

World Maritime University

The Maritime Commons: Digital Repository of the World Maritime University

World Maritime University Dissertations

Dissertations

10-31-2021

Investigation of the preparedness of maritime education and training institutions (METIs) of seafarer's top supplying countries in the introduction of the maritime autonomous surface ship (MASS)

Perlita Cinco

Follow this and additional works at: https://commons.wmu.se/all_dissertations



Part of the [Education Commons](#)

Recommended Citation

Cinco, Perlita, "Investigation of the preparedness of maritime education and training institutions (METIs) of seafarer's top supplying countries in the introduction of the maritime autonomous surface ship (MASS)" (2021). *World Maritime University Dissertations*. 1688.
https://commons.wmu.se/all_dissertations/1688

This Dissertation is brought to you courtesy of Maritime Commons. Open Access items may be downloaded for non-commercial, fair use academic purposes. No items may be hosted on another server or web site without express written permission from the World Maritime University. For more information, please contact library@wmu.se.

WORLD MARITIME UNIVERSITY

Malmö, Sweden

**INVESTIGATION OF THE PREPAREDNESS OF
MARITIME EDUCATION AND TRAINING INSTITUTIONS
(METIS) OF SEAFARER'S TOP SUPPLYING
COUNTRIES IN THE INTRODUCTION OF MARITIME
AUTONOMOUS SURFACE SHIP (MASS)**

By

PERLITA CINCO

Philippines

A dissertation submitted to the World Maritime University in partial
fulfilment of the requirements for the reward of the degree of

MASTER OF SCIENCE

in

MARITIME AFFAIRS

(MARITIME EDUCATION AND TRAINING)

2021

Declaration

I certify that all the material in this dissertation that is not my own work has been identified and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my personal views and are not necessarily endorsed by the University.

(Signature): 

(Date): 21 September 2021

Supervised by:

Supervisor's affiliation.....

Acknowledgements

Sing and praises to GOD ALMIGHTY who had always been at my side, for protecting me and my loved ones, for giving me all the courage, strength and perseverance.

I wish to express my heartfelt gratitude to those who have taken part in the success of my dissertation.

To my family especially to my ever-loving and supportive husband who have sacrificed a lot for taking all the responsibilities on my family and as a mother to our lovely daughter on my behalf. To my loving mother who served as my angel from above that moulded me to be a strong and independent woman. To my father that had supported all my endeavors in life.

To the faculty and staff of World Maritime University especially to my ever hardworking supervisor, Professor Inga Bartusevičienė, for patiently guiding me throughout my journey in making my dissertation. To Professor Michael Ekow Manuel, a second father to me, who had been very supportive of my decision.

To the people who had greatly contributed to my research, Ade Mardani Putra, Daniel Joseph Arulanthu, Mr. Junjun de Vera, Katina Benn, Daniel Sarzosa Vergara and Capt. Alfred Espinosa. To those who have assisted me in my data gathering Engr. Jose Rommel Claudio Chavez and Mr. Alipis. To my classmates, Hnin Oo Wai, Moises Erquiza, May Marfil, Huan Huan Song and Svitlana Shestova.

Last but definitely not the least, to my sponsor, TK Foundation, who had given me the opportunity to take my master's degree in World Maritime University through their scholarship grant.

Abstract

Title of Dissertation: **Investigation of the Preparedness of Maritime Education and Training Institutions (METIs) of Seafarer's Top Supplying Countries in the Introduction of Maritime Autonomous Surface Ship (MASS)**

Degree: **Master of Science in Maritime Affairs**

Looking back on the history of the shipping industry, seafarer's competency evolved with the technology onboard ship. To address the problem of safety, security and protecting the environment, the Maritime Autonomous Surface Ship (MASS) revolutionized the shipping industry. Seafarer's functions will be replaced by machines that require new competency of seafarers to man the automated ships.

This paper aims to investigate the preparedness of Maritime Education and Training Institutions (METIs) of top supplying countries of seafarers in providing the adequate number of seafarers with required competency for automated ships.

Systems Theory was used to identify the factors affecting the METI's preparedness in providing the required competency for seafarers in the introduction of MASS. Mix-method aids the researcher to have a deeper understanding of how the METIs function as a system and how the factors for preparedness affects the METIs in implementing the required competency of seafarers for MASS by comparing for validity and reliability complementing both the qualitative and quantitative data.

The investigation revealed that investing in resources without the regulatory framework is a waste of time and money due to uncertainties of future requirements in implementing the required competency of seafarers for MASS. In conclusion, respondent countries are waiting for the approval of regulatory framework and are not making any preparations for MASS but it can be observed that from the hierarchy as top suppliers of seafarers going down, their strategy on how to remain relevant in the future depends on their level in the hierarchy.

KEYWORDS: MASS, Preparedness, Maritime Education and Training Institution (METI)

Table of Contents

Declaration	2
Acknowledgements	3
Abstract.....	4
List of Tables	8
List of Figures.....	9
Chapter 1 Introduction	12
1.1. Introduction.....	12
1.2. Background and context	12
1.3. Problem Statement.....	13
1.4. Justification of the Research	13
1.5. Research aim and objectives	13
1.6. Research questions.....	14
1.7. Research methodology and methods	14
1.8. Significance of the research	15
1.9. Scope of the Research.....	15
1.10. Limitations	16
1.11. Structure of the dissertation	16
Chapter 2 Literature Review	17
2.1. Introduction.....	17
2.2. Why technology evolved	17
2.3. Evolution of seafarer’s competency with technology.....	17
2.3.1. Earliest time of navigation	18
2.3.2. Middle Age navigation	18
2.3.3. Modern time of navigation	19
2.3.4. Most Advanced Technology in Navigation	21
2.4. Human Error	21
2.5. Benefits of MASS	22
2.6. Challenge in the introduction of MASS	22
2.7. Introduction of MASS	23
2.8. Factors Affecting METIs Preparedness	23
2.8.1. External Factors Affecting METI	24
2.8.1.1. Regulatory Framework.....	24
2.8.1.1.1. International Framework	24
2.8.1.1.2. National Framework	25
2.8.2. Internal Factors Affecting METI	25
2.8.2.1. Resources	26
2.8.2.1.1. Financial Resources	26
2.8.2.1.2. Physical resources.....	27
2.8.2.1.3. Human Resources	28
2.8.2.1.4. Information Resources.....	29

2.9.	Conclusion	32
Chapter 3 Methodology and Methods		34
3.1.	Introduction.....	34
3.2.	Research Design	34
3.3.	Instrumentation	34
3.4.	Data Collection	35
3.5.	Sampling, selection of participants.....	35
3.6.	Research methodology.....	36
3.6.1.	Literature review	36
3.6.2.	Questionnaire Instrument.....	36
3.6.3.	Interview Instrument.....	36
3.7.	Data Analysis.....	37
3.7.1.	Quantitative Data Analysis	37
3.7.2.	Qualitative Data Analysis	37
3.8.	Research Ethics.....	38
Chapter 4 Findings		39
4.1.	Introduction.....	39
4.2.	Quantitative Data	39
4.2.1.	Respondent's Profile: Descriptive Statistics.....	39
4.2.2.	Quantitative Analysis.....	41
4.2.3.	Regulatory Framework	41
4.2.4.	Resources	42
4.2.4.1.	Financial and physical resources from government.....	42
4.2.4.2.	Financial and physical resources from non-governmental organization.....	43
4.2.4.3.	Fund from external sources.....	45
4.2.4.4.	Human resources.....	46
4.2.5.	Curriculum	47
4.3.	Qualitative Data	48
4.3.1.	Respondent's Profile: Descriptive Statistics.....	48
4.3.2.	Qualitative Analysis.....	49
4.3.2.1.	Stakeholders and their role.....	49
4.3.2.1.1.	MARAD	49
4.3.2.1.2.	Higher Education	50
4.3.2.1.3.	METI.....	51
4.3.2.2.	How the METI system works	51
4.3.2.3.	Preparedness of METI in the introduction of MASS.....	55
4.3.2.3.1.	Philippines	55
4.3.2.3.2.	India.....	57
4.3.2.3.3.	Chile.....	58
4.3.2.3.4.	Myanmar.....	59
4.3.2.3.5.	Guyana.....	60
4.3.2.3.6.	Indonesia.....	61
4.3.2.3.7.	China.....	61

4.3.2.4.	Challenges	62
4.3.2.5.	Outlook.....	63
4.3.2.6.	Preparedness of the government	65
Chapter 5 Discussion		67
5.1.	Introduction.....	67
5.2.	METI System.....	67
5.3.	Preparedness on MASS	70
5.3.1.	Regulatory Framework	70
5.3.1.1.	International Regulatory Framework	70
5.3.1.2.	National Regulatory Framework.....	70
5.3.2.	Resources	71
5.3.2.1.	Financial Resource	71
5.3.2.2.	Human Resource	72
5.3.2.3.	Physical Resources.....	73
5.3.2.4.	Knowledge resources	74
5.4.	Challenges.....	75
5.5.	Outlook on the introduction of MASS.....	76
Chapter 6 Conclusions and Recommendations.....		78
6.1.	Introduction.....	78
6.2.	Research Questions.....	78
6.2.1.	RQ1: How does the METI system work?.....	78
6.2.2.	RQ2: What are internal and external factors affecting the MET system that can be considered for preparedness in the introduction of MASS?	79
6.2.3.	RQ3: What are the challenges of the METIs in preparation for the introduction of MASS?	80
6.2.4.	RQ4: What is the outlook of seafarers and cadets on the introduction of MASS and how it will affect their competences?.....	81
6.2.5.	RQ5: What is the preparation of the government in the introduction of MASS?	81
6.3.	Conclusion	82
6.4.	Contribution to literature	82
6.5.	Recommendation	82
6.6.	Limitation and future research	83
References.....		84
Appendices.....		92
Appendix A:	Interview Instrument	92
Appendix B:	Interview Instrument	115
Appendix C:	Summary of Country's preparedness for MASS.....	118

List of Tables

Table 1. Evolution of Typical MASS	20
Table 2. External and Internal Factors Affecting METI's Preparedness in Providing Standard Education and Training to Seafarers	32
Table 3. A Summary of External Factors Based on Empirical Research	70
Table 4. A Summary of Factors Affecting METIs Based on this Research	79
Table 5. Challenges in the Preparedness of METIs in the Introduction of MASS ...	80

List of Figures

Figure 1. Data, Information, Knowledge and Wisdom Pyramid	30
Figure 2. Theoretical Framework of METIs in Providing Required Education and Training to Seafarers	33
Figure 3. Number of Respondent per Country.....	39
Figure 4. Working Environment of Respondents	40
Figure 5. Respondent's Occupation.....	40
Figure 6. Respondent's Working Experience.....	40
Figure 7. Respondent's Familiarity with MASS	41
Figure 8. Prioritization of Regulatory Framework for MASS	41
Figure 9. Preparedness of Regulatory Framework for MASS.....	42
Figure 10. Extent of Government Support to METI.....	42
Figure 11. Resources Expected with Slight Support from the Government.....	43
Figure 12. Resources with Moderate Support from the Government.....	43
Figure 13. <i>Expected Support from the Non-Government Organization</i>	44
Figure 14. Resources Expected with Slight Support from the Non-government Organization	44
Figure 15. Resources Expected with Moderate Support from the Non-government Organization	44
Figure 16. Available Facilities of METIs in Delivering Standard Training for Seafarers	45
Figure 17. Likelihood of METIs to Seek Fund from Outside Sources.....	45
Figure 18. Qualified Lecturer for MASS	46
Figure 19. Qualified Lecturer for MASS Working in Full-time Basis	46
Figure 20. METIs Probability to Hire Part-time Lecturer Qualified for MASS.....	47
Figure 21. Qualified Lecturer for MASS Working in Part-time basis.....	47
Figure 22. METIs Extent to Consider Designing Curriculum for MASS	48
Figure 23. MASS Related Courses Offered by METIs	48
Figure 24. Respondent's Profile of Qualitative Instrument.....	49
Figure 25. METI System Gap Analysis	69

List of Abbreviations

AIS	Automatic Identification System
BIMCO	Baltic and International Maritime Council
CHED	Commission on Higher Education
DCAF	The Geneva Center for Security Sector Governance
DIKW	Data, Information, Knowledge, Wisdom
ECDIS	Electronic Chart Display and Information System
EMSA	European Maritime Safety Agency
GPS	Global Positioning System
ISM	International Safety Management
ICS	International Chamber of Shipping
IMO	International Maritime Organization
LORAN	Long Range Navigation
MARAD	Maritime Administration
MARINA	Maritime Authority Industry
MARPOL	International Convention for the Prevention of Pollution from Ships
MASS	Maritime Autonomous Surface Ship
MNTB	Merchant Navy Training Board
MPA	Maritime and Port Authority
MSC	Maritime Safety Committee
METI	Maritime Education and Training Institute
MHEI	Maritime Higher Education Institution
MoE	Ministry of Education
MTI	Maritime Training Institute
NYK	Nippon Yusen Kaisha
OECD	Organisation for Economic Co-operation and Development
OILPOL	International Convention for the Prevention of Pollution of the Sea by Oil
REC	Research Ethics Committee
SOLAS	Safety of Life at Sea

STCW	Standards of Training, Certification and Watchkeeping
TPME	Technical Panel for Maritime Education
UN	United Nations
UK	United Kingdom
WMU	World Maritime University

Chapter 1 Introduction

1.1. Introduction

How well prepared are the METI's in providing new competency requirements for seafarers in the introduction of MASS? Seafarer's competency must be synonymous with the evolution of technology in the shipping industry. The challenge on the METIs of top supplying countries of seafarers is their preparedness in providing an adequate supply of seafarers in the market with the required competency for MASS. Preparedness in this context is the preparedness of METIs in providing the required education and training for seafarers in the introduction of MASS.

