the form of explicit knowledge, which can be captured and documented, and the

tacit knowledge in the form of skills and competencies. Unlike information which is usually context-independent, tacit knowledge is personal and can only be shared through socialization, interaction, and training which often requires face-to-face communication, or in most cases, transferred through observation, imitation, practice, and interaction with the environment (McQueen and Janson, 2016).

Knowledge sharing is defined as the act of knowledge provider making knowledge available to others within the organization. It was stated that knowledge sharing is not a two-way knowledge exchange between knowledge providers and knowledge recipients and knowledge sharing is limited only to the behavior of knowledge providers (Zhang and Jiang, 2015).

One of the important courses in the maritime training domain is the ones conducted on Electronic Chart Display Information System (ECDIS), as it is one of the recent tools for e-navigation and act as a replacement of conventional paper charts. ECDIS could be used as primary or aid to navigation, as demonstrated by IMO resolution MSC.252 (83) and SOLAS convention, chapter 5, regulation 19.

An ECDIS allows the integration of other operational data, such as ship's course, speed, depth soundings, automatic identification systems (AIS) information, and RADAR/ARPA data into the display. Further, ECDIS allows automation of alarm systems to alert the navigator to potentially dangerous situations. Navigation with ECDIS can also provide enhanced situational awareness of important events.

There are two different aspects of ECDIS training, namely; ECDIS generic course and ECDIS type-specific course. Both are available at the Arab Academy for Science, Technology and Maritime Transport (AASTMT). The Generic course does not require special Instructors, While the type-specific in the AASTMT case is provided using TRANSAS type (ENC mode) by approved and accredited instructors.

Thus, this research comes to evaluate the knowledge sharing in maritime education and training courses provided for ECDIS, as an important tool of navigation. The research will be presented in several sections. Next section will handle the process of reviewing literature, while the third section will discuss the assigned research methodology and framework. The fourth section will discuss the research results and findings. Finally, the fifth section will provide a discussion of the output found as well as a conclusion extracted from the research output.

3 Literature Review

The researcher will develop the hypotheses under study through exploring the literature in the field of knowledge sharing and investigating the assigned knowledge sharing antecedents. A focus will be given to the organizational factors, as they are the ones that could be improved by the AASTMT. The following sections will present different definitions of knowledge sharing, its antecedents, and organizational factors role in knowledge sharing.

3.1 Knowledge Sharing Definition

Teng and Song (2011) suggested that knowledge sharing can be either solicited or voluntary, where solicited knowledge sharing is referred to the sending and receiving of requests for knowledge, as well as the subsequent fulfillment of these requests. On the other hand, voluntary knowledge sharing is referred to the sending and receiving of knowledge without any prior solicitation.

However, knowledge sharing had been identified as a voluntary act, where the term knowledge sharing implies that provider voluntarily presents knowledge in a form that can be used by others and it involves some conscious action on the part of the provider

who possesses the knowledge and actively participates in the sharing process even though there is no compulsion to do so (Zhang and Jiang, 2015; Wulf and Butel, 2017). The term knowledge sharing is used to refer to the voluntary provision of knowledge by those who possess the knowledge to other members of the team.

Three types of knowledge that individuals share had been identified, namely know-how, know-what, and dispositional knowledge. know-how includes experienced-based knowledge that is subjective in nature, know-what includes task-related knowledge that is objective in nature, and dispositional knowledge includes an individual's talents, aptitude, and abilities. It was found that team members evaluate what knowledge is shared between them. The distributed team members presumed shared knowledge did not focus directly the content of the shared project task. Instead, they suggest that the distributed team members presumed shared knowledge focus on how collaborative the distributed working processes are and what is the common goal (Smedlund, 2008).
Despite various advantages associated with knowledge sharing, there are many situations where knowledge is not shared effectively. During the learning process, whether lessons are conducted in collaborative groups or not, there are many circumstances where students do not share their personal knowledge on a certain topic or issue. This could be attributed to various physical, technological, psychological, personality, and cultural factors. In general, problems attributed to the lack of knowledge sharing among students could be studied on the same lines as in organizational settings (Fish and Yuan, 2005).

3.2 Knowledge Sharing Antecedents

Previous empirical studies on knowledge sharing operationalized the term knowledge sharing differently. For example, Hellman and Fried (2007) provides evidence for the use of several measures to explain an individual's sharing of knowledge such as counting the number of hits on personal postings, the number of documents submitted, the number of contributions to meetings, the number of written reports, the rate of contribution to knowledge databases, the number of new ideas, the number of improvement suggestions made, and the number of presentations made. In this regard, although computer-based knowledge sharing is relatively easier to track other forms of knowledge sharing taking place through informal conversations and personal networks are difficult to monitor but may have a considerable impact on organizational performance (Yi, 2009).

To overcome this difficulty some researchers tried to quantify knowledge sharing by asking employees how often they shared work experience, expertise from education and training, and business knowledge obtained informally with others in the team. However, scholars argue that such a listing and rating of knowledge dimensions do not constitute different knowledge sharing behaviors. Inline with these arguments, several researchers attempted to measure knowledge sharing behavior by inquiring individuals how frequently or how well they share knowledge with other members (Yi, 2009).

Some other researchers attempted to measure individuals' willingness or intention to share knowledge (Reychav and Weisberg, 2010) by operationalizing the intention of knowledge sharing as the degree of one's positive feelings about sharing one's knowledge. In this regard, Choi et al. (2010) investigated the relationship between knowledge sharing

intention and knowledge sharing behavior and empirically found a strong positive association between knowledge sharing intention and behavior (Wickramasinghe and Widyaratne, 2012).
This research comes to focus on organizational aspects, as shown in the following section.

3.3 Organization Factors Role in Knowledge Sharing

Top management support is considered one of the important potential influences on organizational knowledge. Numerous studies have found top management support essential to creating a supportive climate and providing sufficient resources (Lin, 2006). The importance of the visible top management's support to organizational knowledge sharing climate was emphasized. Moreover, Lin and Lee (2004) proposed that the perception of top management encouragement of knowledge sharing intentions is necessary for creating and maintaining a positive knowledge sharing culture in an organization.

Also, organizational climate will positively influence knowledge sharing subjective norms. Attitude toward knowledge sharing has been examined in a number of previous studies (Bock et al., 2005; Lin and Lee, 2004). Attitudes can be a mediator between personal factors and knowledge sharing intention (De Vries et al., 2006). Attitudes influence a person's evaluation of a particular behavior. Moreover, attitudes are a major part of the cognitive system and have the potential to influence the intention to share knowledge (Tohidinia and Mosakhani, 2010).

3.4 Critical Review

According to Tohidinia and Mosakhani (2010), it could be observed that the current research will focus on organizational factors rather than the individual factors affecting the knowledge sharing process through both; ECDIS generic and type-specific training. Considering the organizational factors, it could be noticed that *Support* and *Culture* are important factors for knowledge sharing. Such factors will be considered in the current research as well as *Time*, as a main contributor to the research, as it is the chance for students to interact and get contact with each other.

The following section will use the assigned dimensions of *Organization Support*, *Organization Culture* and *Time* as the main antecedents of Knowledge Sharing. The model will be applied to two sample groups of both; ECDIS generic and type-specific training courses.

4. Research Methodology

A survey is done on the students of maritime transport opinion regarding the research dimensions; Knowledge Sharing, Organization Support, Organization Culture, and Time. The survey is done through a questionnaire provided to ECDIS trainees of Maritime Transport Department of AASTMT for both; ECDIS generic and type-specific training courses.
All questionnaires were delivered in person by the researcher to the students in training class in the period of the study, as one of the instructors for the course. The questionnaire is provided to 35 trainees in the period of the study, where this number represents the whole total number of trainees who attend the ECDIS type-specific training since it started in the AASTMT and till the current time of the study. In the questionnaire assigned, the questions were adapted to measure the dimensions under study by implementing a 5-point Likert -scale used for all responses with (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree).

The current research proposed a model for the Importance of antecedents to enhance or increase Knowledge Sharing as illustrated in Figure 1. Two models were proposed for the study, first is ECDIS Generic Training course, while, second is the ECDIS type -specific Training, the model contains Variables, which are: Organization Support, Organization Culture, Time and Knowledge Sharing.

The research framework is illustrated using the following figure:

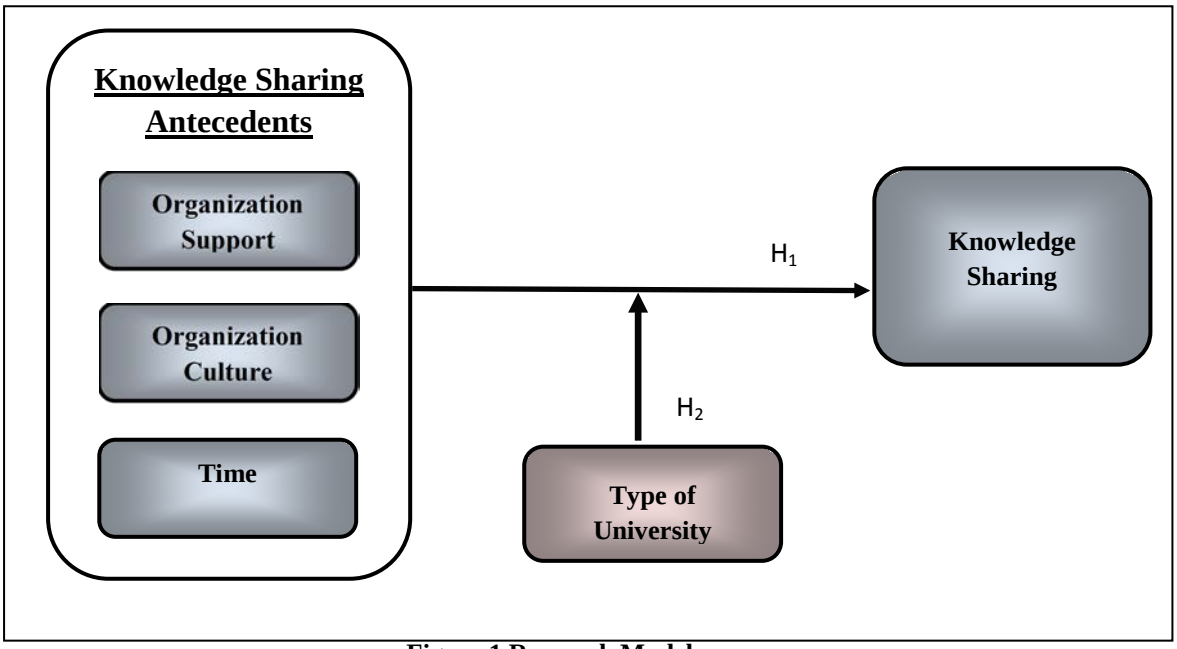

Figure 1 Research Model

Accordingly, the research hypotheses could be stated as follows:

H_1: There is a significant relationship between Knowledge Sharing and its antecedents

H_{1a}: There is a significant relationship between Knowledge Sharing and its antecedents in ECDIS Generic Training.

H_{1b}: There is a significant relationship between Knowledge Sharing and its antecedents in ECDIS type-specific Training.

H_2: There is a significant difference in Knowledge Sharing and its antecedents between ECDIS Generic Training Course and ECDIS type-specific Training Course.

5. Results and Findings

To test the hypotheses mentioned above, the current research used regression analysis. This requires testing the validity and reliability of the research variables as well as presenting a descriptive analysis of the research variables under study. The researcher will present the hypotheses testing through the model constructed using regression analysis.

5.1 Data Testing

Validity and reliability tests are two requirements to prove the accuracy of results extracted from the questionnaire. Therefore, validity and reliability tests were performed to ensure that the data is adequate for analysis. Validity refers to the extent of accuracy of the results of the study. It could be either internal or external. Internal validity refers to the analysis of the accuracy of the results obtained, while external validity refers to the analysis of the findings with regards to whether they can be generalized (Ghauri & Grönhaug, 2005). The validity of the data could be confirmed when the Average Variance Extracted (AVE) of all quality factors are greater than or equal to 50% and all items loadings are greater than 0.4 (Fornell and Larcker, 1981).

Reliability refers to the internal consistency between the items selected to measure one variable. Cronbach's alpha value is one common measurement of reliability. The higher the Cronbach's α value, the higher is the internal consistency, where the minimum value for acceptable reliability is above 0.7 (Hair et al., 2003).