1.2. Background and context

Man's creation of varying tools from stone to microchips was astonishing. Technology evolved with the evolution of humankind that brought industrial revolution from the use of steam power (Muhuri et al., 2019) followed by the utilization of electrical energy for mass production, the third was the automatic production with the aid of electronic and internet and the fourth is known as Industry 4.0, replacing the human function with machines (Lu, 2017).

Technological development is assumed as necessity and utility to cope with the environment that had brought challenges, opportunities and solutions in many domains (Catal and Tekinerdogan, 2019) to include the maritime industry which is the introduction of MASS. Technology serves as an aid of seafarers for navigational safety. However, despite the technology onboard, human error had been recorded as the highest percentage that causes maritime accidents (Ćorović, B. & Djurović, P., 2013). The International Maritime Organization (IMO) instruments had contributed to reduce accidents at sea (Chan et. al., 2016). IMO as a specialized agency of the United Nations (UN) is responsible for the safety, security and prevention of pollution at sea (IMO).

MASS has a high level of safety of crew, efficiency of ships' operation and economic advantage that has the potential in providing solutions for problems in the maritime industry (Basak, 2017). The predicted additional demand of officers (BIMCO and ICS, 2021) and the fast-changing pace of the introduction of technology in the shipping industry is a challenge to the METIs of top supplying countries to ensure an adequate supply of qualified and competent seafarers to man the MASS.

1.3. Problem Statement

The Maritime Safety Committee (MSC), has approved the Outcome of the regulatory Scoping Exercise for the use of MASS, it provides the assessment of the degree to which the existing regulatory framework might be affected to address MASS operations (IMO, 2021).

The gradual introduction of new skills and competences required in MASS operation and control is expected thus, a timely adjustment of education and training for seafarers is needed to cope with the impending problem (Lušić et al., 2019). It is imperative to determine the factors that directly affect the preparedness of the METIs of the countries to assess their preparedness in supplying competent seafarers in the introduction of MASS.

1.4. Justification of the Research

Determining the preparedness of METIs of top supplying countries of seafarers is essential to take proactive measures to ensure adequate supply of seafarers in the market considering the impending problem of predicted additional demand of seafarers. This study will help the METIs identify the factors to consider for preparedness.

1.5. Research aim and objectives

This study aims to determine the preparedness of METIs of the top supplying countries of seafarers in providing the required education and training for seafarers in the introduction of MASS in the shipping industry.

The objectives of the study for the METI of top supplying countries of seafarers are:

1. To enumerate and define the factors affecting the preparedness of METIs of top supplying countries of seafarers in the introduction of MASS.
2. To examine the challenges that the METIs are facing in the process of introduction of MASS in the shipping industry.
3. To determine the outlook in preparing seafarers and cadets on the introduction of MASS in the shipping industry.
4. To determine the regulatory framework set by Maritime Administration (MARAD) for the required competency of seafarers to man the automated ship.

1.6. Research questions

The research methodology to be conducted will answer the following questions:

1. How does the METI system work?
2. What are internal and external factors affecting the METI system that can be considered for preparedness in the introduction of MASS?
3. What are the challenges of the METIs in preparation for the introduction of MASS?
4. What is the outlook of seafarers and cadets on the introduction of MASS and how it will affect their competences?
5. What is the preparation of the government in the introduction of MASS?

1.7. Research methodology and methods

Research methodology is a systematic way of researching to find a solution while the research method calls for an explanation based on collected facts that aim to answer research problems (Goundar, 2012). This descriptive research used System Theory to understand how the METIs function as a system to determine the factors affecting the METIs on its preparedness.

Non-probability purposive sampling was conducted to the top supplying countries of seafarers, being the major suppliers, to determine the readiness of the

shipping industry in meeting the demand of seafarers in the introduction of MASS. Likewise, non-probability purposive sampling was conducted to small supplying countries of seafarers to determine the reliability and validity of the findings found from the top supplying countries of seafarers in terms of preparedness and the factors to be considered for their preparedness in providing required education and training for seafarers.

Qualitative data was gathered through a semi-structured interview to have a deeper understanding of how the METI system works and how the factors for preparedness affect the METIs in implementing the required competences for seafarers. Quantitative data was gathered through a survey questionnaire to determine the extent of preparedness of the METIs based on the factors for preparedness. The results of both data were compared for reliability and validity and were used to complement each other to answer the research questions. Therefore, a mix-method using quantitative and qualitative methods is applicable for this research.

World Maritime University (WMU) Research and Ethics Committee Protocols were obtained before the conduct of the survey and interview and the ethical standards were strictly followed.

1.8. Significance of the research

Determining the factors affecting the preparedness of METIs in providing standard education and training to seafarers, this study will serve as a guide to assess the METI's preparedness in implementing the required competency of seafarers in the introduction of MASS.

1.9. Scope of the Research

This study focuses on determining the internal and external factors affecting the preparedness of the METIs and determining the preparedness of participating countries in providing required competency for seafarers in the introduction of MASS.

1.10. Limitations

The empirical result of this study is subjected to limitations. Some respondents perceived that the research is tackling a confidential matter that could affect the country's or institution's image thus, the target participants hesitated to participate. Also, it was summer vacation from school during data gathering which limits this study to gather data from METIs and students.

Very few participated from the target population of MARAD, METI, Ministry of Education (MoE), seafarers and cadets specifically on the qualitative research. Determining the preparedness of each respondent country in each factor for preparedness was inapplicable due to a very limited number of respondents but instead the result was generalized among the participating countries (David, 2005). In addition, there was no respondent from MoE that opted for this study to base the data for MoE from other stakeholders which adds more room for bias on the result of this study. On the other hand, the survey questionnaire encountered some accessibility problems that also limits the number of respondents.

Further study involving more METI participants can have a more accurate result considering METI being the core element of this study.

1.11. Structure of the dissertation

Chapter 2 will cover how the evolution of seafarer's competency and technology onboard ships, understanding how the METI operates as an open system and determining the factors that affect the preparedness of METI using systems theory. Chapter 3 will cover the methodology of the research to answer the research questions and achieve the aims and objectives. Chapter 4 will cover the research findings. Chapter 5 will be the discussion of the findings of the research. Chapter 6 will be the conclusion and recommendations based on the findings.

Chapter 2 Literature Review

2.1. Introduction

This chapter covers the evolution of seafarer's competency with technology onboard ship. Likewise, it will discuss how the METI system works and identifying the factors for preparedness of METIs in implementing the required competency of seafarers for MASS using systems theory.

2.2. Why technology evolved

According to Tom Chatfield (2019), the evolution of technology is entwined with the evolution of humankind. Man's creation of varying tools from stone to microchips was astonishing. The first industrial revolution started with the use of steam power during the end of the 18th century (Muhuri et al., 2019), the second was the utilization of electrical energy for mass production at the beginning of the 20th century, the third was automatic production with the aid of electronic and internet in 1970s and the fourth industrial revolution, which is also known as Industry 4.0, was the replacement of human functions with machines (Lu, 2017).

It is assumed that they were used to cope with the environment and necessities of life hence technology becomes both a necessity and utility. Considering technology as a necessity and utility, the ship's invention emanated from the need to travel (Basalla, 1988) and the derived demand to transport goods through trade (Ma, 2021). Ships evolved to adopt to various technologies that aid seafarers in efficiency, productivity and safety (Bhardwaj et al., 2019). Likewise, seafarers' competences also constantly change with technology (Rayner, 2019).

2.3. Evolution of seafarer's competency with technology

Navigation can be traced back 100,000 years ago (Strasser et al., 2010) and navigator's knowledge and skills had been developed over time from mental knowledge in informal and non-standardized ways then in an organized manner, merging experience and science, and to a more formalized maritime education in

national context and to a standardized form in international context (Manuel & Baumler, 2020).

2.3.1. Earliest time of navigation

With the oars and sails in the earliest times of navigation, navigators used their observational skills in celestial navigation, wind patterns and behavior of animals that is also shared among seafaring communities. With the limited resources on documents and instruments, it requires good memorization skills for the retention of voluminous amounts of knowledge acquired from informal and non-standardized ways of on-the-job training, mentorship, and experience sharing (Manuel & Baumler, 2020).

2.3.2. Middle Age navigation

Mariner's compass and nautical chart were used as an aid in navigation during the middle age, lead line had been a valuable invention to measure depth of water in 13th century and Astrolabe invented by Martin Behaim in 14th century was used to measure height of sun and star to determine the latitude in celestial navigation (Riley, 2020). Seafarers must be educated on the operation of said instruments and the coastal navigation that expanded to open ocean necessitates traditional seafaring skills to advance. In 1419, Henry the Navigator and his successor organized the collected nautical knowledge to merge experience into science enhancing navigational skills to provide better education for seafarers. Hence, the maritime education was formalized after being regulated by the government under laws and regulations particularly on the enhanced training for ship's masters and pilots (Manuel & Baumler, 2020).

Ships log that is used to determine the ships speed was invented between the 15th – 16th century while between 16th to 17th-century British clockmaker John Harrison invented the chronometer that is used to measure elapsed time at sea through the longitude and Captain Thomas Sumner discovered a method called 'line of position' with the use of the sextant. In the 16th century, the first Naval maritime school was established followed by a dozen of recognized maritime schools and a procedure for a national maritime education system such as binding examinations by

peers for shipmasters requiring 5 years sea experience was established in 1681 through ‘Ordonnance de la Marine (Maritime Act).’ In addition, Samuel Pepys appointed an official examiner and introduced naval officers’ exams in the Netherlands and the United Kingdom (UK) respectively. National governments had become the primary stakeholder in public seafarer education, training and certification systems before the 18th century (Manuel &Baumler, 2020).

2.3.3. Modern time of navigation

Then an evolution of modern technology in the form of gyrocompass that always seeks the True North, Long Range Navigation (Loran) that uses radio transmission pulses to determine the ship’s position, the radar that used to acquire small objects reflected on the screen, Global Positioning System (GPS) that determines the accurate position of the ship, a paperless navigation with the aid of Electronic Chart Display and Information System (ECDIS) that is integrated with radar, fathometer and Automatic Identification System (AIS) which displays other data such as ship voyage plan, information of other ships acquired, its heading and other pertinent data.

These technologies are functioning with the aid of human intervention possessing the required competency. Considering shipping as international in nature, the International Maritime Organization established a basic training, certification and watchkeeping for the shipping industry in international standard through Standards of Training, Certification and Watchkeeping (STCW) 1978, as amended. It is by far the latest regulatory framework for the minimum standard requirement of seafarers’ competency being implemented by the METIs of different countries (IMO).

The first automated ship was “SELEM DALAM 65” from Japan equipped with a centralized control engine room and remote-controlled engine from the navigational bridge. Over the years, more technologies onboard ships were developed to aid seafarer for safe navigation such as automatic steering system, intelligent navigation, Global Positioning System (GPS), to a more advance technology for remotely controlled vessel, unmanned vessel and automated ship – MASS (Table 1).

Table 1.*Evolution of Typical MASS*

Year	Country / Region	Vessels	Features
1964	Japan	"SELEM DAM 65", tanker	Engine room centralized control, engine remote controlled on the navigation bridge.
1970	Japan	"Starlight Maru", tanker	The control and management of the entire vessel is achieved through various subroutines and interfaces.
1985	China	"Berlin Express", container vessel	Automatic steering system, automatic navigation system, vessel management center, comprehensive management of the whole vessel was achieved through the computer system.
2008	China	"Tianxiang No. 1", offshore exploration vessel	Intelligent navigation, radar search, satellite applications, image processing and transmission
2012	EU	MUNIN	Unmanned vessel
2012	China	Automatic unmanned sampling vessel	Robot control technology, automatic navigation technology, ultrasonic intelligent wall protection barrier technology, 3G network / GPRS real-time communication technology. With autonomous navigation, automatic obstacle avoidance, network management and other advantages
2014	UK	"Mayflower", marine autonomous vessel	Unmanned trimaran sailing boat
2016	USA	"Sea Hunter"	Unmanned vessel
2016	China	Unmanned Vehicle	All-weather automatic cruise and risk aversion, remote reconnaissance operations, professional equipment load piggyback, 360-degree video transmission, voice intercom
2016	Norway	"Hronn" light marine vessel	Unmanned vessel
2017	China	"Da Zhi"	Intelligent navigation, intelligent engine room, intelligent energy efficiency management, etc.
2018	Norway	Yara Birkeland	Unmanned, electric, container
2020	Europe	One Sea	Independent control of marine ecosystem by enterprises, completely remotely controlled
2020	UK	Rolls-Royce	Remotely controlled unmanned vessel
2025	Europe	One Sea	Autonomous commercial operation
2035	UK	Rolls-Royce	Unmanned ocean-going merchant vessel

Note. From "Maritime Autonomous Surface Ship – A Great Challenge to Maritime Education and Training," by W. Deling W. DongKui, H. Changhai and W. Changyue, 2020, *American Journal of Water Science and Engineering* 6(1), p. 13, (<https://doi.org/10.11648/j.ajwse.20200601.12>). Copyright 2020 by Science Publishing Group

IMO defined MASS in scoping exercise as a "ship which, to a varying degree, can operate independently of human interaction."