Table (1) shows the validity and reliability tests for the Knowledge Sharing and its dimensions for the trainees receiving ECDIS generic training, where all AVEs and item loadings are above these cut-off values, implying adequate validity for the data under study. It also shows that all Cronbach's alpha values for this study exceed 0.7, implying that the data is reliable.

Table (1) Validity and Reliability Tests for the Research Variables of ECDIS Generic Training

Model	*Variable*	*Item*	*AVE*	*Factor Loading*	*Cronbach's Alpha*
ECDIS Generic Training	***Organization Support***	Item1 Item 2	81.815%	0.818 0.818	0.777
	Organization Culture	Item1 Item 2 Item 3 Item 4	59.192%	0.719 0.410 0.551 0.687	0.766
	Time	Item 1 Item 2	78.507%	0.785 0.785	0.723
	Knowledge Sharing	Item 1 Item 2 Item 3	78.747%	0.787 0.780 0.796	0.864

Table (2) shows the validity and reliability tests for the Knowledge Sharing and its dimensions for the trainees receiving ECDIS type-specific training, where all AVEs and item loadings are above these cut-off values, implying adequate validity for the data under study. It also shows that all Cronbach's alpha values for this study exceed 0.7, implying that the data is reliable.

Table (2) Validity and Reliability Tests for the Research Variables of ECDIS type-specific Training

Model	*Variable*	*Item*	*AVE*	*Factor Loading*	*Cronbach's Alpha*
ECDIS Type-specific Training	***Organization Support***	Item1 Item 2	83.005%	0.830 0.830	0.795
	Organization Culture	Item1 Item 2 Item 3 Item 4	63.632%	0.654 0.654 0.584 0.654	0.809
	Time	Item 1 Item 2	87.677%	0.877 0.877	0.859
	Knowledge Sharing	Item 1 Item 2 Item 3	64.385	0.675 0.530 0.726	0.720

5.2 Descriptive Analysis

Table (3) shows the mean and standard deviation of the research variables, as well as the corresponding frequencies for the responses of the ECDIS generic training course. It was noticed that the mean values of all the research variables are above the average of 2.5. All frequencies of research variables are relatively lying in the zones of neutral and agree.

Table (3) Descriptive Analysis of the Research Variables of EDIS Generic Training Model

Variables	*Mean*	*Standard Deviation*	*Frequency*				
			1	*2*	*3*	*4*	*5*
Organization Support	3.7143	.71007	0	0	15	15	5
Organization Culture	3.7429	.70054	0	0	14	16	5
Time	3.4286	.60807	0	0	22	11	2
Knowledge Sharing	3.9429	.72529	0	0	10	17	8

Table (4) shows the mean and standard deviation of the research variables and the responses frequencies for the ECDIS type-specific training course. It was noticed that the mean values of all the research variables. are above the average of 2.5. Also, all frequencies of research variables are present in the zone of 4 and 5, indicating that most of the respondents' opinions lie in the zone of agreement for ECDIS type-specific training

Table (4) Descriptive Analysis of the Research Variables of ECDIS Type-specific Training Model

Variables	*Mean*	*Standard Deviation*	*Frequency*				
			1	*2*	*3*	*4*	*5*
Organization Support	4.6286	.49024	0	0	0	13	22
Organization Culture	4.6286	.49024	0	0	0	13	22
Time	4.4000	.49705	0	0	0	21	14
Knowledge Sharing	4.7143	.45835	0	0	0	10	25

5.3 Testing Hypothesis

5.3.1 Testing the Relationship between Knowledge Sharing and ECDIS Generic Training Table (5) shows the correlation analysis between independent variables and the dependent variable "Knowledge Sharing". It was observed that the value of Pearson's correlation coefficient of research variables; Organization Support, Organization Culture, Time, and Knowledge Sharing are 0.0767, 0.0781, and 0.657 respectively with P-values of 0.000. Thus, there is a significant positive correlation between knowledge sharing and its antecedents.

Table (5) Correlation Matrix between Research Variables of ECDIS Generic Training

		Organization Support	*Organization Culture*	*Time*	*Knowledge Sharing*
Organization Support	Correlation (r)	1			
	P-value				
	N	35			
Organization Culture	Correlation (r)	.557**	1		
	P-value	.001			
	N	35	35		
Time	Correlation (r)	.564**	.543**	1	
	P-value	.000	.001		
	N	35	35	35	
Knowledge Sharing	Correlation (r)	.767**	.781**	.657**	1
	P-value	.000	.000	.000	
	N	35	35	35	35

Table (6) displays the results of the regression analysis of ECDIS Generic Training constructs; Organization Support, Organization Culture, and Time on "Knowledge Sharing". The multiple regression analysis shows that there is a significant impact of Organization Support on Knowledge Sharing, as P-value is 0.001. Similarly, Organization Culture (p-value=.000) shows a significant impact on Knowledge Sharing, while Time (p-value=0.104>0.05) has an insignificant impact on Knowledge Sharing. Moreover, the table shows that Organization Support, Organization Culture and Time explain 78.8% of the variation in Knowledge Sharing, as R Square is 0.788.

Table (6) Regression Analysis of Independent Variables on Knowledge Sharing for ECDIS Generic Training

Training Type		***Unstandardized Coefficients***		***Standardized Coefficients***	***T***	***P-value***	***R Square***
		B	***Std. Error***	***Beta***			
ECDIS Generic Training	***(Constant)***	-.111	.392		-.284	.778	0.788
	Organization Support	.423	.110	.414	3.851	.001	
	Organization Culture	.470	.109	.454	4.296	.000	
	Time	.212	.127	.178	1.675	.104	

5.3.2 Testing the Relationship between Knowledge Sharing and ECDIS Type-specific Training.

Table (7) shows the correlation analysis between independent variables and dependent variable "Knowledge Sharing". It was observed that the value of Pearson's correlation coefficient of research variables; Organization Support, Organization Culture, Time, and Knowledge Sharing are 0.692, 0.692, 0.516 respectively with P-values of 0.000. Thus, there is a significant positive correlation between knowledge sharing and its antecedents in the ECDIS type-specific training.

Table (7) Correlation Matrix between Research Variables of ECDIS Type-specific Training

		Organization Support	***Organization Culture***	***Time***	***Knowledge Sharing***
Organization Support	Correlation (r)	1			
	P-value				
	N	35			
Organization Culture	Correlation (r)	.388*	1		
	P-value	.021			
	N	35	35		
Time	Correlation (r)	.145	.145	1	
	P-value	.406	.406		
	N	35	35	35	
Knowledge Sharing	Correlation (r)	.692**	.692**	.516**	1
	P-value	.000	.000	.001	
	N	35	35	35	35

Table (8) shows the impact of Organization with coefficients of 0.429, 0.429, and 0.354

Support, Organization Culture and Time on Knowledge Sharing for the trainees of ECDIS type-specific training course. There is a positive significant impact on Organization Support, Organization Culture and Time on the dependent variable "Knowledge Sharing" respectively, and p-values of 0.000. Also, the R square is 0.832, which means that Organization Support, Organization Culture and Time explain 83.2% of the variation in Knowledge Sharing.

Table (8) Regression Analysis of Independent Variables on Knowledge Sharing for ECDIS Type-specific Training

Training Type	*Research Variables*	*Unstandardized Coefficients*		*Standardized Coefficients*	*T*	*P-value*	*R Square*
		B	*Std. Error*	*Beta*			
ECDIS Specific Training	**Organization Support**	.429	.075	.458	5.718	.000	0.832
	Organization Culture	.429	.075	.458	5.718	.000	
	Time	.354	.069	.384	5.137	.000	

5.3.3 Difference in Knowledge Sharing between ECDIS Generic Training and Type-specific Training.

Table (9) shows the T-test conducted to compare means of research variables between ECDIS generic training and type-specific training courses. It was found that there is a significant difference in Organization Support, Organization Culture, Time and Knowledge Sharing between ECDIS generic training and ECDIS type-specific Training. Recognizing the mean values, it could be noticed that mean organization support of ECDIS type-specific Training (Mean = 4.6286) is higher than that of ECDIS generic training course (Mean = 3.7143). Also, the mean organization culture (4.6286) of ECDIS type-specific Training is higher than that of ECDIS Generic Training (3.7429). Similarly, the mean in *Time* and *Knowledge Sharing* of ECDIS type-specific training are higher than that of ECDIS generic training.

Table (9) T-testing Analysis between Knowledge Sharing - ECDIS Generic and ECDIS Type-specific Training

Research Variables	*Training Type*	**Group Statistics**			
		N	*Mean*	*Std. Deviation*	*P-value*
Organization Support	*ECDIS Generic Training*	35	3.7143	.71007	0.000
	ECDIS Type-specific Training	35	4.6286	.49024	
Organization Culture	*ECDIS Generic Training*	35	3.7429	.70054	0.000
	ECDIS Type-specific Training	35	4.6286	.49024	
Time	*ECDIS Generic Training*	35	3.4286	.60807	0.000
	ECDIS Type-specific Training	35	4.4000	.49705	
Knowledge Sharing	*ECDIS Generic Training*	35	3.9429	.72529	0.000
	ECDIS Type-specific Training	35	4.7143	.45835	

6 Discussion and Conclusion

The current study identifies potential insights into the ways organizations could support knowledge-building mechanisms to enhance the effectiveness of their training courses. It was found that organization support and organization culture have a significant impact on knowledge sharing in both types of training. This means that organization factors are considered as important for

knowledge sharing, which is a good result in favor of the AASTMT indicating a positive significant contribution to the role in Knowledge Sharing. Observing the ECDIS generic training course, it had been found that there is an insignificant impact of Time on Knowledge sharing, showing a shortage in the course duration and interaction which is against the chance for knowledge exchange and interaction between students.

On the other hand, considering ECDIS type-specific training course, it had been shown that there is a significant impact of

Time on Knowledge Sharing. Thus, the ECDIS type-specific training course was able to overcome the problem of time that was present in the ECDIS generic course, implying the fact that it is really useful to apply ECDIS type-specific training for the role of knowledge sharing.

The above results imply reviewing the IMO amendments of STCW.7/CIRC.24, as it contradicts with the IMO amendments. The amendments do not require documentation of ECDIS training, which implies further investigation regarding the point.

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The Impact Of Northern Sea Route On Suez Canal Route

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Abstract

The NSR defines the different fairways going from Novaya Zemlya in the west to the Bering Strait in the east. The length of the route depends on the ice conditions and the choice of different stretches of the route, but is generally considered as 2100 to 2900 nautical miles. The NSR is only used in the navigation between month of July and the end of month of Novembre. (Nilsen, 2013)

There is a fear that the North Sea Route might affects the trade quota of the Suez Canal Routedespite the obstructions facing the navigation through NSR such as ice-polar in addition to the safety requirement needed from the ship owners and operators during the cargoes transit and there concern with the saving distance only.
The NSR reduces the voyage distance between the East and the West there fore ship owners are encouraged to choose the NSR.
This research paper aims at pointing out that the volume of the cargoes transfer between the East and the West can not depend on the NSR facilities and depending on SCR is inevitable.

The purpose of this paper is to prove that the developing of the NSR will not affect the trade quota of Suez Canal Route (SCR) during the curent period, for several hinders facing the NSR.

The methodology used in this paper depends on descriptive analysais by showing the tables and figures used to declare the numbers and the tonnage of vessels transited and passed both routes from the begining of routes history. The statistics curves used to show the increasing and decreasing of using the routes in different effective navigation conditions.
The paper arrives at the conclusion that the NSR will not substitute the Suez Canal Route but will only stand in competition with it.