According to the MSC the revised four degrees of autonomy are as follows:

- *Degree one:* Ship's crew is required onboard to operate and control the systems and functions. Other operations may be automated that need not be supervised at all times.
- *Degree two:* ship is controlled remotely but ship's crew is available onboard to take control and operate the systems and functions.
- *Degree three:* No ship's crew onboard. Ship is remotely controlled from another location.

- *Degree four*: Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.

2.3.4. Most Advanced Technology in Navigation

The emergence of technologies has brought challenges, opportunities and solutions for many domains (Catal and Tekinerdogan, 2019) to include the maritime industry.

In 2017, a fertilizer company and a marine system provider in Norway started developing autonomously operated and fully electrified vessels. The MASS project has progressed in Europe and significant results have been reported in Japan. In 2019, an automatic operation test using an optimal navigation program for a large-sized car carrier by a Japanese shipping company had been successful. The installed program has the capability of assessing the surrounding situation, calculating the risk of collision, determining the optimal route and operating the ship automatically (Nippon Express, 2019). Likewise, the NYK had successfully tested the manned autonomous ship, to reduce crew workload, navigated from Xinsha, China to the port of Nagoya, Japan to the port of Yokohama, Japan (NYK, 2019). Recently, a fully autonomous 12 meters commercial vessel had successfully traversed the North Sea and West Mersea (The Maritime Executive, 2019).

2.4. Human Error

Despite all the technology onboard ships to aid seafarers for safe navigation, human error had been recorded as the highest percentage that causes maritime accidents (Chan et al. 2016). Most important instruments of IMO were established such as the Safety of Life at Sea (SOLAS) after the tragic sinking of Titanic in 1912 focusing on the safety of merchant ships; the wreck of Torrey Canyon in 1967 that resulted in the amendment of Convention 1954 (OILPOL) by the International Convention for the Prevention of Pollution from Ships (MARPOL) for a more comprehensive anti-pollution prevention and International Safety Management (ISM)

Code was adopted for the safe operation of ship focusing on human factor after the Herald of Free Enterprise capsized in 1987 to mention a few.

2.5. Benefits of MASS

Shifting from traditional/conventional ships (Bartusevičienė, 2020) to MASS or autonomous ships is a necessity that can satisfy the needs of the maritime industry due to its high level of safety of the crew, the efficiency of ships' operation and economic advantage (Basalla, 1988 and MSC, 2017). Reduction of crew requirement onboard automated ships will subsequently reduce labor cost but more importantly removing human elements onboard implies safety of crew (Emad et al., 2020). Using more advanced technology can improve reliability in ship handling, eliminating human error thus reducing marine accidents in maritime transportation (Wariishi, 2019 and Bartusevičienė, 2020). This will likewise improve efficiency by having more spaces for freight paying cargo, saving of fuel, reduction of emissions (Emad et al, 2020 and Bartusevičienė, 2020) and improving the working environment of seafarers (Wariishi, 2019 and Bartusevičienė, 2020).

2.6. Challenge in the introduction of MASS

On the other hand, an estimated 1.89 million seafarers are serving onboard 74,000 merchant ships worldwide that transports 90% of world trade. Currently, officers are having a shortfall of 26,240 and it is predicted that by 2026, an additional 89,510 officers are needed to operate the world merchant fleet (BIMCO and ICS, 2021).

The present demand and the fast-changing pace in introduction of technology in the shipping industry is a challenge to the METIs in ensuring the sufficient supply of well-trained and educated officers to man the automated ship by adapting a new educational system in anticipation of autonomous shipping (Lušić et al., 2019) to ensure the safety of navigation particularly during the transition period (Bartusevičienė, 2020). This emerging technology brought that disruption in the

maritime industry questioned the preparedness (Catal and Tekinerdogan, 2019) of METI in providing the required competency for seafarers on autonomous shipping.

2.7. Introduction of MASS

In anticipation of the introduction of MASS in the shipping industry, the IMO has strategically planned for integrating new and advanced technology in its regulatory framework. Just recently, the MSC, has approved the Outcome of the Regulatory Scoping Exercise for the use of MASS that provides the assessment of the degree to which the existing regulatory framework might be affected to address MASS operations (IMO, 2021).

In the near future, gradual introduction of new skills and competences required in MASS operation and control is expected (Emad et al., 2020) thus, a timely adjustment of training and education for seafarers is needed to cope with the impending problem (Lušić et al., 2019). Determining the preparedness of METI in providing STCW courses for seafarers to man the MASS, a thorough evaluation of how the METI system works and the factors affecting its preparedness should be understood and evaluated.

2.8. Factors Affecting METIs Preparedness

METIs are responsible for equipping seafarers with relevant knowledge, skills and competences according to the minimum standard set by STCW convention through curriculum delivery depending on the latest technologies available on-board (Ngcobo, 2018).

Understanding the world we live in and how problems emanate from it, humans were able to develop systems thinking to understand the complexity of institutions (Mthuli, 2018). Considering METIs as an open system, it refers to a system that is constantly interacting with its external environment (Lunenburg, 2010) while close system is a system having a minor interaction with other systems or its external environment. (Heil, n.d.). Accordingly, school can also be viewed as a closed-system

as it solves most of their problems independently through their internal forces without taking into account forces from the external environment.

Accordingly, determining the METIs preparedness in implementing the seafarers' required competency in the introduction of MASS, an open system theory can be applied in identifying and understanding the different elements and systems that compose the structure and how they function and relate to one another gives a better comprehension on how the METI system works externally and internally (Meadows, 2009 and Mthuli, 2018).

2.8.1. External Factors Affecting METI

External factors are beyond the immediate control of METI that can create challenges and opportunities from labor market, legal, regulatory such as developing competitive advantage; public policy and regulations and social environment; and barriers such as product quality regulations. Thereby making external factors and objectives closely interrelated (OECD [Organisation for Economic Co-operation and Development], 2018).

2.8.1.1. Regulatory Framework

“Regulatory frameworks are legal mechanisms that exist on national and international levels” (DCAF [Geneva Center for Security Sector Governance] n.d.). In the maritime industry, regulations were formulated due to accidents at sea. International regulations rapidly became the reference in the design and implementation of education and training programs for officers globally (Sampson, 2004).

2.8.1.1.1. International Framework

The IMO, is a specialized agency of the UN responsible for the governments to adopt the highest practicable standards, designed to enhance safety, security and efficiency in shipping engaged in international trade. STCW is the first international convention that sets a global standard for the training of seafarers (IMO, n.d.-a). It is

a self-imposition regulation to all its member states to be implemented by the METIs through its national provision (Sampson, 2006). Part A of the STCW Code is mandatory, it contains a tabulated required minimum standard of competence of seafarers while Part B is a recommended guidance that intends to help member states in implementing the convention (IMO, n.d.-b). It is revised as necessary in keeping up with the evolution of technology onboard ships to align with seafarer's required competency (Emad et al., 2020).

2.8.1.1.2. National Framework

At the national level, the National Administration is responsible for regulating the STCW Convention (IMO, n.d.-c) that meets or exceeds the STCW standard requirements (IMO, n.d.-a). In the case of the Philippines, Maritime Industry Authority (MARINA) is the single Maritime Administration responsible for the implementation and enforcement of the STCW Convention (*Republic Act 10635*). However, MARINA has to work with Commission on Higher Education (CHED) in regulating the Maritime Higher Education Institutions (MHEI) per Joint CHED – MARINA Memorandum Circular No. 1.

2.8.2. Internal Factors Affecting METI

“The internal environment of an institution is ostensibly under the control of management and refers to the institution's business model, production and innovation capabilities, as well as financial and human resources” (OECD, 2018, p. 146).

The Revolution of new skills based on government policies and industrial demands had affected the human element externally that subsequently affected the internal approaches of the METI where it can indirectly influence (Mthuli, 2018) triggering significant adjustment in various parts of the education system (Sgouropoulou et al., 2016). They have to gradually reform the curriculum, educational technology and training methods to meet the required skills and competency of seafarers (Emad et al., 2020) for MASS.

2.8.2.1. Resources

Education resources cover all those materials, non-material, audio visual, school environment, human and non-human, drawn or photographed, built manually or electronically operated, books and all forms of related materials in an academic environment used in the teaching and learning process. They also include other fundamental materials used in the school to make teaching very easy and learning more meaningful and comprehensible to the learners (Usman, 2016).

Resources are considered as the most influential internal factor for METI's implementation and are categorized into physical, human and financial resources (Mthuli, 2018). The lack of economic resources of a country has an indirect impact on the poor entry level of student's knowledge and understanding, poor access to training of lecturers, incapability of paying staff salaries, inability to construct new buildings and procure hard and software (Sampson, 2006). This can also result in poor quality education that leads to cheaper labor (International Commission on Shipping, 2000).

2.8.2.1.1. Financial Resources

"Financial resources are the basis for the procurement, utilization and maintenance of all other types of resources" (Yizengaw & Agegnehu, 2021) needed by the METI such as acquiring appropriate equipment, services and supplies needed in implementing the program (Strzelczyk, 2020), invest in human resources by offering attractive remuneration for staffs and lecturers and for infrastructure development to project the image of the institution (Mthuli, 2018). However, corruption among officials had greatly impacted the availability and adequacy of resources (Amadi, 2019).

Higher education funds are from external sources such as the government, students and their families and donors ("Higher Education in Context," n.d.). A strong financial base is necessary in the production process and the quality of its product and services (Kaltasso, 2014). It is imperative to consider financial management to ensure effective and efficient utilization of funds and to mitigate exposure to financial risk

(Munge et al., 2016). Qualified personnel are required to efficiently manage financial resources to promote equity and quality education (MoE, 1994 & MoE, 2007).

According to Yizengaw & Agegnehu (2021), private institutions have low levels of stakeholder participation in budget preparation and their financial resources are not being managed by qualified personnel while government institutions are better at planning functions of financial resource management than private ones that can be attributed from having a skilled accountant and budget planning. On the contrary, private institutions are better at financial reporting practices.

2.8.2.1.2. Physical resources

Physical resources are school facilities that are instructional and non-instructional (Amadi, 2019), viewed as didactic materials (Obanya 2010), used as raw materials like facilities, infrastructure and equipment such as buildings, classrooms, books, libraries, computers, laboratories, simulators, audio and visual aids, swimming pools, lifeboat and fire drill equipment (Sampson, 2016 & Meadows, 2009) or as an aid to achieve an objective or goal of an organization (Amadi, 2019).

A well-equipped school creates a conducive environment for teaching and learning, reducing drop-outs among learners and enhances teaching and learning activities (Usman, 2016). On the other hand, classrooms that lack basic equipment and overcrowded create an ‘uncomfortable and ergonomically unhelpful learning environment’ (Sampson, 2004) which directly affects the students’ academic performance that had demonstrated a high degree of relationship with the physical environment (Amadi, 2019; Ahmodu, n.d.).

Various schools were found to have poor quality facilities (Asiabaka and Embakwem, 2008) while modern school environments emphasize on having adequate and spacious facilities and required utilities in appropriate quality and quantity (Amadi, 2019). Inability to improve and upgrade basic classroom facilities put pressure on the METI (Sampson, 2004) as part of their requirements.

The school administration and state governments have the responsibility in ensuring that adequate resources are available to concerned schools (Agbonghale & Adavbiele, 2018). Despite that, physical resources are not evenly distributed in private compared with public schools (Strong, 2006 & Starr & White, 2008). Private schools have more adequate resources such as the provision of educational materials, adequacy of staff and conducive learning environment (Strong, 2006).

2.8.2.1.3. Human Resources

Human resources constitute a vital vein of any institution. In the school system, it includes lecturers and support staff. They are responsible for the management of different resources (Usman, 2016). Every level in the educational system relies heavily on lecturers for the execution of its program as education cannot take place without teachers thereby making them a nucleus of the educational system in achieving their goal (Sarwar, 2011). It can be costly but institutions are obliged to keep up with competitors and to fulfil the accrediting requirements (Sampson, 2006).

Excellent lecturers that can impart knowledge even without the necessary physical resources to deliver the required competency plays an essential role in the development and sustainability of MET (Emad et al., 2020 and Mthuli, 2018). They can be composed of industry experts and teaching assistants that form the core of the human aspect (Sgouropoulou et al., 2016). They undergo training programs to achieve a high level of teaching quality (Sampson, 2006).

One of the challenges of the METIs is the availability of qualified lecturers to deliver the required competency for a workplace that is yet to exist (Emad et al, 2020). METI's salary is less attractive compared to the shipping industry which makes it difficult for METI to recruit qualified lecturers. More so, on the top-level management which they could not afford (Mthuli, 2018). Generally, lecturers are mostly certificated senior officers possessing excellent knowledge and understanding but, due to the incapability to hire qualified lecturers, the institutions are forced to rely on the returning alumni temporarily and on less experienced seafarers who have inadequate

knowledge of the subject (Sampson, 2004). In addition, a seafarers' knowledge and skills as a lecturer may become rapidly irrelevant due to rapid change (Alop, 2019) in technology.

Human resources across the world vary tremendously depending on the METI's resources to invest in their teacher and lecturers, wages and employment conditions and the vital staff development (Sampson, 2004). However, to satisfy human resources or if the market is tight (Usman, 2016), the school must provide them with salary, a working environment and job security that are beyond their physiological needs (Herzberg, 1987). Likewise, employees' needs for affiliation, acceptance, esteem and self-actualization to retain a motivated, committed workforce that are highly qualified (McLeod, 2020) must be taken into consideration.

Proper utilization of resources attains optimal learning experience for students (Amadi, 2019) however, resources alone cannot create change and progress in a learner without a teacher (Usman, 2007).

2.8.2.1.4. Information Resources

According to Lunenburg (2010) 'information resources are knowledge, curricula, data, and other kinds of information utilized by the school.' Data is a storage of un-interrelated text and numbers (Sanders, 2016) when contextualized, categorized, calculated, corrected and condensed becomes an information. Accordingly, knowledge is broader, deeper and richer than data and information (Davenport and Prusak, 2000). In addition, according to the Data, Information, Knowledge and Wisdom (DIKW) pyramid, the property is increasing towards the apex (Sanders, 2016).

Figure 1.

Data, Information, Knowledge and Wisdom Pyramid



Note. From “Defining Terms: Data, Information and Knowledge” by John Sanders, 2016, *SAI Computing Conference*, p. 2, (<http://dx.doi.org/10.1109/SAI.2016.7555986>). Copyright 2008-2021 by ResearchGate

Curriculum delivery is important in imparting knowledge to students through various activities such as lectures, case studies, discussion and practical sessions that can be used to attain the optimal learning experience of the student (Chaudhary, 2015). In addition, collaboration with the industry for student’s exposure such as berthing onboard ship (Sampson, 2004) can further enhance the students’ knowledge and gain a better understanding (Sgouropoulou et al., 2016) of the subject matter.

Generally, METIs design curricula in cooperation with and overseen by ministerial departments of the government or bodies having such specific responsibility (Sampson, 2004). In the Philippines, the Maritime Authority Industry (MARINA) and Commission on Higher Education (CHED) are closely working together in the implementation of Bachelor of Science in Marine Transportation and Bachelor of Science in Marine Engineering (Joint CHED-MARINA Memorandum Circular No. 01, 2019). A consultation was held last January 15, 2019, aimed at gathering inputs from various stakeholders in maritime education on revisions of policies, standards and guidelines per the STCW Convention 1978, as amended (Pateña, 2019).

Designing curriculum varies in every country being overseen by national ministerial departments or specific bodies having such responsibility as, for example, Commission on Higher Education (CHED) heads of inter-agency committee of Technical Panel for Maritime Education (TPME) in the Philippines, Merchant Navy Training Board (MNTB) works closely with both Maritime Coastguard Agency and MET in United Kingdom while Shipping Division of the Maritime and Port Authority (MPA) is responsible for the enforcement of STCW in Singapore (Sampson, 2006).

Designing a curriculum that meets the minimum requirement of STCW for the MASS operators such as computer science, robotics, communication theory and skills, legislation, math and science, in general, is a great challenge (Lušić et al., 2019) for curriculum developers. The process of creating, approving, launching new curricula, modules, and subjects takes time (Alop, 2019) that subsequently unable seafarers to keep up with the fast-changing pace in the introduction of technology onboard ships (Bielić, 2017).

2.8.2.1.5. Other Factors

Other factors that affects METIs are constraints such as law and policy, expectations of parents, values and goals and the society's existing knowledge according to Hanson (1977) and Owens (1981), Obilade (1989) (as cited by Oyebade, 2001). In addition Lunenburg (2010) identified METIs being influenced by its environment socially, politically, and economically.

Internal factors directly impact the METIs in providing required education and training to seafarers producing synergy. All the resources are essential in the delivery of the required education and training for the seafarers. The absence of one factor can affect or will incapacitate the METIs to operate effectively. Likewise, it is being influenced by its environment.

Table 2.

External and Internal Factors Affecting METI's Preparedness in Providing Standard Education and Training to Seafarers

External Factors	Internal factors
Regulatory framework <ul style="list-style-type: none">- International regulatory framework- National regulatory framework- Environment- Constraints	Resources <ul style="list-style-type: none">- Financial resources- Physical resources- Human resources- Knowledge resources

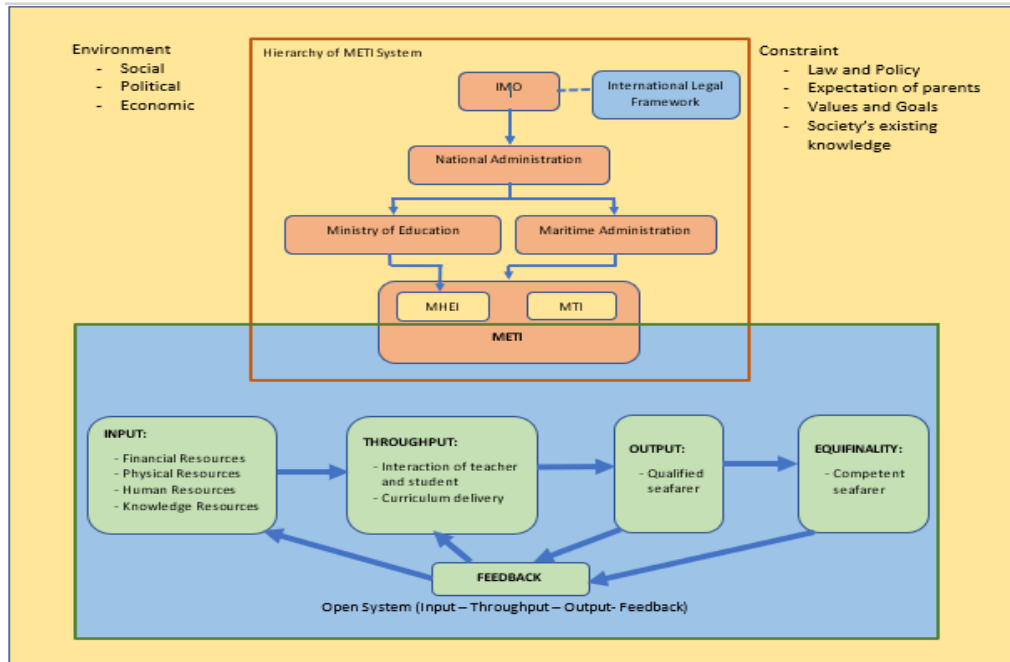
How METIs interacts with its external environment and how it operates in providing required education and training to seafarers is shown in Figure 2.

2.9. Conclusion

METIs are an ‘open system’ and its preparedness in providing standard competency for seafarers is influenced externally and internally. Externally, policy from the higher hierarchy will trigger the change in METI and financial capability will determine the METI’s capability to provide its needed resources. All the resources must co-exist and are essential during the delivery of knowledge to students. The absence of one resources can paralyze the operation of the METI or can result to a low quality education. Resources can greatly impact the student’s learning experience and it is necessary to have adequate quantity and quality to achieve its equifinality. Resources also depend on the economic capability of the country or support from other institutions which can vary in every country that can subsequently vary the output of each country. Therefore, the preparedness of the METIs depends on the adequacy, quantity and quality of its resources in achieving its equifinality.

Figure 2.

Theoretical Framework of METIs in Providing Required Education and Training to Seafarers



Note. The data for is Input-Throughput-Output-Feedback Diagram is adapted from Schools as Open Systems, by F.C. Lunenburg, 2010, (<http://www.nationalforum.com/Electronic%20Journal%20Volumes/Lunenburg,%20Fred%20C.%20Schools%20as%20Open%20Systems%20Schooling%20V1%20N1%202010.pdf>). Copyright 2010 by Fred C. Lunenburg

Chapter 3 Methodology and Methods

3.1. Introduction

This section presents the research design of this study.

3.2. Research Design

Research design is the systematic approach in gathering, collecting, measuring and analyzing data (Kothari, 2004) economically, having a valid, objective and accurate answer (Kumar, 1996). The fast-changing pace of the introduction of technology in the shipping industry, the predicted additional demands of officers and the deliberate approval of policies poses a challenge to METIs in its preparedness in providing the adequate supply of seafarers having the required competency for MASS. Understanding that METIs as a system that works within a larger system, a systems theory was used to analyze how and what factors affect the METIs in implementing the newly required competency of seafarers for MASS that involves the determination of composition of internal and external factors within the structure (Garcia et. al., 2007) of METIs thus, this study is a descriptive-analysis. Proper instrumentation in research design is necessary to collect the desired data.

3.3. Instrumentation

Systems theory was used to determine the factors affecting the preparedness of METIs and to have an in-depth understanding of how these factors affect the METIs, a semi-structured interview was used to collect data. Its flexibility allows the researcher to ask follow-up questions from respondents to elaborate more on the topic (Kumar, 1996) particularly on identifying the factors and their impact on the METIs, the challenges the hinder the METIs in implementing required competency for MASS and their status for preparedness. In addition, a survey questionnaire was used to collect specific data that can be answered directly without elaboration by the participant but, in the case of descriptive research, an interview was necessary to complement and to compare the result for reliability and validity. Therefore, a mixed-method is more appropriate using the qualitative and quantitative research. The result

of the quantitative research was used to converge with the result of the qualitative research.

3.4. Data Collection

Individual interviews with MARAD and METIs representatives were conducted online through zoom to collect qualitative data. A meeting was agreed upon by both parties before scheduling a meeting. The interview was recorded and transcribed for review and the text were later thematized for synthesis and analysis. The interview questionnaire in google form was emailed in advance to the participants to anticipate the data that is needed for the study. A survey questionnaire, for quantitative data, in google form was emailed to stakeholders and the data were collected. It was transferred into a spreadsheet for analysis. Both methods were conducted simultaneously.

On the other hand, the research was perceived as tackling a confidential matter that could affect the country's or institution's image thus the target respondents hesitated to participate thereby limiting the researcher to gather data widely. In addition, an accessibility problem was encountered in the survey questionnaire.

3.5. Sampling, selection of participants

Purposive nonprobability sampling was conducted on small and top supplying countries of seafarers. It is necessary to assess the preparedness of METIs of top supplying countries to determine their capability in providing competent seafarers for MASS being the major supplier. The data of preparedness of small supplying countries will be compared with the data from top supplying countries for validity and reliability. Stakeholders from Maritime Administration (MARAD) and METI's having the technical expertise on the field were interviewed. They were able to provide a deeper understanding of the METI system and factors affecting the METIs in implementing required competency for seafarers. For quantitative sampling, a survey questionnaire was administered to MARAD, METI, seafarers and cadets considering seafarers and cadets to be directly affected in the introduction of MASS in the shipping industry.

3.6. Research methodology

Following instruments were used to answer the research questions:

3.6.1. Literature review

Literature review was conducted to identify the factors that are considered in the preparedness of METI in providing the required competency to seafarers for MASS using ‘Systems Theory’ through systems analysis. Internal and external factors were identified that influenced the METIs were used as determinants of its preparedness that were used as foundation to formulate questions for qualitative and quantitative instruments.

3.6.2. Questionnaire Instrument

Survey questionnaire was created in google form consisting of 58 questions divided into four (4) parts: 17 questions for external factors affecting METIs, 16 questions for internal factors affecting public METIs, 15 questions for internal factors affecting private METIs and 10 questions for socio-demographic variable of participants. It is a combination of Likert scale, multiple choice and open-ended questions aimed to answer research questions 2 and 3. The survey questionnaire seeks to gather data on the extent of preparedness of METI in implementing STCW courses for MASS based on the internal and external factors identified.

3.6.3. Interview Instrument

A semi-structured questionnaire for individual interviews is composed of 8 questions for regulators (MARAD and MoE) and 8 questions for the METIs. The interviews were recorded and transcribed on Otter.ai and were reviewed. Some texts were corrected and a very minor native language was translated to English. Transcribed texts were thematized and were consolidated prior to synthesis and analysis.

The individual interviews seek to answer research questions 1 to 5 determining the process on how the METI work in implementing the required education and

training of seafarers; the proactive measures of the government and METIs; the extent of support that the government and non-governmental organizations provide for the METI and the support received by the METI; how the METI acquire support; the resources needed by the METI; the challenges that the government and the METI is facing; and the preemptive measures of the government and the METI to meet the challenges. A necessary follow-up questions were asked to have a comparative data with the survey questionnaire.