المستخلص

الزيادة المستمرة للتعاملات التجارية بين اوروبا و اسيا أدت إلى زيادة حجم نقل البضائعبين الشرق و الغرب ، و يعتبر طريق قناة السويس هو الممر الاساسى بينهما وعلى هذا نحو ، فقد لعب التطور التكنولوجى فى قطاع النقل دوراً فعالاً حيث اصبح من الامكان نقل كمية من البضائع عبر مسافات طويلة فى وقت أقل على ذى قبلويعتبر ذوبان الجليد بالقطب الشمالى فى العصور الاخيرة من العوامل التى اسهمت فى ازدهار حركة الملاحة و بالتالى قد ساعد ذلك على نمو الحركة الاقتصادية فى هذه المنطقة بشكل كبير و لكن على الرغم من ذلك ، فمازال هناك الكثير من التحديات و الصعوبات المتعلقة بالملاحة فى القطب الشمالى ، ومن ضمنها ، عدم وجود بنية تحتية ملاحية وعدم وضوح الأحكام و القوانين المتعلقة بالملاحة هناك وايضاً

عدم الدراية الكافية بالفصول الخالية من الجليد فإن القطب الشمالى يستخدم ملاحيا ما بين شهر أغسطس حتي نهاية شهر نوفمبر.
إن الهدف من هذه الرسالة هو أستبيان علاقة التجارة الملاحيه فى قناة السويس و القطب الشمالى و إثبات كفاءة قناة السويس فى حركة الملاحة ومن ثم العمل على تطورها.
تهدف الرسالة إلى توضيح عدم تأثر حصة قناة السويس بحركة الملاحة فى القطب الشمالى على الرغم من ان بعض السفن قد اتخذت القطب الشمالى مساراً لها فى الوقت الحالى ، و يجب التنويه على ان مسار القطب الشمالى لن يلغى مسار قناة السويس ولكن سيظل منافساً له فقط.

1. Introduction

Today there is a growing interest in the NSR as a transit route. The distance between Northern Europe and Northeast Asia can be reduced with as much as 50 % compared to the traditionally route through the Suez Canal. The presence of thick ice has been the main reason for not considering this pathway as an option, but as the ice continues to diminish the economic potential of using the route is becoming stronger. Therefore, DNV expects 480 container transit voyages across the Arctic Sea in 2030 (DNV, 2010). However there are some risks and uncertainties related to shipping in the remote Arctic areas such as issues with the regulation of the route, unstable weather and lack of sufficient infrastructure.

Hence, this paper presents the addresses of the NSR, both in terms of route limitations as well as vessel restriction for the most common transport system and hazards that threaten as the distress of the vessel through the passing of NSR and the charts edition of this area of navigation in the NSR. Hence, this paper will therefore not evaluate the route as a replacement for the route through the Suez Canal but rather look at the feasibility of a vessel using best route. As a result required freight rate will be presented as a main factor for the charterers and ship-owners in deciding upon the required route. The conclusion will refer to the methods and the ways to develop the SCR to face any competition in the future decades and this development is to serve marine trade under safe conditions.

The ship owners and vessels operators are mainly preoccupied with safety of the vessel and the fleet and reduce the vessels deprecations and costs. However the NSR does not offer these conditions simultaneously since it is able to reduce the costs but unable to provide the require safety. Keeping in mind that the safety factor cannot be dismissed .On the other hand the SCR provide the safety transit for the vessels since it equipped with essential safety facilities .

The paper demonstrates the importance of SCR since it can be used throughout the whole year and serve the liner cargo transport from the East and the West. On the other side, the NSR availability is almost limited to five months only throughout the year, which makes it difficult for the charterers and the cargoes receivers to depend on it completely. The dependency of the West on the SCR for transiting crude oil products has been proved throughout the paper.

2. Specifications of The Suez Canal

- It is the longest canal in the world without locks
- The accidents are almost nil compared with other waterways.
- The canal is navigable 24hrs
- The Canal is liable to be widened and deepened when required, to cope with the development in ship sizes and tonnages.
- With the adoption of the Vessel Traffic Management System (VTMS) (a system depending upon the most up-to-date radar network), vessels can be monitored and followed on every spot of the Canal and intervention in emergency cases can be taken.

- The Suez Canal accommodates the partially loaded VLCCs and ULCCs

3. Navigational Capacity Of Suez Canal

Table1 shows the changed parameters that help the canal to serve the international maritime service throughout the years since it is first launching and the transit of all types of vessels, starting with 5000DWT and reaching up to 240000DWT. The table shows the importance of the The Suez Canal as it is considered to be the shortest link between the East and the West due to its unique geographic location and linking between the Mediterranean sea at Port said and the Red sea at Suez .

This importance is getting augmented with the evolution of maritime transport and world trade. The maritime transport is the cheapest means of transport, whereas more than 80 % of the world trade volume is transported via waterways (seaborne trade). Saving in distance , time and in operating costs for vessels that transit the Canal, also firm up this importance. (suez canal. 2016)

Table.1: The chang of navigation in SC from 1869 - 2015

Item	Unit	1869	1956	1962	1980	1994	1996	2001	2010	2015
Overall Length	Km	164	175	175	189.80	189.80	189.80	191.80	193.30	193.30
Double paths Length	Km	--	27.7	27.7	77	77	77	79	80.5	113.3
Width at 11m depth	M	--	60	89	160/175	170/190	180/200	195/215	205/225	205/225
Water depth	M	8	14	15.5	19.5	20.5	21	22.5	24	24
Max. Draft of ship	M	6.7	10.6	11.5	16	17	17.6	18.8	20	20
Cross Sectional Area	m 2	304	1200	1800	3250/3600	3600/4000	3850/4300	4350/4800	4800/5200	4800/5200
Max. Loaded ship	DWT	5000	30000	60000	150000	170000	185000	210000	240000	240000

Source (suez canal. 2016)

4. Idea of the New Suez Canal

Creating a new canal, parallel to the existing one, to maximize benefit from the present Canal and its by-passes, and double the longest possible parts of the waterway to facilitate traffic in the two directions and minimize the waiting time for transiting ships. This will certainly reduce the time needed for the trip from one end of the Canal to the other, and will increase the numerical capacity of the waterway, in anticipation of the expected growth in world trade. The New Suez Canal goes side by side with the Suez Canal Area Development Project.

The project will also have quite a positive impact on the Egyptian national income as it will boost the hard currency earnings, provide much needed job opportunities and create new urban co mmunities. (suez canal. 2016)

5. Traffic Trends

Since its opening in 1869, the Suez Canal has become the main transport route between Asia and Europe. By changing the route of Magellan which travelled around the Cape of Good Hope, this impressive feat of engineering significantly shortened the distances between the two continents, increasing the safety of traffic and restoring the centrality of the Mediterranean as a crossroads to the major shipping routes worldwide. The importance of this route is confirmed if we consider the years between 1967 and 1975 when, as a result of the tensions that followed the nationalization on of the Canal by Egypt and Government and of the Six Day War, navigation in the Canal was prohibited causing a contraction international trade and, along with other factors, one of the greatest recessions of the post-war era. Interestingly, the first ship that crossed the Suez Canal on June 5, 1975, after eight years of closure, was a ship of the Italian shipping company Ignazio Messina, which is headquartered in Genoa and is a leader in the trade between the Mediterranean, the Red Sea and East Africa. Between 7% and 8% of all the total cargo traded globally passes through the Canal. This implied the passage of 822 million tonnes of products, 416 million of which went southward while 406 million went northward.

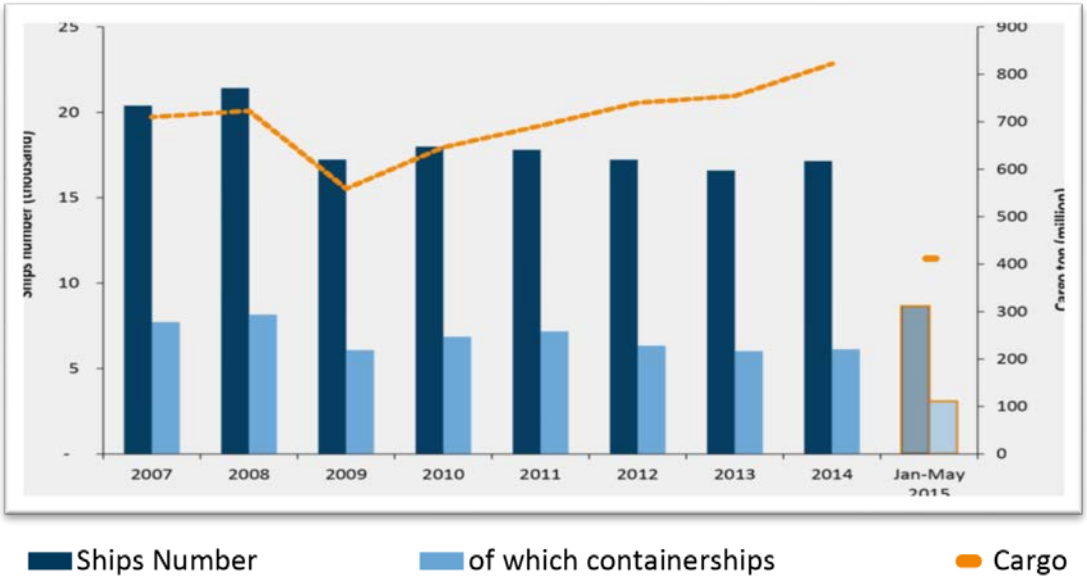

Figure1: Ships and cargo passing through the Suez Canal Source: Suez Canal Authority (2016)

5.1 The Objectives of the New Suez Canal

- Boosting the hard currency earnings for the Egyptian national income
- Increasing the doubled parts of the Suez Canal to 50%
- Shortening the transit time from 18 hours to 11 hours for the southbound convoy
- Minimize the waiting time for vessels to become three hours at most instead of 8-11 hours, the matter that will cut down on trip cost and make the Suez Canal more attractive for ship owners
- Attract more ships to use the Suez Canal, and add to the Canal classification as an important international maritime route
- Increase the number of ships that the Canal can handle on a daily basis in order to cope with the expected growth of world trade

6. The Economic Interest Of NSR Use

As far back as 1877 there were occasional expeditions with the intention of taking Siberian agricultural products and mineral resources over the Kara Sea to world markets. Only 75 trios of 122 were successful till 1919 they carried only 55 thousand tons of various cargoes (NSR. Review note,2007). Failures of Kara expeditions are supposed to be connected due to the absence of proper system of navigation, ports, ice-breakers.

In 1899 admiral Makarov ordered the world's first powerful icebreaker "Ermak" in England, which is intended to be used for regular communication with the Ob and Yenisei rivers through the Kara Sea (Selin, 2003).

The first evidence of possible use of the Northern Sea Route was expedition performed by Swedish scientist Nils Nordenskiöld on Vega in 1878-79 this voyage was the generalized experience of two trips on the streamers Preven and Imer through the northern sea route between Siberia and Europe in 1875 and in 1876 (NSR. Review note, 2007).

In the early twentieth century the development of the Northern Sea Route was one of the essential tasks of the Russian economy. In 1909, icebreakers Taimyr and Vaigach were built, they were intended for the systematic study of the Northern Sea Route (Burkhanov, 1958). In 1914, these icebreakers were sent to an expedition through the Northern Sea Route in a single season.

During the trip this problem had not been resolved; in October 1914, steamers encountered impassable ice, which forced the expedition to remain in the drift for the winter (Burkhanov, 1958). Only in September 1915, icebreakers reached Archangel, this ended the trip in two seasons.

7. The Arctic Geography

The Arctic is the region surrounding the North Pole, geographically regarded as the region above the Arctic Circle at 66° 33” North, though definitions such as treeline and permafrost may also be used. Throughout this research paper the Arctic will be defined as the area within the Arctic Circle.

The Arctic region is one of the few areas on earth that is not dominated by humans. Still the area is subject to major climate alterations due to human activity. Never the less, the region is of massive political

interest, where the main stakeholders are USA, Canada, Russia, Sweden, Finland, Iceland, Norway and Denmark as the governing state of Greenland (Arctic Monitoring and Assessment Programme (AMAP, 2011). The interest is largely founded in the oil and gas reserves expected to be found in the area. All these stakeholders are represented in the Arctic Council, which is an intergovernmental forum facilitating communications between the members, aligned efforts such as research, legislation and regulation of activity of the area (Arctic Council, 1996).

During the winter season, the lack of sunlight sets the stage for the formation of snow and ice, which occur at freezing point of 0 degree Celsius (Helmenstine) and -1.9 in salt water (noaa.gov, 2013), in combination with traditionally cold summers, the conditions have led to the development of multiyear ice (MYI).

7. Shipping Routes Of NSR

Arctic shipping is the term used for shipping from to or through Arctic areas. As of 2009, most of the activity within the arctic is to and from locations, moving resources out of the area where very few voyages went through the arctic in 2009. Never the less, the activity and prospect of shipping through the Arctic becomes more and more attractive for shipping companies as the sea ice cover continues to diminish (Smith, 2012).

As the understanding of the earth grew, it became apparent that the arctic could connect continents if the waters of theArctic Ocean proved to be navigable.