3.7. Data Analysis

3.7.1. Quantitative Data Analysis

The result of the survey questionnaire was collected directly into google form was transferred into the spreadsheet. All nominal data were computed in Microsoft excel. Questions with Likert scale were computed using the estimated weighted mean while multiple-choice were computed using frequency and percentage to determine the highest frequency among the cluster and the most favored item in the group (Garcia et.al., 2007). Descriptive statistical data are presented in Chapter 4.

3.7.2. Qualitative Data Analysis

The qualitative data were transcribed and imported into Microsoft word and manually thematized to 10 codes. The data were first consolidated per country to determine their preparedness however not all codes were found in each country. All data were consolidated using systems theory to determine how the METI system function within a larger system and how they interact with each other. Further, the data were consolidated as determinants for preparedness of METI since not all codes were found in every participating country. The preparedness of each country for each determinant was not identified thus, the result was generalized having the possibility of bias (Garcia, 2003).

3.8. Research Ethics

The approval of World Maritime University (WMU) Research Ethics Committee (REC) was sought prior administering the interviews and survey questionnaire as it involved humans. All the data collected were anonymized, kept confidential and will be deleted after the completion of the course. The conduct of this research abides by the highest ethical standards as set by the WMU REC.

Chapter 4 Findings

4.1. Introduction

This chapter will present the findings from both quantitative and qualitative methodology separately to include tables, charts and quoted text aimed to aid the researcher in achieving the research objectives.

4.2. Quantitative Data

This section presents the respondent's profile and quantitative data from survey questionnaire.

4.2.1. Respondent's Profile: Descriptive Statistics

There were 11 respondents from 5 countries (Figure 3) of both small and top supplying countries of seafarers as summarized in Table 5. Out of 11, 4 were from private institution and 7 from public (Figure 4); 6 employees, 2 seafarers and 3 cadets (Figure 5); only 1 has no working experience while the rest have working experience (Figure 6).

Figure 3.

Number of Respondent per Country

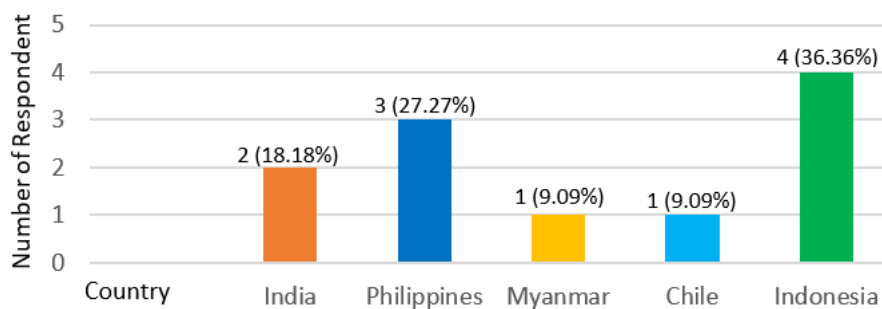


Figure 4.

Working Environment of Respondents

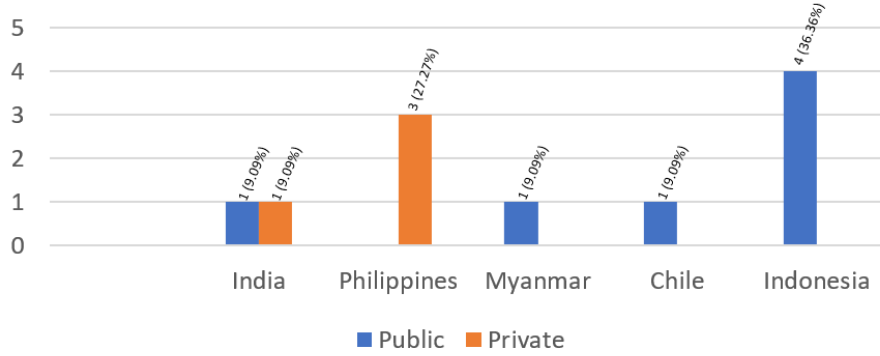


Figure 5.

Respondent's Occupation

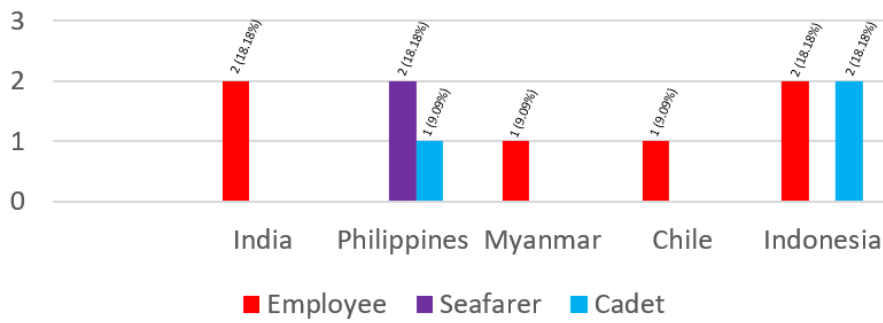
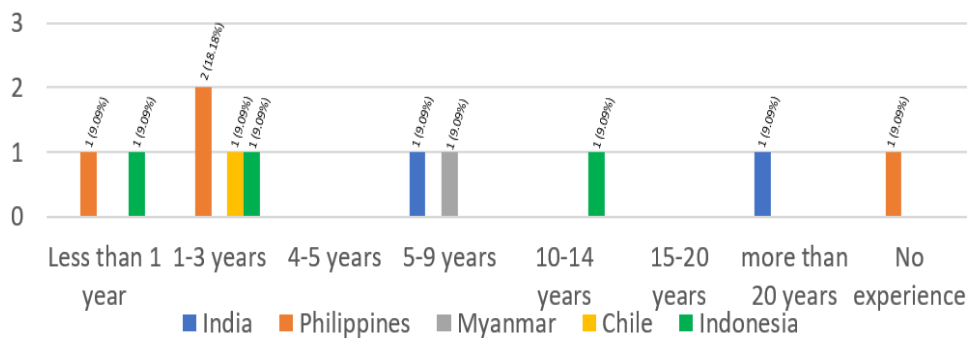


Figure 6.

Respondent's Working Experience

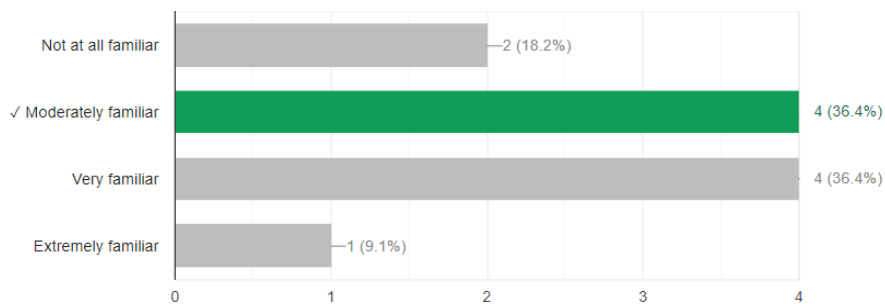


4.2.2. Quantitative Analysis

Based on the findings, the estimated weighted mean for familiarity of respondents on MASS is 2.36 which corresponds to moderately familiar with MASS (Figure 7).

Figure 7.

Respondent's Familiarity with MASS



4.2.3. Regulatory Framework

The estimated weighted mean for both prioritization and preparedness for regulatory framework for MASS are 2.54 that corresponds to low priority and none at all as shown in Figure 8 and Figure 9 respectively.

Figure 8.

Prioritization of Regulatory Framework for MASS

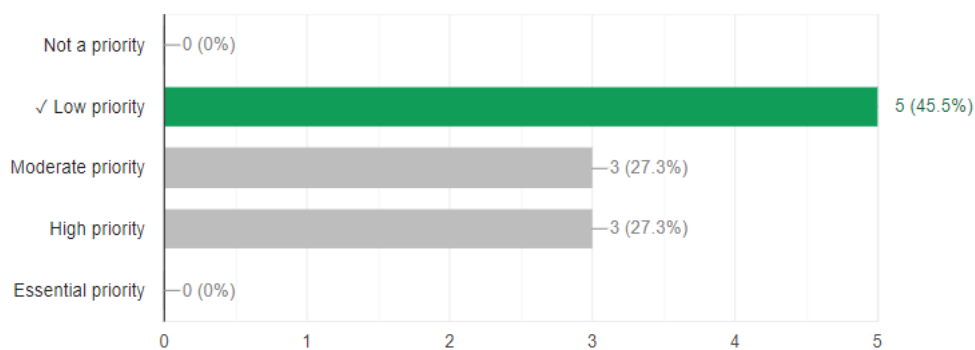
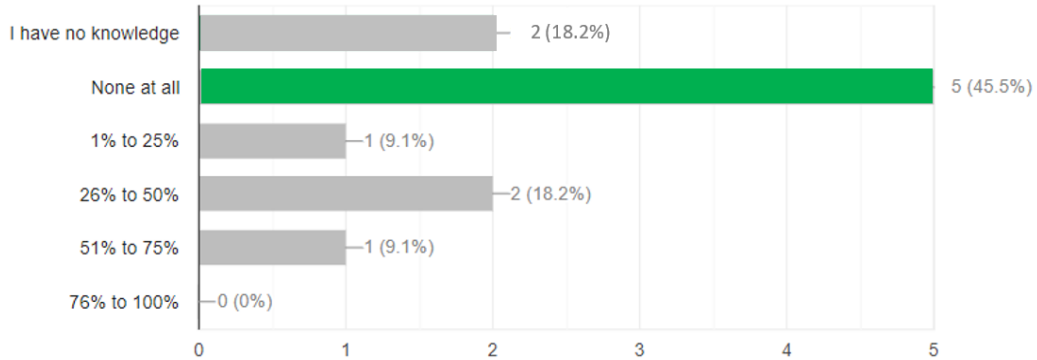


Figure 9.

Preparedness of Regulatory Framework for MASS



4.2.4. Resources

4.2.4.1. Financial and physical resources from government

The extent to which the government will support the METI has an estimated weighted mean of 3.36 that it may neither oppose nor favor as shown in Figure 10. In addition, it is expected to give slight financial support and slight and moderate support for physical resources that the METI will be needing in the implementation of the required education and training of seafarers for MASS having an estimated weighted mean as shown in Figure 11 and Figure 12.

Figure 10.

Extent of Government Support to METI

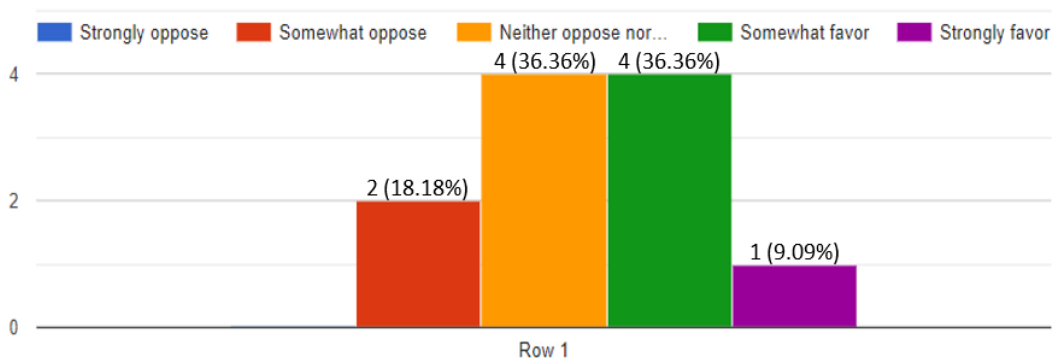


Figure 11.

Resources Expected with Slight Support from the Government

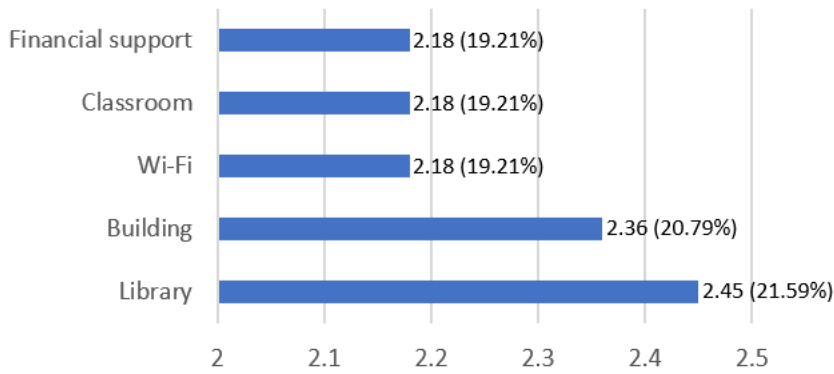
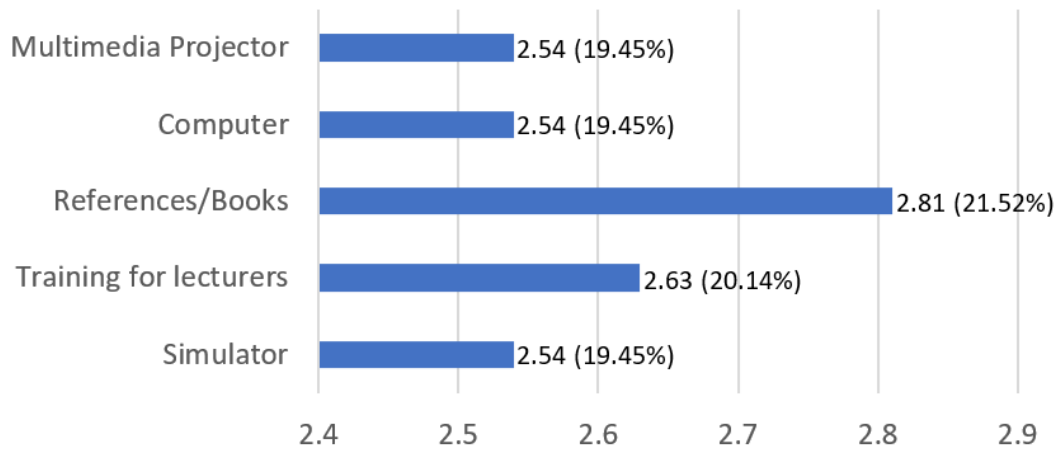


Figure 12.

Resources with Moderate Support from the Government



4.2.4.2. Financial and physical resources from non-governmental organization

On the other hand, an estimated weighted mean of 3.91 or somewhat likely the non-governmental organization are expected to extend support to the METIs in providing required competency of seafarers for MASS as shown in Figure 13. Mostly, they have been providing slight support for financial resources as shown in Figure 14 indicating their estimated weighted mean while moderate support to the physical resources needed by the METIs as shown in Figure 15.

Figure 13.

Expected Support from the Non-Government Organization

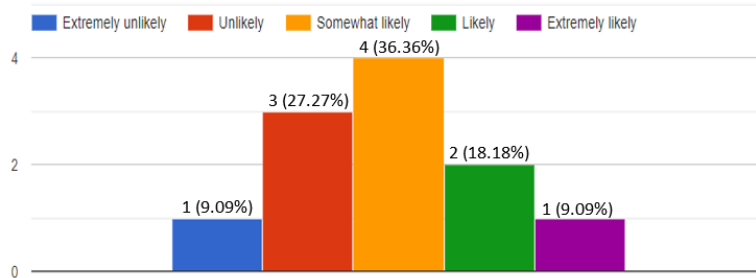


Figure 14.

Resources Expected with Slight Support from the Non-government Organization

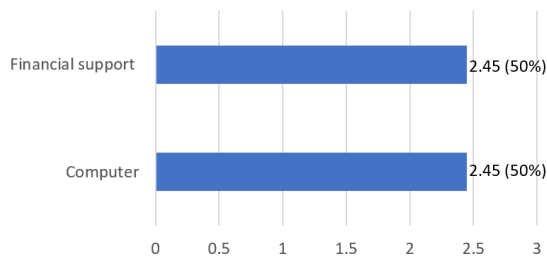
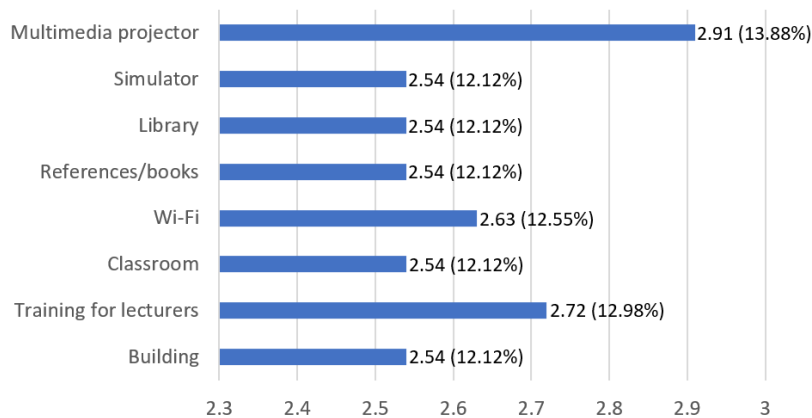


Figure 15.

Resources Expected with Moderate Support from the Non-government Organization

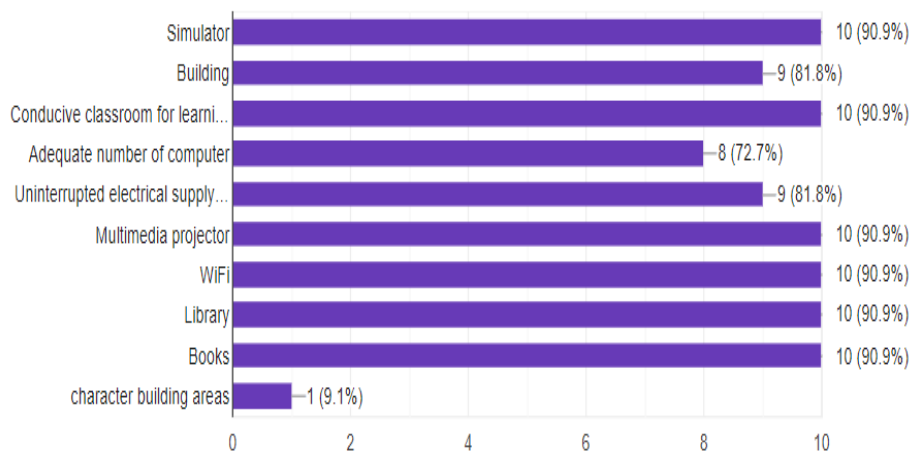


Based on the table shown, it is evident that non-governmental organization are expected to provide more resources needed by the METIs compared to the government.

In addition, METIs has the required facilities in providing current STCW courses to seafarers for MASS as shown in Figure 16.

Figure 16.

Available Facilities of METIs in Delivering Standard Training for Seafarers

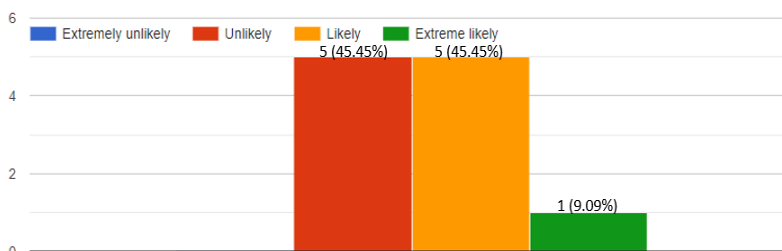


4.2.4.3. Fund from external sources

METI is likely to seek funds from outside sources as shown in Figure 17 having an estimated weighted mean of 2.63.

Figure 17.

Likelihood of METIs to Seek Fund from Outside Sources

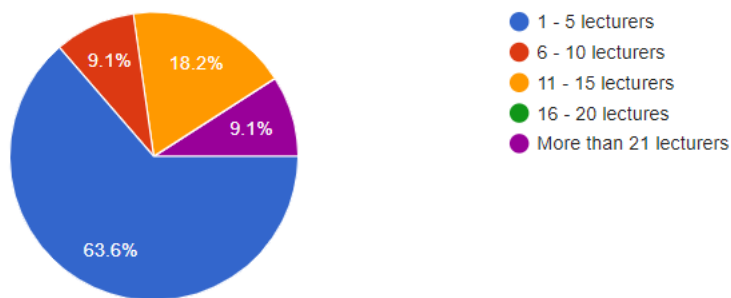


4.2.4.4. Human resources

Almost every METIs has a qualified lecturer for MASS as shown in Figure 18 since they are offering related courses.

Figure 18.

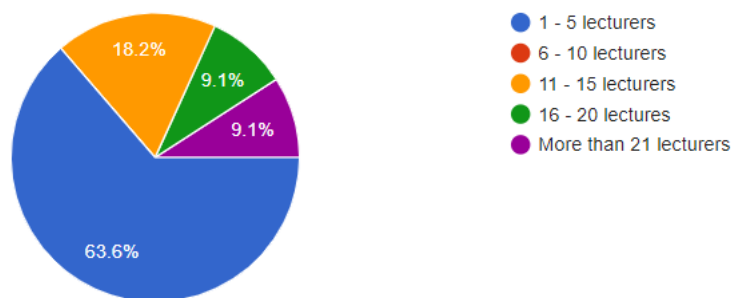
Qualified Lecturer for MASS



Majority of the METIs can afford to hire few qualified lecturers for MASS in full-time basis as shown in Figure 19.

Figure 19.

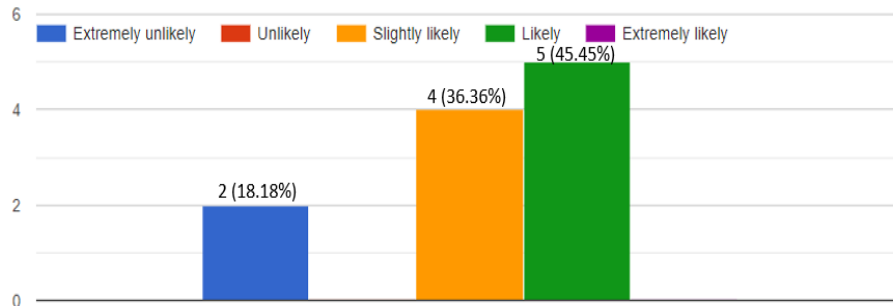
Qualified Lecturer for MASS Working in Full-time Basis



METIs are slightly likely to hire a part-time lecturer qualified for MASS as shown in Figure 20 having an estimated weighted mean of 3.09.

Figure 20.

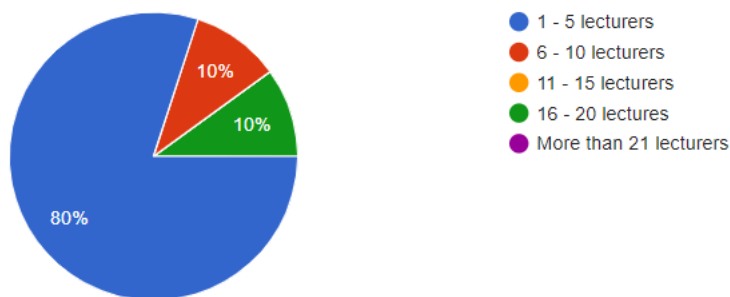
METIs Probability to Hire Part-time Lecturer Qualified for MASS



METIs will probably hire 1-5 MASS qualified lecturer in part-time basis as shown in Figure 21.

Figure 21.

Qualified Lecturer for MASS Working in Part-time basis



METIs have few numbers of qualified MASS lecturer, few qualified MASS lecturers in full-time basis, slightly likely to hire part-time lecturer and have the probability of hiring the least number of qualified MASS lecturer.

4.2.5. Curriculum

METIs might or might not consider designing curriculum for MASS (Figure 22) but are offering MASS related courses (Figure 23).

Figure 22.

METIs Extent to Consider Designing Curriculum for MASS

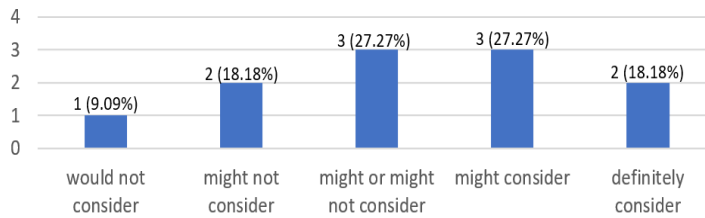
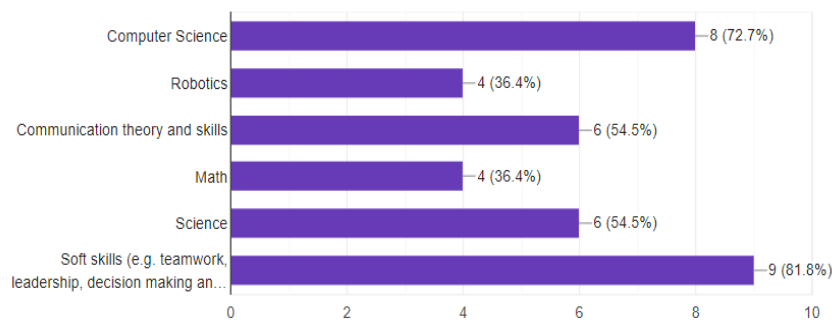


Figure 23.

MASS Related Courses Offered by METIs



4.3. Qualitative Data

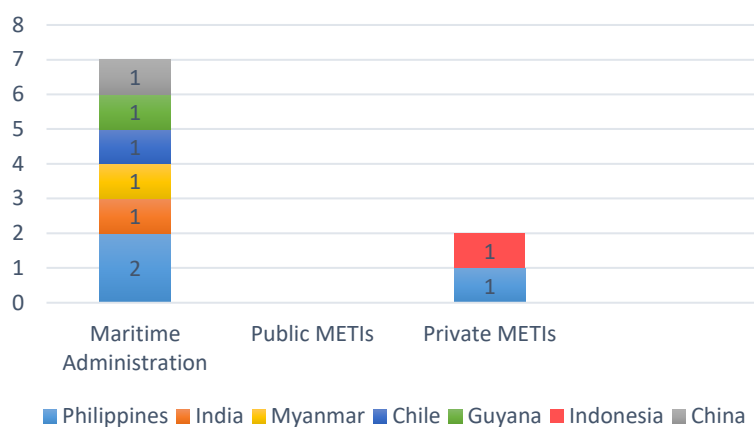
This section presents respondent's profile from qualitative methodology and findings from the interview conducted.