7.1 The Northwest Passage

The Northwest Passage (NWP) is the name of multiple routes going from the Atlantic Ocean to the Pacific via the Arctic Ocean along the Northern Coast line off North America. The route was first successfully navigated but Roald Amundsen in the 1900's. Successfully navigating the NWP was believed to open the sea way, and present an alternative route to moving goods within the USA and between the west coast of USA and Asia, bypassing the Panama Channel (Arctic Monitoring and Assessment Programme (AMAP, 2011). The NWP showed itself to be extremely difficult to navigate because of this approximately 36 000 islands. Only two of the routes the multiple routes defined as the NWP are classified as deep waters, allowing for certain sizable ships (max 15 m) to navigate the region. Because of the islands, the average temperature is lower than at sea, increasing the formation of ice, making the route extremely difficult to navigate, and it is expected to be the last arctic route to be ice free (Heygster, 2011) (Smith, 2012) (Arctic Council, 2009).

7.2 The Northeast Passage

The Northeast Passage (NEP) is a route that starts off the coast of Norway, and goes to the Baring strait. This route has a high degree of correlation with the NSR .

The major difference between the two routes is that the NEP covers the whole voyage through the Arctic Ocean, while the NSR only covers the voyage within the Russian territorial waters (Arctic Marine Shipping Assessment 2009).

At some regards the NEP and NSR is regarded as the same routes especially after the opening of commercial shipping of the NSR in 1991 (Humpert, 2011).

8. Hinders Facing The NSR

Weather Conditions Dependence the Route is navigable only four months per year

The lack Of High Ice Class Vessels the ships of ice-class should be very maneuverable and have the same propulsion power astern as well as forth.

High Insurance Premium the premium can appear times higher, in contrast to premium for Suez Canal transportation Keeping in mind that in case the shippers and the charterers required to insure cargo, they shall face a problem with the insurance company since that some commodities are effected by the low temperature during the transportation .

Imperfections of Legal Framework there are two main legal frameworks that should be followed while navigation in Arctic. They are IMO Guidelines and Russian Rules for Navigation on the Seaways of the Northern Sea Route. The latter is not well prepared and does not contain all the information, needed for providing the safe passage. While the IMO is making changes to its guidelines, listening to the experts, Russian Rules were not changed since 1996.

Ports And Terminals only a half of 41 northern Russian ports, situated along the NSR, are now functioning. This situation can badly influence the safety, because the distance to the nearest port in case of emergency increases.

9. Trend Of Vessels passing Via Suez Canal

The geographical position of the Suez Canal makes it the shortest route between East and West as compared with the Cape of Good Hope. The Canal route achieves saving in distance between the ports north and south of the Canal, the matter that is translated into other saving in time, fuel consumption and ship operating costs. About 8 % of the world seaborne trade passed through the Suez Canal in 2009. The figure below shows the increasing number of vessels using the Suez Canal, starting with 5579 ton in Y1975 and reaching up to 16833 ton in Y2016

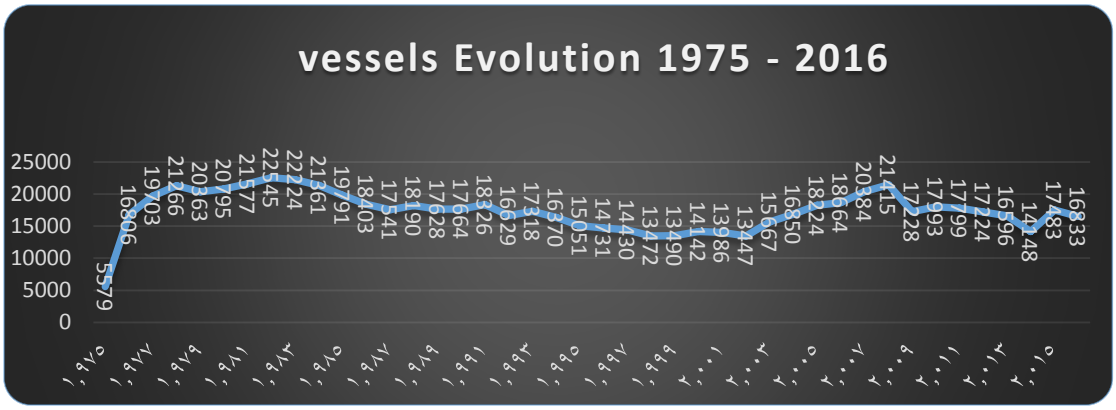

Figure 2 : Numbers of vessels transited SC per year from 1975 – Till 2016 source (suez canal. 2016)

10. Saved Distance Via NSR and SCR

Regarding the travel time shown below when using the two routes , the North sea information office has introduced a comparison between the NSR & SCR from port of Rotterdam (Netherland) toward port of Dalian (China) and the study shows the following.

Table 2 : The voyage plan distance from Rotterdam toward the East via SCR&NSR

FROM	TO	VIA SCR	VIA NSR	SAVING TIME
Rotterdam	Yokohama	12894 NM	8452 NM	-34.45 %
Rotterdam	Shanghai	12107 NM	9297 NM	-23.20 %
Rotterdam	Vancouver	10262 NM	8032 NM	-21.67 %

Source.Nourth sea route information office (LIoyds List, 2015)

Despite the Arctic route presents saving in distance from the Eastern region to the Western, however, it does not serve the main regions -Europe- which depend on the import of fuel from the Arab gulf. On the other hand, Suez Canal provides the ideal route and the ideal saving cost for distance to serve this trade as shown in the below table 3.

The demand of cargoes between the East and the West is the main factores which affects the choice of routes. The importance of SCR is shown in transportation of black gold which Europ dependes on.

Table 3: Distance and transit time when using SCR and NSR

VOYAGE		VIA NSR		VIA SCR		SAVE DAYS	PCT %
		DISTANCE	DAYS /ECO-SPEED 14 KNOTS	DISTANCE	DAYS / ECO-SPEED 14 KNOTS		
DAMMAM KSA	ROTTERDAM	13685 NM	40.7	6341 NM	18.8	-21.9	-53.66
YANBU KSA	ROTTERDAM	14906 NM	44.3	3807 NM	11.3	-33	-74.45
ZIRKU ISLAND UAE	ROTTERDAM	13549 NM	40.3	6206 NM	18.4	-21.9	-54.19
SINGAPORE	ROTTERDAM	10025 NM	29.8	8670 NM	25.8	-4	-13.51

Author (Distance table 2017)

- The advantages explained above can be useful and could be develop by the following Activating the Egyptian maritime field by strengthening it, through the purchase and construction of merchant vessels, which will serve the commercial industry and help in creating a logistic cycle between the neighboring continents. Hence, this will boost the commercial income of the Suez Canal.
- Organizing seminars with ship owners, governmental authorities and companies using the Suez Canal, in order to, highlight the impediments they face, find suitable solutions for them, and adopt the ideas that serve both the Suez Canal and the third parties.
- Providing services for ships and cargoes owners who use the Suez Canal, and giving special offers which contribute in attracting more vessels to the Suez Canal.

- Widening the Suez Canal breadth more to help the underway vessels to increase its speed and deduct the voyage cost
- Developing facilities of port surrounding the Suez Canal concerning loading and unloading process and linking it together to serve the vessels transit Suez Canal.

Conclusion

The NSR will not eliminate the SC and also cannot be called the direct competitor of Suez Canal for now, but it is considered as the high-potential addition to Suez Canal. Suez Canal and NSR will be necessary together and they will serve separate to some extent based on the origin of the goods to be transported and the port of discharge markets.

The NSR is a very difficult route for people, hull, techniques and constructions.

The weather conditions and ice fields hamper the evacuation in case of emergency. This route comes through Arctic, which has very vulnerable ecosystem, and that is whyany accident may cause ecological disaster. The consequences of such a disaster cannot be easily redressed.

More infrastructure is required for this route exemplified in coast station and ports to prevent any accident in this area.

Concerning the ice-breaker assistance and its effect on the economical feasibility of the NSR Whatever Russians will do, it will be expensive since, icebreaker support is needed, so it will not be economically competitive in comparison with Suez Canal.

NSR is mainly monopolized by Russia since it owns the ice-breakers and pilotages, however, it is also under the supervision of many countries (USA-CANADA-SEWEDEN-FINLAND-ICELAND-GREENLAND) thus it may cause conflict between them, since the arctic area has the largest reserves of mineral gas and oil. On the contrary, Suez Canal has only one owner and one authority, under command of the international law of seaborne trade.

The authorities of NSR face obstacles in case of oil spill pollution which makes it very difficult to deal with in such weather conditions.

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Improving the efficiency of Personal Floatation Device (PFD) in Reducing Human Causalities at Sea

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Abstract

Despite the safety precautions that are currently followed on board ships , Man Overboard (MOB) accidents are still happen and increasing. In general, there is a significant increase in marine activity, where many activities may lead to increased MOB accidents, the human ability to survive and withstand the cold water decreases with time that is if the person manages to survive the initial shock causing panic and fear. In addition, the increasing rate of the loss in temperature is directly proportional to the duration. The chances of survival of the injured decreases until it reaches low rates with giving due care to the general physical condition of the casualty and its physical and psychological ability to tolerate cold water. Many victims of this type of accidents were wearing PFD (Personal Flotation Device), but so many of them died due to either drowning or hypothermia. Therefore, there is a need to review the personal safety equipment in terms of its suitability to the nature of work and the surrounding environment.

The rapid improvement in the personal Life Saving Appliances (LSA) must be extensive in order to determine if a system or a device is appropriate for the effective reduction of the drastic number of losses of life at sea. This can be done thorough analysis of the current events and deducing the causes that lead to losses of life. Also, rapid solutions must be found to reduce losses of life resulting from accidents associated with various marine activities. Consequently, reflecting on and enhancing the safety of human life at sea.

Keywords: MOB accidents, PFD (personal floatation device), and hypothermia

المستخلص

على الرغم من احتياطات السلامة التي يتم اتباعها حالياً على متن السفن إلا أن حوادث غريق بالبحر لا تزال تحدث وبشكلٍ متزايد بصفةٍ عامة. ومع وجود زيادة ملحوظة في النشاط البحري فإنه قد تؤدي العديد من الأنشطة إلى زيادة حوادث الغرق، ومن المعلوم أن القدرة البشرية على البقاء على قيد الحياة وتحمل الماء البارد تتناقص مع مرور الوقت وذلك إذا ما نجا الشخص من الصدمة الأولية التي غالباً ما تسبب الذعر والخوف. بالإضافة إلى ذلك فإن المعدل المتزايد للانخفاض في درجة الحرارة يتناسب طرديا مع المدة الزمنية بالماء. ولذلك تتناقص فرص نجاة المصاب حتى تصل إلى معدلات منخفضة مع إيلاء العناية الواجبة للحالة البدنية العامة للمصاب وقدرته الجسدية والنفسية على تحمل الماء البارد .

ومن الملاحظ أن العديد من ضحايا هذه الحوادث كانوا يرتدون أجهزة الطفو الشخصي إلا ن الكثير منهم لقوا حتفهم إما بسبب الغرق أو انخفاض حرارة الجسم، وبالتالي فإن الحاجة تستدعي مراجعة معدات السلامة الشخصية من حيث ملاءمتها لطبيعة العمل والبيئة المحيطة. لذا فإن التطور السريع في معدات السلامة الشخصية لا بد أن يواكبه إمكانية تحديد جدوى النظام أو الجهاز في التخفيض الفعال للأعداد الكبيرة في خسائر الأرواح في البحر. وذلك يمكن التوصل إليه عن طريق إجراء تحليلٍ شاملٍ للأحداث الجارية ومحاولة استنتاج الأسباب التي تؤدي إلى خسائر في الأرواح. وبالإضافة إلى ذلك يجب إيجاد حلول سريعة لتقليل خسائر الأرواح الناجمة عن الحوادث المرتبطة بأنشطة بحرية مختلفة، وبالتالي يتم تعزيز سلامة الحياة البشرية في البحر.

1- Introduction:

Man overboard is an incident when the person falls over ship board into the water and needs immediate rescue. Despite the availability of safety equipment on board ships, drowning events are still occurring for seafarers or travelers due to the many types of accidents. These accidents result in the direct exposure to sea water resulting in loss of life due to both; rapid decrease of body temperature and shock whether psychological or due to cold water (British rowing, 2007)

Man overboard is a common occurrence and one of the most hazardous situations in which a person falls off the ship into the water while working or due to a certain accident. Although seafarers are trained to manage such accidents, severe weather conditions and rough sea can ruin the rescue operation. Areas with ice-cold water temperature could cause hypothermia or other major health problems or in many cases could even lead to death. Numerous people lost their lives in the past owing to this kind of accidents. (Kantharia, 2010, British rowing, 2007).