4.3.1. Respondent's Profile: Descriptive Statistics

Summary of profile of 9 respondents are shown in Figure 24.

Figure 24.

Respondent's Profile of Qualitative Instrument



4.3.2. Qualitative Analysis

This section presents the findings on the role of stakeholders of METIs, how the METI system works, the internal and external factors affecting the METIs, the preparedness of both small and top supplying countries of seafarers in the anticipation of the implementation of new competences of seafarers for MASS and their outlook for MASS and the challenges that the countries are facing in the introduction of MASS.

4.3.2.1. Stakeholders and their role

4.3.2.1.1. MARAD

The maritime administration is the government authority that ensures the proper implementation of STCW standard through regulatory framework.

P2: “our organization... completely monitors, admits, administers and controls the STCW that means a framing of the policy, monitoring of the policy, making of the policy, stakeholder consultation, everything related to STCW is administered by DG shipping [Maritime Administration].”

P4: *“single government agency mandated by law in the Philippines to implement the STCW convention to develop rules, policies and regulations and even standards for giving full and complete effect to the STCW convention...”*

P8: *“... the one who implement... make the policy and at the same time monitor or accredited, make some accreditation to some maritime education institution, or even maritime education training institution.”*

P3: *“in Chile, the Maritime Administration is the Navy... we deal with all the legislation part the policymaking and of course, the METI part is not... out of this direction...that also have department the maritime education department... set the policies... regarding the IMO relations. Maritime administration... is the one that approves the STCW IMO model courses and probably all the... instruction courses and has to pass some kind of a verification and after process, we authorize a METIs to deliver this...”*

4.3.2.1.2. Higher Education

The ministry of education set rules and regulations for the required education and training of cadets.

P8: *“... METI or Maritime education training institution is different from a MHEI... when it comes to maritime education training institutions it is MARINA. CHED has nothing to do with it. CHED is for those who are offering program for Bachelor’s Degree and that’s it but... other than BS program, it will be just MARINA.*

P2: *“Ministry of HRD, the Ministry of Education has... devised and framed rules... framed set of regulation and rules we need to use in standard in general.”*

P4: "... we... partner with CHED or the Commission on Higher Education [Ministry of Education in other countries] for the implementation of standards of education for the operational level."

4.3.2.1.3. METI

The METIs complies with the STCW standards to produce globally competitive seafarers for the shipping industry.

P1: "will keep on providing quality graduates adhering to the standards of STCW so that the graduates can compete or are qualified in the seafaring industry around the world. Basically, the role is always to comply with the regulatory and the standards of the STCW."

4.3.2.2. How the METI system works

The IMO sets the international regulatory framework for STCW courses. Countries that have ratified the STCW convention will promulgate the international regulation to become a national law.

P3: "...we are... the liaison between the international... IMO regulations, then we are the ones that... setting the legal framework for... using this international part for a policy making processes... So for instance... when Chile ratified the STCW in 1987. Then hearing in the Maritime Administration, we create our own policy for a proposed... to the defense ministry, our own legislation... So the International... regulation became a national law..."

P7: "... our MET is under the Ministry of Transportation Republic of Indonesia, referred to Maritime Administration and maritime administration also connect directly as a representative in Indonesia to the IMO."

Standard set by the national law must adhere to the international standard.

P5: “... we are also supposed to ensure that everything in keeping with the STCW convention is implemented and promulgated into our national laws so that we have that standard of operation here locally...”

The maritime administration is responsible for the proper implementation of STCW standard through accreditation of the METIs.

P6: “that departments of maritime administration is highly responsible for all trainings related to the conventions and all control of the maritime institute and training center.

P7: “... maritime administration will assess all of the MET, whether they are already implementing... STCW or not. If they're not implementing... STCW it means they're not ready...”

P2: “... So, the controlling and administering and monitoring of the METIs are done by DG shipping under the STCW convention”

To ensure that the METIs provide quality education and training, the maritime administration conducts audits on the facility and syllabus should be in compliance with the STCW standards.

P7: “... If... only one... one of the requirement is not complied so it means the maritime administration will not give you license or permit to conduct with every training. So... first the... facility. And then Human Resources also, who will... teach. They should be capable to teach cadets and all those seafarers. So, they have to be qualified as a professional lecturer.

P7: “...they will monitor and also audit and physically to check everything, such as the facility... and... syllabus should be based on STCW... your one package, your syllabus, your curriculum, your facility all of that.”

In some countries, both public and private maritime institutions are governed by both the maritime administration and ministry of education for higher education institutions but for those institutions offering ancillary training for seafarers, they are only governed by maritime administration.

P4: “... we would have to work in tandem with CHED when it comes... to the operational level... all training center are training institutions, as we call it here in the Philippines. They are controlled by or regulated by Marina. CHED only comes into picture when the control and monitoring would have to be in relation to the higher education institutions...”

The degrees to be offered are mainly under the control of maritime universities. They must comply with the standard requirements before they can be allowed to operate.

P2: *Now, the Ministry of shipping will not directly control the degrees... will be as per the maritime universities...”*

P5: “... our organization has direct oversight of any training on METs... who are conducting training [for the seafarers]... we're supposed to ensure that MET's are compliant to a certain level, before they are given clearance to operate as a maritime training institution... I would say direct monitoring and evaluating responsibilities as it relates to maritime training institutions... we're also the agency approving the curriculum”

P7: “... if some MET... will propose to conduct... the new training... the MET will propose to the Maritime Administration. The requirements is not only

about the facility, but the professional are the human resources, who will... teach the seafarer. And... whether they're qualified or not. So, the maritime administration... will check all of the instrument. Human Resources, and then the facility. Curriculum syllabus. Yeah. And all of these requirements should be in compliance... if they're not in compliance, so the maritime administration we'll not give the permit to conduct with those course... everything is determined by Maritime Administration.

METIs can be either private or public and the government supports all the requirements of the public METIs while private METIs are self-sustaining.

P7: "... in Indonesia, we have private and we have public and... so if you are under the Ministry of Transportation, it means... public... the government will subsidize you, give you a lot of chance and give you good facility... if in... private it is different... because they stand for Foundation, but for under the government the government responsibility to build the good facility as the IMO requirements, we should comply with those requirements.

Maritime administration ensures adequacy of facility requirements for the conduct of courses by the METIs.

P7: "... Maritime Administration... is the institution responsible to ensure that Human Resource Development is in compliance with the regulation... to ensure adequate facility and equipment for the conduct of the course... So the government will give the budget for every MET... additional material if you need something and you have to propose... and government will... assess this is okay, is this we need? Will give you the fund.

4.3.2.3. Preparedness of METI in the introduction of MASS

4.3.2.3.1. Philippines

In the Philippines, the regulators are very open and will be very supportive for change that the disruption of MASS will bring.

P4: “... CHED and Marina system is very open to adapting developments and best practices in maritime education and training. So, I would say we are both responsible for supporting the development of that standard...”

Though there is still no policy nor any preparations being made by the government.

P8: “As far as I know... we don't have any policies yet with regards to adoption of MASS. This point in time... one of the priorities of MARINA now is to make the Philippine be accepted by EMSA.”

They foresee a new set of resources that will be needed for the implementation of standard training of seafarers for MASS.

P1: “this [MASS] is very futuristic, futuristic endeavor. But, for the preparations or... for the possible resources, we still get on the planning stages, because it's... more on diversification of resources”

But, METIs can have their own initiative in sourcing funds to meet their requirements needed in implementing standard training for seafarers for MASS.

P4: “... but if the education and training institutions themselves would initiate because I can also imagine that they would have a free hand in sourcing funds and dispersing funds for this purpose from their maybe principals who needed that technology be taught to their seafarers or maybe grants by non-

government organizations who are into this or even maritime associations like our unions, who are into this kind of technology.”

One of the factors identified needed in the implementation of standard training of seafarers for MASS is the capacity development of human resources.

P1: “Honestly, faculty... have not yet started training for the MASS. Because again... The idea here in the Philippines is still young... and most advanced countries, you know, started it already, but the rainfall effect will really go here in the Philippines sooner or later. So by that time then we can start”

The triggering factor for adapting changes in the METI in implementing STCW courses, specifically for MASS, is the regulatory framework set by the government. They must adhere to the new regulations for required education and training to remain relevant in the future. They also anticipate the introduction of MASS in the seafaring industry and are open to change that is expected to happen.

P1: “we always strive to be the best in the country and to supply the good, this time, the qualified seafarers. And for the MASS. Since the government has not yet fully introduced it in the regulation for the MASS, we still have to adhere and wait, whatever the government is imposing to us. So... we can say, wait and see for us, but we keep on continuous improvement. And looking forward because if that is the direction of the government towards the international compliance, then we have to adhere and prepare for it. But for now, we can still wait and see for the... regulations.”

The METIs in the Philippines are anticipating the introduction of MASS and are open for change that the MASS will bring in the future. They offer courses related to MASS despite the absence of a regulatory framework to remain relevant in the future.

P4: *“I would know maritime institutions, both schools and training institutions or training centers, who... are giving their seafarers... a specific training. And I would imagine, there are maritime education and training institutions offering these trainings but on in-house category. It means it's not yet regulated. It's not yet accredited or part of the standardized mandatory courses being controlled by either CHED and Marina.”*

4.3.2.3.2. India

In India, the policy is already in place and the METI is already offering courses for degree one of MASS.

P2: *“...we have already syllabus in place... making the syllabus, we have a standard policy for that [degree one for MASS]”*

P2: *“whatever is pertaining to degree one, we are already in place and our METIs are doing these courses related to covering this syllabus related to the degree one. But, as a... proactive step we have come up with something called robotics... autonomous AI and robotics which are taught to our basic level officers and ratings... so robotics... automation and artificial intelligence, blockchain technologies, these are included as based on the requirement of industry, it is not the STCW requirement, but these are proactively brought because of the industry's requirement.”*

Though they have facilities in place for degree one but is still uncertain for the facility required in the furtherance of MASS.

P2: *“... still MSC is deliberating, still legal committees deliberating... we don't know what is going to come... we are still evolving, we don't know what is the requirement for the shore training and shore simulator and shore setup what will be required. So, we don't know what is the setup required for shore side... what will be required for the ship side, what seafarers on board for degree two*

degree three, what they will require, we know that... something new will come up, that additional requirement will be given already”

Facilities for degree one are already in place and new facilities requirement for degree two is still unknown due to uncertainties of specification and design of simulator that is yet to exist.

P2: “... the seafarer METIs have the infrastructure in places like building Wi Fi, other things, only the simulator things which will be required will be tried and they have their own library, whatever books comes they can procure the books.”

To come up with their own facilities, METIs are generating their own financial resources to be sustainable but, the government may provide funds when necessary and capable.

P2: “... public METIs are themselves sustainable. They have their own funds, they are autonomous. Government doesn't keep funding, government has funded and started them. They're funding everything... they do on their own, they have to make courses, earn money and run the organization. And if there is something new and they require heavy funds, which is required for the nation's development, then the government may try and fund it but it is left to the METIs to come up with their own...And these are all self-sustainable and they were able to get their own ECDIS, their own simulators, everything on their own.”

4.3.2.3.3. Chile

In Chile, they are aware that the MASS will soon be introduced in the industry but as a small supplier of seafarers, they are not taking any actions yet.

P3: “...we are... aware that the MASS will be fact very soon. But... in the practically where we don't have any measures yet. We are just studying and being aware that this will be our issue that we have to face in the future...”

Shipowners as end-users of the seafarer’s knowledge and skills invest in the METIs by providing their needed resources.

P3: “... because I think that in our country, everything works according to the requirements of the ship owners... I think that probably... after the IMO set the standards... the proper training that... they are going to need. And after that... the shipowners will invest in the... proper needs for the implementation of MASS. But I think that this will be a disruptive change... in the standard methods of education and training.”

However, without the regulatory framework, the specific requirements and resources needed by the METIs in providing standard training of seafarers for MASS are still uncertain.

P3: “Well, first of all the... policymaking... after... the IMO resolutions... on the implementation of MASS... after developing that and then setting... the local policies... we will be very clear on what are going to be the needs... for this implementation.”

4.3.2.3.4. Myanmar

In Myanmar, they have not made any preparations for MASS yet.

P6: “So, unfortunately, we have not developed the maritime autonomous surface ship yet... we have not developed the MASS yet. So, we have no idea about this, how will you? How will we implement in the future? And what will be... the challenges and futures?”

To adopt with the change brought about by MASS, connotes new requirements for resources needed for the implementation of new sets of skills.