A man overboard is an emergency accident that requires the immediate location and recovery of the overboard victim due to bad weather and heavy sea. It is likely that the overboard seafarer will drown or get hypothermia.

There are 2 type of man overboard incidents

- Man overboard that has been observed which needs immediate action.
- Man overboard when the point or time of falling is unknown (non-observed) which needs implementing search and rescue.

No seafarer wants to get injured during their work on board ships. It is quite well-known that the work environment at sea is rough and despite all the precautions taken, accidents still happen due to one main reason; that is human error. (Kantharia, 2010)

A set of regulations have been set and applied in order to guarantee the safety of seafarers whilst working on ships; however, there are a few types of fatal accidents that still occur on board ships worldwide. As a seafarer working at sea, it is necessary to be well aware of how to take precautions to avoid them. (Kantharia, 2010)

What is meant by cold water? According to medical specialists, cold water is defined as water with

temperature below 15°C. Abrupt or unexpected immersion into water with such temperature is a possible hazard. (British rowing, 2007)

2- **The severity of exposure to temperature loss (Hypothermia)**

Hypothermia is a situation wherein there is an extensive loss of body temperature due to prolonged contact of the body with cold water, and the body's normal metabolism and functions get affected. (British rowing, 2007)

The first stage of cold water immersion is the cold shock reaction. In this stage, the heart rate as well as the blood pressure increase. There is also uncontrolled gasping and sometimes uncontrolled movement. Cold shock response lasts from 30 seconds to 2 minutes and it can cause death on its own. It's worth mentioning that among all those who die in cold water, 20% of them die within the first two minutes. They drown as they are controlled by fear or they swallow water in the first gasp. If the victims have cardiac problems, the cold shock may cause a heart attack. To survive this phase, they have to control their breathing and to know that it will pass and stay calm.

The second phase in cold water immersion is named as "cold incapacitation". Being short on proper insulation, the body will generate its own. A long time before their core temperature falls a degree, the veins in their extremities (hand and feet) will become narrow. They will not be capable of controlling their arms and the muscles in their arms and legs will completely stop working adequately to keep them on the surface. (vittone.oct.2017)

2.1 - The risk of cold water and Hypothermia:

Cold water is regarded as a risk since it absorbs heat from the body and the immersion in it can have serious physiological impacts. The normal body temperature is 37°C however when the body lose heat at a rate bigger than the body produce, the core temperature falls. Due to the fact that water is 24 times more thermally conductive than air, the rate of heat loss in cold water is huge and swiftly takes away the body heat which leads to hypothermia. According to Professor Mike Tipton, cold water shocks are one of the major stresses you can put your body under. Cold water kills, rapidly. These shocks can take place at temperatures below 15°C. Sea temperature rises slower than air's temperature. (British rowing, 2007)

2.2 - How long will the cold water shock last?

In the majority of people, the cold water shock will subside in a short period of time, often after a few minutes. Although it is a short-lived response, it can seriously threaten your survival.

When your breathing is compromised due to immersion or submersion in water, drowning is inevitable. The phases of drowning due to the cold water immersion can be recognized in four different stages. Each one of these phases plays an important role the drowning situation. However, it's nearly impossible to determine the precise sequence of these phases. (Royal National Lifeboat Institution, Aug 2016)

2.3- Here are the possible yet highly four phases:

- Firstly, the initial immediate risk.
- Next, short-term.
- After that, long-term.
- Finally, post-rescue risk.

The accurate differentiation between the said four stages can ensure a successful highlighting of the exceptional risks at different stages either of immersion and rescue. The initial immersion in cold water is the most. hazardous. Direct physiological responses affect rowers negatively. It is believed by a wide array of experts that drowning is closely related to hypothermia. However, over 50% of the cases of drowning are closely related to immersion which happens soon after. Hypothermia is more likely to develop for a long time

Table (1): The cold water (below 15°C) physiological effect during one hour

phase	Risk category	Main risk	Approximate duration
Phase 1	Initial immersion risk	Cold water shock	0-3 minutes
Phase 2	Short-term immersion risk	Swim failure	3-15 minutes
Phase 3	Long-term risk	Hypothermia	15-30 minutes
phase 4	Post-rescue risk	Collapsing	Hour after rescue

Source: British rowing 2007

3- Man overboard accidents around the world (USA, japan and UK)

Man overboard is one of the most 10 common accidents onboard Ships which cause losses of human lives, in spite of all safety precaution on board ships which have been improved a lot in the last decades. Furthermore, safety precautions are mentioned in the Code of Safe Working Practices for Merchant Seafarers 2015 edition. It advises all seafarers to wear lifejackets or 0working vest that do not restrict free movement during work. A working lifejacket, a personal flotation device or a buoyancy aid should be worn, where and when necessary.

Any seafarer is required who goes on deck for any reason during adverse weather conditions, should wear a lifejacket suitable for working. Any person working aloft must be wearing a safety harness and working life jacket.

Despite all these precautions and advice, MOB incidents are still prevalent. To be precise, it is the first kind of accidents that affect seafarers' life and leads to loss of human life. Some of the victims are lost till now. This is a further evidence that shows how serious this accident is, according to marine accident investigation branch in the United Kingdom (MAIB), there have been around 21 persons who fell overboard between the years 2013 to 2016. The South Australian Department of Transport, report. Man overboard incidents are more frequent than most people think and the most recurring result is death. According to a recent five-year study, 15% of MOB accidents that

needed rescue assistance were from recreational power crafts, 18% were from sailing pleasure crafts and the remaining percentage was from fishing vessels and commercial ships.

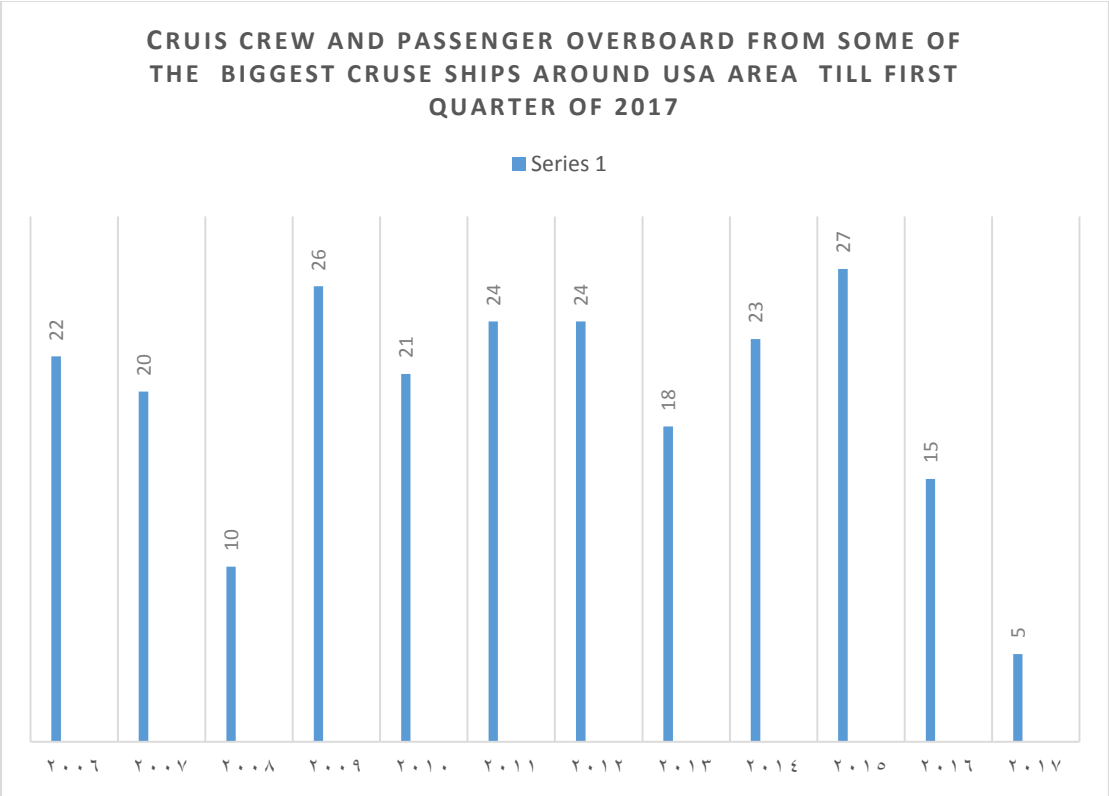

Fig. (1) Cruise Crew and passenger overboard from some of the biggest cruise ships around (USA) area till first quarter of 2017
Source: (Sedria, 2017)

Fig. (1) Shows that from 2006 to 2017 there have been 235 MOB accidents onboard some of the largest cruise ships around the USA. Some of those victims are still missing up till now, taking into account the large number of search and rescue centers found in this area as a result of the number of the cruise, passenger ships. (Renee, 2017)

Man Overboard accidents (MOB) have been recognized as the main cause of marine fatalities. MOB accidents are an obvious direct danger to all those who work on vessels and offshore rigs. Almost 30% of all deaths in the oil &gas offshore industry all over the world are caused by MOB accidents. Some of the reasons why MOB accidents occur are as follows: supply boat accidents, crane failure, helicopter ditching and other marine accidents, equipment failure, lack of adequate worker training, insufficient safety precautions, and lack of regular maintenance can all take part in causing fatal MOB accidents. (Health and Safety Executive.2010)

In Japan, the number of fatal and injury accidents related to onboard ships activity, which happened during the period from June 2008 to June 2012, in which the board conducted investigations was carried for 95 ships. (Japan Transport Safety Board, 2012)

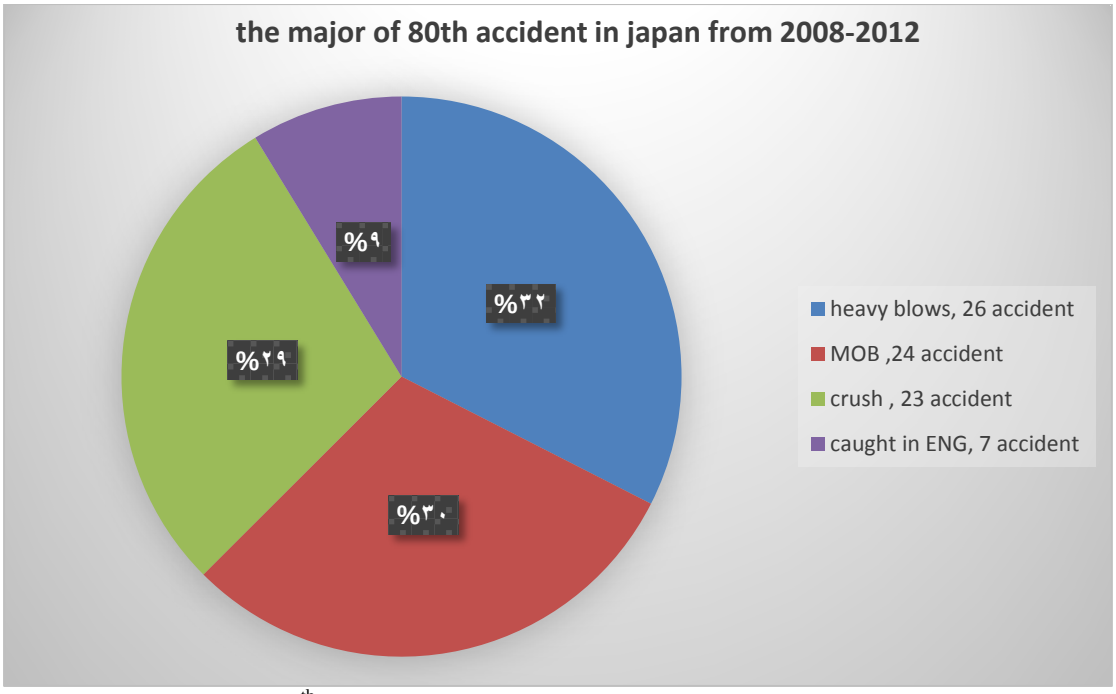

Fig. (2): The Major of 80th Accident in Japan from 2008-2012
Source: (Japan Transport Safety Board, 2012)

From figure 2 it is clear that MOB accidents come in the 2nd stage of the most common accidents by 24 injuries which represent around 30% of the total accidents.

3.1 - Man overboard accidents due to boating activity

Some areas like USA has a lot of boating activities such as sports like fishing and tourism. There are a lot of accidents that happen because of those activities.

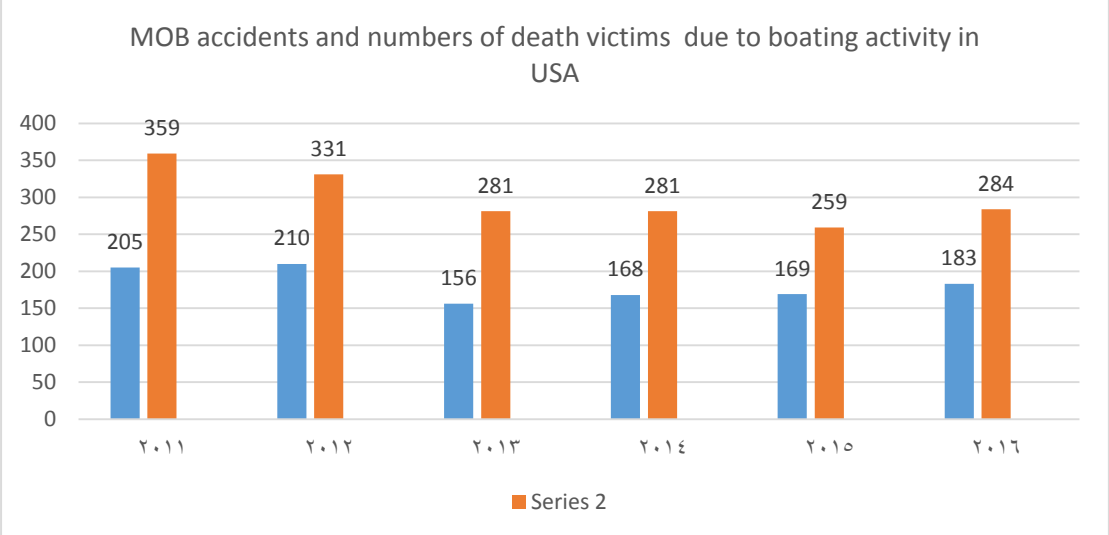

Fig. (3): MOB Accidents and numbers of death victims Due to boating activity in USA
Source: (U.S department of homeland security 2011to 2016)

In fig. (3): from 2011 to 2016 there were1795 falling overboard accidents which happened in the USA. The number of victims involved in those accidents is 1091 which represents 60%, and that is a huge percentage. (Recreational boating statistics; USA coast guard annual reports)

Every year about 165 people die around the UK coastline and a massive number of those deaths is most probably because of cold water shocks. According to Professor Mike Tipton, cold water shocks is one of the major stresses you can put your body under; cold water kills and it rapidly kills. These shocks can take place at temperatures below 15°C.Sea temperature rises slower than air temperature. Even on the south coast of England which is warm to some extent sea temperatures do not go up to more than 15°C. Also in many parts of Scotland and Northern Ireland, the sea surface's temperature is always below 15°C all year long. (Royal National Lifeboat Institution Aug.2016)

3.2 - Survival chances for MOB:

Unfortunately, the majority of cases, valued by 85 to 90 %, end in death - particularly on cruise ships. Sea survival expert Mike Tipton, a Professor at the University at Portsmouth and co-author of essentials of sea survival, points out the variables like the height of the fall (that can cause trauma through crashing to a part of the ship), the temperature of the water, and the sea state and weather conditions (visibility included). All of these factors contribute in the likelihood of survival in addition to the rescue team response time and the passenger's psychological state and swimming abilities. Most fatalities are due to physiological responses to the extremely cold seawater, responses including a cold shock, gasp response and the physical impairment that occurs during the first few minutes' right after hitting the water and later on, the possibility of hypothermia taking place. "The best thing you can do in the first few minutes of immersion, is try to rest, relax, float," he says. "Proposing that limiting movement and preserving energy is the best strategy to raise the odds of survival" he added. (Royal National Lifeboat Institution, Aug 2016)

4- Avoidance of the risk in case of falling overboard

If the falling passes the critical time safely, then the injured got a good chance for recovery. Before death due to hypothermia. So, the injured should stay calm and breathe deep and quite. The person must also try not to lose body temperature by moving much which leads to the rate of losing heat. Must wear a flotation device like a life jacket or working vest it greatly increases the chances to pass the elementary shock stage, raising the hand above the water and will keep the person alive when cold prevents you from swimming. However, the flotation device, whatever it is, does not protect the human body from the hypothermia's effect.

4.1 - Prevention is the best cure

The panic condition of the person and the time for recovering the MOB are very important elements and must be highly considered. This depends on the type of MOB maneuvering and ship turning circle characteristic essentially during different loading condition, besides the time required to launch the survival craft especially if the falling person was not observed due to any reason.

The life jacket or work vest is recommended to be worn during daily routine work activities, but both of them do not protect from hypothermia. For example, due to boating activity in the

period of 5 years from 2011 to 2016, there were 51 persons who died due to hypothermia and that shows in figure 4.

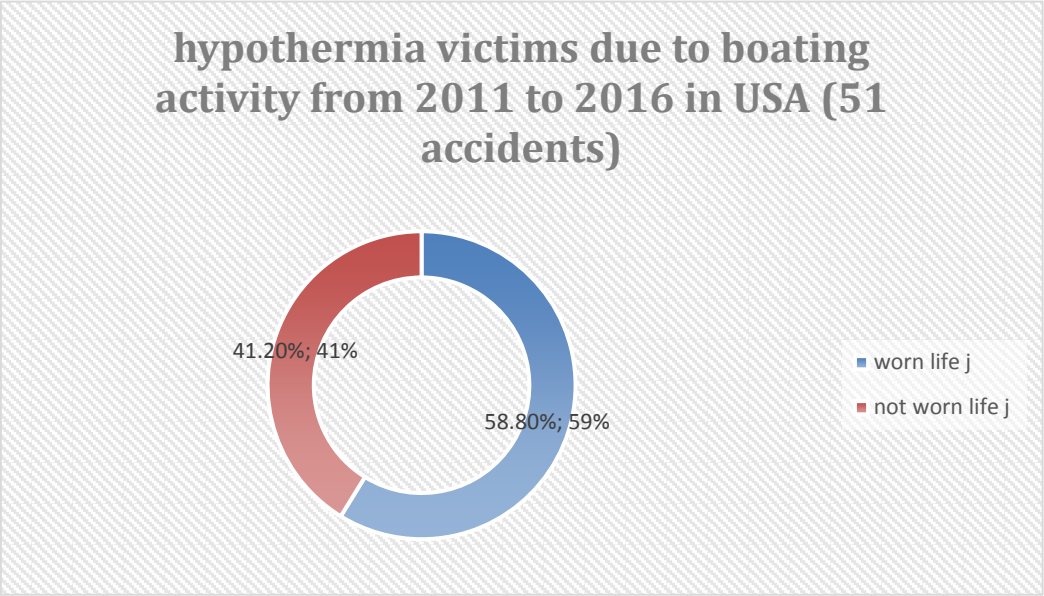

Fig. (4): Hypothermia victims due to boating activity from 2011 to 2016

Source: recreational boating statistics; USA coast guard annual reports

4.2 - Minimizing the risk of losing life onboard (PFD)

Some personal life saving appliances, while useful during abandon ship situation and falling overboard, are only effective if the fallen person is immediately observed. An example would be, life jacket and all types of life buoys. However, they fail to provide any protection against hypothermia. Meanwhile immersion suit is the only personal life saving appliance that provides both kinds of protection, yet it may be cumbersome to wear especially during daily routine work which requires technical hand skills. Personal flotation device provide, the two type of protection, enabling the injured person to float and to be protected above the water from hypothermia.

With a view to minimize the loss of life, we need to know what should be ensured to the person who has fallen. A floatation device is to be worn during falling and it must be a bright color to be easy to discover. It protects the victim from hypothermia by keeping the person without direct contact with water or in other words, to be floating totally above the water- not immersed in water. These features are available in personal safety equipment, but individually, there is no single unit that provides all of these features and that is light in weight as well.

Fig 5 shows the future of maritime safety system, it was successfully launched with an impressive industry reaction to the introduction of the Device. The launching of it gained a great international interest. Personal Overboard Survival System is considered as a unique solution and a top-notch achievement in the drive to prevent losses of life at sea. Also, it is a one-of-a-kind system of its type worldwide. It is made to improve the chances of survival

Fig (5): Flotation Device (Cobham, 2014)

in the man overboard (MOB) situations, vessel abandonments and helicopter ditching, when the time passed in water is directly associated with the likelihood of survival. It protects MOB against drowning, hypothermia, exposure to sea spray and extremely cold winds. Since it is predictable and easy to use, it permits the MOB to take themselves out of the water in the matter of as little as 60 seconds. The lightweight system is tailor-made for the easy usage on offshore support and crew transfer vessels, merchant vessels transport helicopters and workboats. After awarded the certificate of compliance from Lloyd's Register, the wearable PFD (Personal Floatation Device) is ready for international use. It is considered an IMO compliant personal life-saving appliance. (Cobham, 2014)

4.3 - The preference of PFD

It is a person overboard survival system. It is considered a complete wearable water survival system. It is used by individuals working above or near water.

The system supplies various means of floatation that ensure an effective decrease of losses of life.

1- It includes both an inflatable life jacket which is SOLAS-approved. It is tied to a personal life raft into a single compact light-weight vest.

2- In less than 60 seconds, the MOB could be above the water surface and stay over into the raft.

3- IT can be either activated manually or automatically with immediate contact with water.

4- To provide a better protection from hypothermia than any other personal LSA such as life jackets, life buoys and immersion suits.

5- Buoyancy for the life vests is 151 Newton and 801 Newton for the rafts.

6- Compliance with IMO A-520 (13) and its update for Personal Life-Saving Appliances.

7- Easy detection during search and rescue operation because of its height above the water, particularly during rough sea comparing with a life jacket and a life buoy.

8- Protects the person from wind effects.

Fig. (6): PFD wore
Source: (Cobham, 2014)

9- Comfortable during daily work in normal activity like mooring, anchorage, painting, and deck maintenance. Moreover, it can be worn as safety belt or safety harness.

Conclusion:

MOB is the most common event in various marine activities. Victims of this type of accidents are subjects to trauma, panic, drought and drinking water, taking into account the sea's temperature in the areas at the time of the accident. This type of accidents occurs in all types of ships and offshore units, also marine activities with the neglect of the load factor and height. This type of accidents has not been reduced in recent years, despite the practice of maritime institutes and the training of ships provided for in international conventions.

Persons falling overboard from a ship do not lead to immediate death, but death occurs as a result of other factors. The first is the caused by the tension and the psychological factor by the negative feeling caused by the growing fear over time. This feeling arises especially in the case of a person falling overboard and falls into despair that there's no hope in anyone observing him during the falling. Some personal life-saving appliances as life jackets and life buoys are highly effective during crises, falling overboard or the cases of abandoning ships for instance. The only problem with the formerly mention appliances is that it doesn't protect victims against hypothermia which is said to be the main aspect for most causality cases. The only thing that protects against hypothermia is the immersion suit which can't be worn at all times. Luckily, the release of the most innovative personal floatation device provides both types of protection. It enables the victim to be floating above the water's surface and protected from hypothermia as well.

Recommendations:

In order to minimize the number of injuries and loss of life by hypothermia, drowning due to falling overboard seafarers onboard ships must be provided with some PFD which can combine

floatation with body protection from hypothermia and is easy to work with during daily work routine.

- Provide SOLAS ships by PFD to replace working life jacket (or work vest).
- PFD must be worn during daily work on deck
- PFD should be worn at port when the ship is alongside or at anchor.
- All crew of fishing ships and fishing boat especially those who work in the cold weather must be provided with PFD.
- Crafts which are involved in boating activity can be provided with PFD with modification to stop automatic inflation (to be manual only).
- Review the personal flotation device onboard (Vessels, OSV or AHTS) which is involved in dangerous work like towing, or anchor handling.

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Service Quality as a Mediator between Interactivity, Simulation and Students' Satisfaction

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Abstract

This research aims at evaluating the current services provided in the training courses of maritime transport department, college of Maritime Transport and Technology, Arab Academy for Science, Technology and Maritime Transport (AASTMT). Also, the paper attempts to test the impact of Interactivity in training and Simulation-Based Services provided on the Students' satisfaction. In addition, the mediation impact of perceived quality between both; Interactivity and Simulation-Based Services on one side and students' satisfaction on the other side is investigated. Results show a significant impact of both; Interactivity and Simulation-Based services on Students' Satisfaction. Finally, it is shown that there is a partial mediation of perceived quality between Interactivity, Simulation-Based Services and students' satisfaction.

Keywords: Training Quality, Perceived Quality, Education Training, Students' Satisfaction.

المستخلص

يهدف هذا البحث إلى تقييم الخدمات الحالية المقدمة من خلال الدورات التدريبية لقسم النقل البحري، كلية النقل البحري والتكنولوجيا بالأكاديمية العربية للعلوم والتكنولوجيا والنقل البحري. كما يختبر هذا البحث تأثير التفاعل في التدريب وخدمات المحاكاه على مستوى رضا الطلاب. وبالإضافة إلى ذلك، يقوم هذا البحث بدراسة تأثير دور جودة الخدمة المدركة كوسيط بين كل من التفاعل وخدمات المحاكاه من جانب ورضا الطلاب من الجانب الآخر. وتظهر النتائج تأثيرًا كبيرًا لكل من التفاعل وخدمات المحاكاه على رضا الطلاب. كما أن هناك تأثير للجودة المدركة كوسيط جزئي بين التفاعل وخدمات المحاكاه ورضا الطلاب

1. Introduction

The education sector is playing an increasingly important role in developing the manpower and the economy of countries. Thus, there is an increasing interest in student satisfaction globally and a number of studies have investigated student satisfaction with a variety of focuses. The need to recruit and retain students has become highly important in recent years. By identifying the role of service quality, interactivity and simulation which lead to student satisfaction, universities will be more successful in both attracting and retaining students. However, strategies developed from those factors must also enhance teaching and learning to be able to increase student satisfaction. This raises a complex range of issues in higher education as the need to balance student expectations around teaching with the

imperative for providing high-quality learning outcomes in consumer-driven societies poses many challenges (Poon and Brownlow, 2015).

The factors of service quality, interactivity and simulation that may lead to students' satisfaction are discussed below as they are considered as the one affecting student's satisfaction. As a maritime transport department, it is highly concerned with practical work rather than training which is not based on simulation to reach an excellent level of facing challenges that seafarers may be exposed to while they are at sea. The researcher will study training courses quality with a focus on the technical parts that students are highly concerned with. These parts are defined through a pilot study as Interactivity and Simulation-Based Services. The following sections will study students' satisfaction in details as well as factors that are supposed to impact students' satisfaction in the maritime field.

1.1 Students' Satisfaction

Customer satisfaction is defined as the attitude resulting from what customers believe should happen (expectations) compared to what they believe did happen (performance perception) (Kuo et al., 2009). Satisfaction reinforces quality perception and drives students' enrollment. It is generally accepted that customer satisfaction is the product of some type of evaluation process by the customer. It was observed that more recently researchers have viewed customer satisfaction as a summary of emotional and cognitive responses that pertain to a particular focus (such as expectations or actual experiences), which occur after consumption or after accumulative experiences (Clemes et al., 2011).

Satisfaction can be measured as an overall feeling or as satisfaction with the elements of a transaction (Chen and Tsai, 2007). Student satisfaction is defined as "*the favorability of a student's subjective evaluation of the various outcomes and experiences associated with education. Student satisfaction is being shaped continually by repeated experiences in campus life*" (Annamdevula et al, 2016).

In the context of higher education, students are regarded as the primary customers. It was argued that student satisfaction is a short-term attitude based on an evaluation of their experience with the education service supplied supply of teaching/learning materials. Student satisfaction is not determined solely by the students' teaching and learning experiences but rather by their overall experiences as a customer of a particular institution (Wilkins and Stephen, 2013).

1.2 Perceived Quality

Perceived service quality is the result of comparing expectations and perceptions (Ali et al., 2016). It has been rightly pointed out that analyzing students' perceptions of service quality with a marketing approach may assist in attracting and retaining students (Ali et al., 2016).

The American Society for Quality defines quality as the totality of features and characteristics of a product or service that bears on its ability to satisfy given needs (Yilmaz et al., 2010). Such definition was then developed in several ways; one of which is that service quality is the total evaluation of an organization providing a

certain service, where the evaluation is the result of the comparison between the organization's actual performance and the customer's general expectations of how the organization was supposed to be performing (Deng et al., 2010).

Applied to the context of higher education, service quality was defined as "the difference between what a student expects to receive and his/her perceptions of actual delivery" (Caroll and Birch, 2013). It was pointed out that students' perceived service quality is an antecedent to student satisfaction. The academic literature postulates that positive perceptions of service quality can result in student satisfaction and satisfied students may help attract new students through engaging in positive word-of-mouth (WOM) communication and may return themselves to the university to take further courses (Strayhorn, 2008).

1.3 Interactivity

Interaction among peers is vital in any learning program. Collaboration is an important part in most of the innovative courses delivered. Groups of learners interact and develop the attributes of a 'virtual learning community' even though they may never meet in the same place or same time. Collaboration was defined as the process of shared creation of two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own. Besides having group discussions with their peers, students need to interact with their tutors to seek clarifications on any issues pertaining to their lessons and also to ensure that they are progressing in the 'correct path'. It had been highlighted that importance should be given to student and instructor interaction which affects how well student learn. one of the components of a successful online introductory statistics course is student-professor interaction (Saminathan and Goolamally, 2013).

Researchers found that if students actively engage in discussing with their peers, they will gain a lot of benefits (Orawiwatnakul and Wichadee, 2016). In general, e-learning is often chosen to give learners flexibility and control over the content and schedule of training. Providing learners with control over the training program affects how they interact with and perceive the training content (Karim & Behrend, 2015).

1.4 Simulation-Based Services

Educational programs are rapidly changing which require a good understanding of such changes to be able to make decisions on how best to meet these changes (Dörnyei & Ushioda, 2013). Accordingly, Simulation Based Learning is considered as a major power of problem based learning. Key applications for simulation, such as training, decision support, procedure and mission planning will continue to be paramount for industry and will increase competency of seafarers. Real life training using real equipment presents a number of challenges. Increased risk to personnel and equipment combined with limited access to required marine assets and related escalating costs is creating increased demand for simulation technology (Panayides, 2006).

Simulation under highly realistic circumstances presents a safer and more cost-efficient training alternative. Simulation has already proven its effectiveness and is, without doubt, the future of maritime training. Due to the almost unlimited possibilities provided by simulation, better results can be achieved in a safer, more efficient manner, which in turn produces higher quality personnel (Sibert, et al., 2012).

2. Literature Review

Student satisfaction level has become a major focus of researchers in the competitive learning environment owing to its strong impact on the success of educational institutes and prospective

student's registration since the past few decades. Plentiful research available provided different conceptualizations and arguments on what the student satisfaction level is and how is it measured by universally accepted models (Weerasinghe and Fernando, 2017).

In the context of higher education, the concept of regarding students as customers of higher education service providers is not a new idea. Various researchers have suggested that students are primary customers and partners in the higher education sector as they consciously choose and buy services. According to Sapri et al. (2009), student satisfaction plays an important role in determining the accuracy and authenticity of the services being provided. This was further supported by Barnett (2011) who stated that satisfaction of students is important as it is the only performance indicator of service quality for service providers of higher education. Moreover, student satisfaction is a short-term attitude which results from their experience with the education services received (Sultan and Wong, 2013).

There are many ways to explain the facets of student satisfaction. As an example, Kaldenberg et al., (1998) looked at factors such as coursework quality, non-curriculum events and other university-related factors as determinants of student satisfaction. Moreover, Appleton-Knapp and Krentler (2006) divided factors influencing student satisfaction into institutional factors and personal factors. Institutional factors included quality of instruction, quality and promptness of the instructor's feedback as well as the clarity of his/her expectations, the teaching style of the instructor, the research emphasis of the institute and the size of classes. Personal factors that were found to be predictors of student satisfaction were age, gender, employment, temperament, preferred learning styles and students' average grade point. Therefore, in order to ensure students are satisfied, higher education service providers have to consider both institutional and personal factors (Chahal and Devi, 2013).

Students' satisfaction is achieved when real performance of educational services exceeds student expectations. Student expectations are student expectations of the quality of services provided by educational services while performance is the real performance of the service quality provided by educational services. The main predictors of student satisfaction with educational services are performance of faculty, staff and classes (Andrew and Leonard, 2011).

The above definitions mentioned means that students satisfaction is related to the perceived service quality by students regarding the educational process. Thus, it depends on their experience to consider a certain university rather than another. Therefore, this research studies the relationship between service quality and students' satisfaction, as well as the relationship between Interactivity and students' satisfaction. Service quality in the field of higher education is particularly essential and important. It is an established fact that positive perceptions of service quality have a significant influence on student satisfaction. Satisfaction can be viewed as a state felt by a person who has experienced performance or an outcome that fulfills his or her expectation. Both quality and quantity of interaction with the instructor and peers are crucial to the success of courses and student satisfaction. Similarly, students' perception of interaction is the critical predictor of satisfaction in a course. On the other hand, social presence is a strong predictor of satisfaction (Weerasinghe and Fernando, 2017).

In general, this research aims at investigating the importance of such factors in the satisfaction of trainees in

the Arab Academy for Science, Technology and Maritime Transport (AASTMT). This study will apply some statistical tools to figure out the important factors affecting students' satisfaction. Finally, a discussion of the results and findings will be provided with recommendations for further research.

3. Research Framework

A survey is done through a questionnaire provided to student of Maritime Transport Department of AASTMT. The questionnaire included four main parts; Satisfaction, Training quality, Simulation-Based Services and interactivity. All questionnaires were delivered in person by the researcher to the students in training class in the period of the study. Questionnaire is provided to 600 students in the period of the study from September to December, 2017, where 532 respondents are only considered in the study after excluding questionnaires with missing responses.

In the questionnaire assigned, the questions were adopted to measure the dimensions under study by implementing a 5-point Likert -scale used for all responses with (1 = weak, 2 = average, 3 = good, 4 = very good, 5 = excellent). Thus, the literature had been reviewed and the following hypotheses were raised for testing:

H_1: Interactivity significantly affects students' satisfaction in maritime transport training.

H_2: Simulation-Based Services significantly affect students' satisfaction in maritime transport training.

H_3: Perceived Training Quality significantly affects satisfaction in maritime transport training.

H_4: Perceived Training Quality significantly mediates the relation between Interactivity and Students' Satisfaction.

H_5: Perceived Training Quality significantly mediates the relation between Simulation-Based Services and Students' Satisfaction.

Accordingly, the research framework could be presented using the following figure:

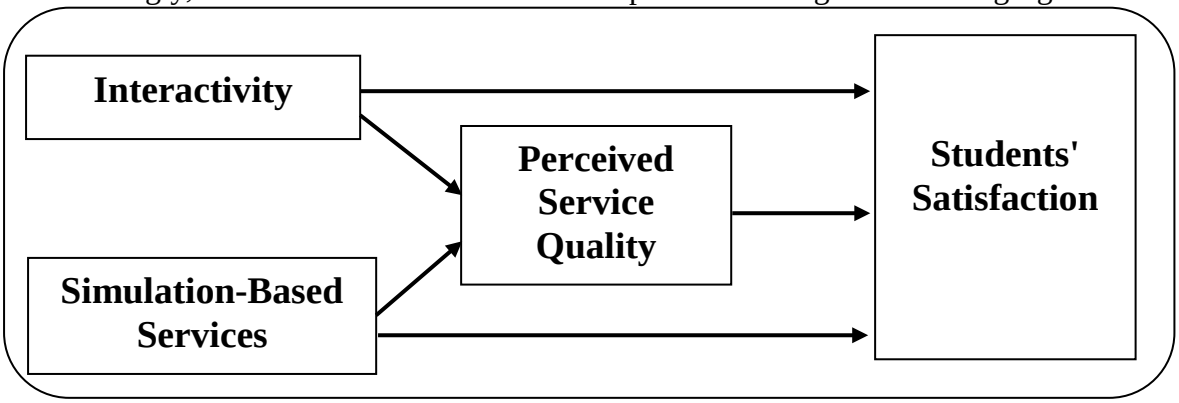

Figure (1) : Research Conceptual Diagram for the Current Study

4. Data Analysis and Results

To test the hypotheses mentioned above, the current research used regression analysis. This requires testing the validity and reliability of the research variables as well as presenting a descriptive analysis of the research variables under study. After that, the researcher will present the hypotheses testing through the model constructed using regression analysis.

4.1. Descriptive Analysis

Table (1) provides the frequency table for the research variables, where it could be found none of the students in the sample

under study see the training quality, Interactivity, Simulation-Based Services as weak. Also, relatively larger percentage of the sample, about 76 % are ranked between excellent and very good. Yet, there is a valid percentage of the sample under study that could see that the dimensions under study are ranked between average and good (around 22%).

Table (1): Frequency Table for Research Variables

Variable	Mean	St. Dev.	Frequency					Total
			Excellent	V. Good	Good	Average	Weak	
Training Quality	4.124	0.891	162	243	116	11	0	532
Interactivity	4.321	0.987	202	223	99	8	0	532
Simulation-Based Services	4.056	0.888	287	209	45	0	0	532
Students' Satisfaction	3.897	0.983	161	205	129	36	1	532

4.2. Data Testing

Table (2) shows the results of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO), Average Variance Extracted (AVE) and Factor Loading (FL) for each variable and the corresponding constructs. It could be observed that the KMO and AVE values are all above 50% and the FL are all above 0.4, which means that the research variables have adequate convergent validity. Reliability test is an assessment of the degree of consistency between multiple measurements of a variable. Cronbach's alpha is the most widely used reliability measurement tool with a generally agreed lower limit of 0.7. Table (2) also provides an overview of the reliability scores. As can be seen from this table, all the alpha coefficients were above the required level of 0.7.

Table (2): KMO, AVE, factor Loadings and Cronbach's Alpha of items

Variables Under Study	Number of Items	KMO	AVE	Items	FL	Cronbach's Alpha
Training Quality	4	0.810	70.359	Item 1	0.749	0.857
				Item 2	0.750	
				Item 3	0.750	
				Item 4	0.566	
Simulation-Based Services	3	0.689	71.023	Item 1	0.637	0.787
				Item 2	0.770	
				Item 3	0.724	
Interactivity	3	0.716	73.449	Item 1	0.706	0.814
				Item 2	0.751	
				Item 3	0.746	
Satisfaction	2	0.500	79.887%	Item 1	0.799	0.709
				Item 2	0.799	

4.3. Hypotheses Testing

In this section, the findings of the model significance are presented through the correlation and regression analysis. This will provide a decision whether to accept or reject the hypotheses under study.

4.3.1 Testing the First Hypothesis

This hypothesis is designed to test the impact of Interactivity on Students' satisfaction. Table (3) shows the correlation matrix between the two variables, where it was found that there is a significant, positive and moderate relationship between Interactivity and Students' satisfaction, as P-value = 0.000 and r= 0.535.

Table (3): Correlation Matrix between Interactivity and Satisfaction

		Interactivity	Satisfaction
Interactivity	Pearson Correlation	1	
	P-Value		
Satisfaction	Pearson Correlation	.535**	1
	P-Value	.000	

Also, table (4) shows the regression analysis of the impact of Interactivity on Students' satisfaction, where it was found that there is a significant impact of Interactivity on Students' satisfaction (B= 0.755, P-value = 0.000). Also, R square was found to be 0.357, which means that 35.7% of the variation in Students Satisfaction is explained by Interactivity.

The regression equation could be stated as follows:

Students Satisfaction =0.755*Interactivity + 0.901

Thus, the first hypothesis was accepted, which is:

H_1: Interactivity significantly affects students' satisfaction with training in maritime transport.

Table (4): Regression Analysis of Interactivity on Students' Satisfaction

	Unstandardized Coefficients		T	P-Value	R Square
	B	Std. Error			
(Constant)	.901	.087	10.309	.000	0.357
Interactivity	.755	.052	14.592	.000	

4.3.2 Testing the second Hypothesis

This hypothesis is designed to test the impact of Simulation-Based Services on Students' satisfaction. Table (5) shows the correlation matrix between the two variables, where it was found that there is a significant, positive and moderate relationship between Simulation-Based Services and Students' satisfaction, as P-value = 0.000 and r= 0.585.

Table (5): Correlation Matrix between Interactivity and Satisfaction

		Simulation-Based Services	Satisfaction
Simulation-Based Services	Pearson Correlation	1	
	P-Value		
Satisfaction	Pearson Correlation	.585**	1
	P-Value	.000	

Also, table (6) shows the regression analysis of the impact of Simulation-Based Services on Students' satisfaction, where it was found that there is a significant impact of Interactivity on Students' satisfaction (B=0.687, P-value = 0.000). Also, R square was found to be 0.521, which means that 52.1% of the variation in Students Satisfaction is explained by Simulation-Based Services.

4.3.3 Testing the third Hypothesis

This hypothesis is designed to test the impact of Training Quality on Students' satisfaction. Table (7) shows the correlation matrix between the two variables, where it was found that there is a significant, positive and moderate relationship between Training Quality and Students' satisfaction, as P-value = 0.000 and r= 0.660.

Table (6): Regression Analysis of Simulation-Based Services on Students' Satisfaction

	Unstandardized Coefficients		T	P-Value	R Square
	B	Std. Error			
(Constant)	.819	.082	9.935	.000	0.521
Simulation-Based Services	.687	.041	16.613	.000	

The regression equation could be stated as follows:
Students Satisfaction = 0.687* Simulation-Based Services + 0.819
Thus, the second hypothesis was accepted, which is:
H_2: Simulation-Based Services significantly affect students' satisfaction with training in maritime transport.

Table (7): Correlation Matrix between Quality and Satisfaction

		Training Quality	Satisfaction
Training Quality	Pearson Correlation	1	
	P-Value		
Satisfaction	Pearson Correlation	.660 **	1
	P-Value	.000	

Also, table (8) shows the regression analysis of the impact of Training Quality on Students' satisfaction, where it was found that there is a significant impact of Interactivity on Students' satisfaction (B=0.773, P-value = 0.000). Also, R square was found to be 0.634, which means that 35.7% of the variation in Students Satisfaction is explained by Training Quality.

Table (8): Regression Analysis of Training Quality on Students' Satisfaction

	Unstandardized Coefficients		T	P-Value	R Square
	B	Std. Error			
(Constant)	.570	.080	7.103	.000	0.634
Training Quality	.773	.038	20.234	.000	

The regression equation could be stated as follows:
Students Satisfaction = 0.773* Training Quality + 0.570
Thus, the third hypothesis was accepted, which is:
H_3: Perceived Training Quality significantly affects satisfaction with training in maritime transport.

4.3.4 Testing the fourth Hypothesis

This hypothesis is designed to test the mediation impact of Training Quality between Interactivity and Students' satisfaction. To test this impact according to Sobel test, three steps are followed. First, testing the impact of Interactivity on Training quality; second, testing the impact of Interactivity on Students' Satisfaction; and third, testing the impact of both; Interactivity and Training Quality on Satisfaction. To find a mediation impact, the researcher should find a significant impact in the steps mentioned.

Table (4) showed the significant impact of Interactivity on students' satisfaction, which is the first step in mediation. Table (9) below shows the impact of Interactivity on Training Quality, which is the second step in testing the mediation. It was found that there is a significant impact of Interactivity on

Training Quality (B=0.713, P-value = 0.000). Also, R square was found to be 0.378, which means that 37.8% of the variation in Training Quality is explained by Interactivity.

Table (9): Regression Analysis of Interactivity on Training Quality

	Unstandardized Coefficients		T	P-Value	R Square
	B	Std. Error			
(Constant)	.842	.071	11.798	.000	0.378
Interactivity	.713	.042	16.885	.000	

The regression equation could be stated as follows:
Training Quality = 0.713* Interactivity + 0.842

Table (10) below shows the impact of Interactivity and Training Quality on students' satisfaction, which is the third step in mediation. It was found that there is a significant impact of both; Interactivity and training Quality, as P-values = 0.000, which are less than 0.05. This means that there is a partial mediation of Training Quality between Interactivity and Students' Satisfaction. Also, R square was found to be 0.710, which means that 71% of the variation in Students Satisfaction is explained by Interactivity and Training Quality. This means that the independent variable; Interactivity, is still significant in the presence of the mediator; Quality, implying a partial mediation of Quality in the relationship between Interactivity and Satisfaction.

Table (10): Regression Analysis of Interactivity and Training Quality on Satisfaction

	Unstandardized Coefficients		T	P-Value	R Square
	B	Std. Error			
(Constant)	.381	.085	4.488	.000	0.710
Interactivity	.314	.055	5.667	.000	
Quality	.618	.046	13.436	.000	

The regression equation could be stated as follows:

Students Satisfaction = 0.314* Interactivity + 0.618*Quality + 0.384

Thus, the fourth hypothesis could be accepted, which is:

H_4: Perceived Training Quality significantly mediates the relation between Interactivity and Students' Satisfaction.

4.3.5 Testing the fifth Hypothesis

This hypothesis is designed to test the mediation impact of Training Quality between Simulation-Based Services and Students' satisfaction. To test this impact according to Sobel test, three steps are followed. First, testing the impact of Simulation-Based Services on Training quality. Second step is testing the impact of Simulation-Based Services on Students' Satisfaction. Third step is testing the impact of both; Simulation-Based Services and Training Quality on Satisfaction. Table (6) showed the significant impact of Simulation-Based Services on students' satisfaction. Table (11) below shows the impact of Simulation-Based Services on Training Quality, where it was found that there is a significant impact of Simulation-Based Services on Training Quality (B=0.700, P-value = 0.000).

Table (11) Regression Analysis of Simulation-Based Services on Training Quality

	Unstandardized Coefficients		Standardized Coefficients	T	P-Value
	B	Std. Error	Beta		
(Constant)	.670	.062		10.760	.000
Simulation-Based Services	.700	.031	.697	22.406	.000

The regression equation could be stated as follows:
Training Quality = 0.700* Simulation-Based Services + 0.670

Table (12) below shows the impact of Simulation-Based Services and Training Quality on, where it was found that there is a significant impact of both; Simulation-Based Services and training Quality, as P-values = 0.000, which are less than 0.05. This means that there is a partial mediation of Training Quality between Simulation-Based Services and Students' Satisfaction. This means that the independent variable; Simulation-Based Services, is still significant in the presence of the mediator; Quality, implying a partial mediation of Quality in the relationship between Simulation-Based Services and Satisfaction.
The regression equation could be stated as follows:

Students Satisfaction = 0.285* Simulation-Based Services + 0.574*Quality + 0.434

Thus, the fifth hypothesis could be accepted, which is:
H_5: Perceived Training Quality significantly mediates the relation between Simulation-Based Services and Students' Satisfaction.

Table (12); Regression Analysis of Simulation-Based Services and Training Quality on Satisfaction

	Unstandardized Coefficients		Standardized Coefficients	T	P-Value
	B	Std. Error	Beta		
(Constant)	.434	.082		5.292	.000
Simulation	.285	.052	.243	5.478	.000
Quality	.574	.052	.491	11.071	.000

5. Discussion and Conclusion

The results showed above imply the importance of the dimensions under study; Interactivity, Simulation-Based Services and Training Quality with respect to Students' Satisfaction. This means that the department of Maritime Transport has to give high consideration for the three factors to be able to maintain and improve the level of students' satisfaction to increase the competitive advantage and retain students for further courses provided by the department. Also, it was found that there is a low percentage of students who ranked the dimensions between good and average, which is the zone that needs more efforts to be minimized to increase students' competitive advantage among institutes offering same courses that are provided by the maritime transport department of AASTMT. This was observed through the mean values as well, which are all around the value 4, referring to the zone of very good agreement.
In addition, it was found that there is a partial mediation of perceived quality between both; Interactivity and Simulation-Based Services on one side and Students' Satisfaction on the other side. This implies the importance of perceived quality and that a large portion

of the impact of both; Interactivity and Simulation-Based Services on Students' Satisfaction does happen through the existence of a desired level of perceived quality. A further study could be done to evaluate the current model obtained in each of the training courses provided. Also, a study could be done to evaluate the difference in the dimensions under study according to different training courses provided. In addition, a study could be done to evaluate the differences in the dimensions under study according to different demographics, such as: Age and experience.

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