P6: “... right now, there is no... specific convention... for that training... So, if we're developing the autonomous ship... it will be related to all training facility or resources just like the simulator... That's why the training standard wherever you require, and another one is a facility... it will... include... simulators... and also the human resources... the instructor... will have a fully knowledge of their surface ship. That's why we need the human resources. And also, we will need a certification guidelines... And the other one is the cost. So it will be distributed from the budget that we can achieve. So, we have to... distribute... the cost...”

4.3.2.3.5. Guyana

Guyana as a developing nation is aware of the MASS but no proactive measures were taken for the required education and training of seafarers for MASS.

P5: “We haven't really started anything much in relation to MASS. Our country is still one of the developing nations... But... begun to look at... that [MASS] specifically as yet.”

METIs in Guyana are self-supporting. They provide their needed resources to sustain the institution.

P5: “... the METIs... are independent bodies. So they're usually responsible for providing the resources. But... when it comes to the... operationalization of the MET, and the actual work of the MET, that's when maritime has the responsibility. So we don't deal with their resources and all those different things, they have direct responsibility for that. And we just deal with the oversight of the actual... operationalization of what are they responsible for... they're [METIs] all private.”

4.3.2.3.6. Indonesia

Indonesia is not making any preparations either in the introduction of MASS.

P7: "... we're not ready for that issue [MASS]... we DON'T prepare anything regarding... what we have to change, the strategy, how to train, how to operate?... who will operate the ship from shore?... they [the institution] don't care. Because the top level, they don't compel us..."

4.3.2.3.7. China

China is on the initial stage of the initial step of the development of MASS in the form of guidance called smartship.

P9: "... in September 2018 we have our work plan 2019 to 2021... to develop the Smartship... It's just as the initial step on initial stage of the development of the MASS... it's just a guidance. Already have just guidance... it includes a... five aspects, including a smart ship, smart code, smart navigation guarantee, smart shipping surveys, and smart shipping supervision."

Some schools give students an overview about MASS.

P9: "As far as I know, there are not much school that develop... or have the courses on MASS. Only few school... have the relevant courses. It tell the students or tell the seafarers how... the MASS developing or how is the shipping look like in the future."

China has proactive measures on MASS but is not focused on educational aspects.

P9: *“The regulation on MASS is also our concern... But at this time or at this stage, we've focused much... on... regulations of MASS but not in aspects on education or STCW convention about the MASS.”*

4.3.2.4. Challenges

Seafarers supplying countries are facing the challenges of unemployment of seafarers without the required competency for MASS, financial resources, human resources, technology, regulatory framework and physical resources brought about by the disruptive technology in the shipping industry.

P2: *“the main thing is people, the seafarers have a particular mindset... So, the perception is that they will lose jobs... The second challenge I told is regarding funding, we don't know what will be coming up, and what will be the investment involved in the funding of the show relative to the simulators and the METIs related infrastructure and simulators... The third thing is related to the training, how will you set up your training pool because you will need specialized training instructors who will train them... So many trainers have to be trained, so we don't know how it is going to come and how we will proceed... the fourth challenge which I can think about is related to cybersecurity...”*

P6: *“We have... no... standard convention for the training. So that will be the future challenges, and also the human resources. That means... our country... don't have a related training facilities for the instructors... And another one is the cost. We cannot... estimate how much cost will be in the future in the implementation of the that ship so training standard costs and human resources will be the challenge in the future.”*

P5: *“Right now, the present challenge, I believe, is our legal framework. Not only our legal framework, but our human resources... we usually make do with what we have, currently, but it's still not sufficient. I don't think human*

resources are ever really sufficient. So I think human resources on our legal framework, those are there... plenty of room for improvement concerning those two factors.”

The output without meeting those challenges can result in lesser demand of graduates that will eventually lead to a decrease of employment of seafarers without the required competency for MASS.

P1: “I think the only challenge is... 100%... is how to deploy our graduates because... the ship will be not needing any seafarers on board anymore. So, the school is producing graduates to operate the ship. So, that is our challenge, how to employ our graduate, but for now, still not on the horizon here in the Philippines. We keep on continuing to produce... quality graduates demand current shipping operations for current industry.”

P1: “So if that autonomous ship is owned by other companies, or other countries, and they declined to accept our seafarers to operate it ashore, then that is also a great challenge for us as a private maritime institution”

4.3.2.5. Outlook

Some notions were identified on what will be the future of seafarers in the introduction of MASS.

P2: “...India being a labor supplying country like Sri Lanka, Bangladesh, Philippines, we have a lot of seafarers and a lot of revenue comes through this and we have a large number of seafarers who are going on ships serving and coming back. So, they have a notion that if this [MASS] comes then they will lose job you know...because they will lose job and relevance...”

P4: “Now, in the future, I could imagine that the challenge would be... how practical it is for seafarers to be given an additional training because in the

Philippines, we have so much training for seafarers and seafarers are in fact complaining of so much training they would have to undergo in order to advance their career, in order to maintain their career, in order to be relevant at career at sea. So, I think that is a probable challenge in the future. How much would be the cost of training? How long will the training be? And if it is, in that the return for taking the training will be as rewarding as the sacrifice of spending time with family of the expenses for the training, things like that.”

P7: “... when we are discussing about the problem, about MASS because the Philippine and Indonesia are big supplier of seafarer and what will be the impact of the MASS for them. There's a lot of people that might lost their job... I realize that this will happen to my country in the future... we have to prepare... seriously it will impact all institutions [METIs] directly and a lot of seafarer... I think it is... about... the level of the structure of organization in our country...”

P7: “And many people... depends on this job... when they lost their job, I think... poverty will increase in Indonesia... there's no any preparation at this moment...”

If there are negative notions, there are also positive notions for embracing the technology and seeing the opportunities that the MASS could offer in the future.

P1: “... I think the cadets or the incoming cadets... is more excited, you know, the young seafarers, the young cadets now are most on the gadgets and they are excited, but that excitement is only very shallow, but on the job opportunity... of course, drastically in any industries, the terms from manual to automatic will resort to reduction of manpower. So, it will be the same in our industry also”

P2: “In fact, they will get more jobs relevant to this because there are so many offshoots in this so that they can get some offshore job and people will love to

get that money same money working in offshore and the associated maintenance and troubleshooting related jobs will come and the Indian seafarers are much more advanced in digitalization. So, they can get more jobs everywhere with their enhanced knowledge, including the seafaring knowledge which they possess...”

Other countries may still be resistant to change and may still be in the denial stage but must embrace technology to adapt to change.

P8: “... mass is not yet seen that this will be really the future... we still need somebody to be there... really need to have the seafarers on board of the vessel but again, it will be depending on how we do have the technology and how are we going to explain further the advantages of mass... adaptation and even... the acceptance of... the Filipinos for MASS knowing when it comes to... technology... we're not yet open, so maybe that will be the adjustment on how are we going to embrace MASS in this point in time.”

4.3.2.6. Preparedness of the government

Generally, countries have no regulations at hand for automated ships having no international regulations mandating for new required competency of seafarers.

P1: “... there are no regulations yet here in the Philippines or any mandates for the autonomous ships operations...”

P4: “... with regards to MASS I am afraid to share information that the current developments... the current developmental programs and the research agenda for the development of education and training standards within Marina is yet to include MASS...”

P8: “... as far as MARINA or PMMA is concerned, they're not yet pushing. Like having MASS really on this subject. It might be depending on the

instructor because it is not yet on the curriculum. We haven't yet put it officially that we need to put MASS as part of the subject or perhaps maybe on the new technologies. They might provide it as a topic but in order for them to make it official and absorb... we need to put MASS officially we don't have something like that at the moment.”

Chapter 5 Discussion

5.1. Introduction

This chapter discusses the METI system; the preparedness, challenges, and outlook of participating countries and preparedness of METIs based on determinants.

5.2. METI System

Based on the findings, METI provides quality education to the seafarers to become globally competitive in the seafaring industry in compliance with the standard set by STCW. It is a system working in a larger system. Externally, it is hierarchical in structure from international level to national level. The IMO set the international regulatory framework for seafarers competency. The maritime administration serves as the bridge between the IMO and the national government in the implementation of the STCW within a country. It creates policies and regulations for implementation and accredit, monitor and audit the METIs to ensure compliance with the standards. They can either be Maritime Training Institutes (MTI) that is purely regulated by MARAD or Maritime Higher Education Institutions (METI) that is regulated by both MARAD and Ministry of Education (MoE) or CHED in the case of the Philippines. They collaborate to ensure compliance with standards of education. The governmental structure varies from country to country. In addition, the level of hierarchy depends on the structure of regulating body in every country as shown in Figure 2. MARAD regularly assesses the METI and an external independent body, having no influence to either METI or MARAD, will conduct audit to METI to ensure its quality standard in compliance with STCW. It forms part of the feedback system of an institution.

P7: "So, the Maritime Administration in Indonesia will assess every entity whether this is private or public. If they are not complying with the IMO regulation... they will stop them to operate... So EMSA from Europe and maritime... They visit us also they assess, and audit our institution, whether we comply with IMO regulation or not... in terms of the process... because you know, that the EMSA really, really strict to check all of the document... But the

Maritime Administration regularly will assess every MET because they will not issue the certificate, who... have power to issue a seafarer certificate... This is one of a kind... the Maritime administration ensures that all of the great craftsmen from STCW are really complied by the MET... ”

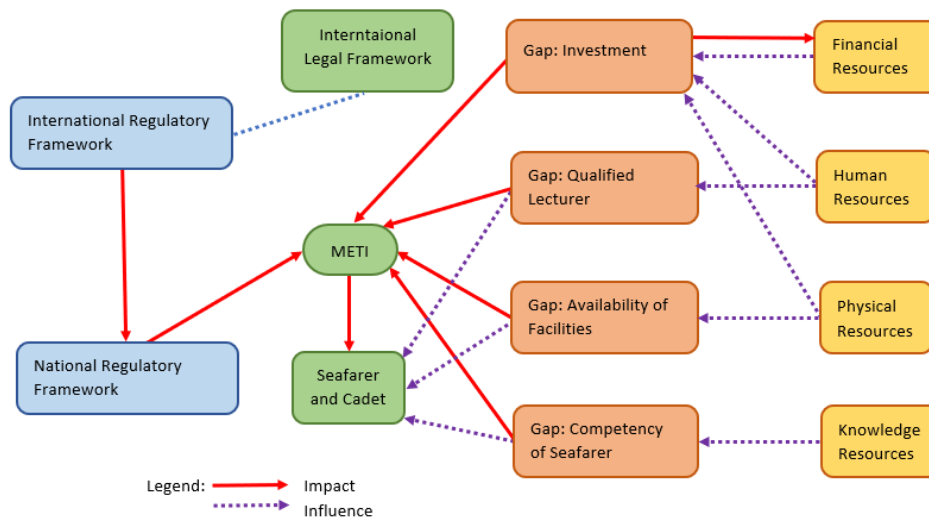
METI operates in an open system that requires needed resources to produce globally competent seafarers as its equifinality. Implementation of required competency for seafarers requires resources such as financial, human, physical and information resources. However, based on the definitions in Chapter 2, knowledge is of higher level than information as shown in the DIKW hierarchy pyramid (Figure 1). Knowledge can be acquired from information received; thus, it is appropriate to replace information resources to knowledge resources. Thereby resources can be financial, human, physical and knowledge resources. Course curriculum is delivered by the METI in their learning space through teacher-student interaction with the aid of adequate resources that are essential in seafarer’s optimal learning experience to achieve METIs equifinality.

METIs are self-sustainable and have to source out funds from the students in the form of tuition or from donors to ensure adequate needed resources in delivering the course. The imbalance of resources can result in a varying degree of competency among seafarers as it directly influenced the optimal learning experience of students. For the successful implementation of required competency for MASS, challenges must be leverage by addressing the gap in the system by continuous collaboration from a partnership.

Further, a comparison of external and internal factors that can be considered to influence the preparedness of METI in implementing the required education and training of seafarers for MASS based on literature review and empirical research are summarized in Figure 25.

Figure 25.

METI System Gap Analysis



External factors are those that can be influenced by the METI but are beyond their immediate control while internal factors are in full control and management of the METI. All internal factors are found to be resources that are essential in the operation of METI in delivering the required education and training for seafarers. Financial resources indirectly impact the delivery of required competency but are the source of funds to invest in all other resources such as human, physical and knowledge resources. Financial resources and donations are taken from the external environment yet the METI has full control in sourcing out and utilizing. The international and national regulatory framework is being worked on by a separate organization or institution that is beyond the control of METI or has its autonomy thus, considered as external factors.

Table 3.

A Summary of External Factors Based on Empirical Research

External factors (Literature review)	External factors (Empirical research)
Regulatory framework <ul style="list-style-type: none"> - International regulatory framework - National regulatory framework - Environment - Constraints 	Regulatory framework <ul style="list-style-type: none"> - International regulatory framework - National regulatory framework
Internal factors (Literature review)	Internal factors (Empirical research)
Resources <ul style="list-style-type: none"> - Financial resources - Human resources - Physical resources - Knowledge resources 	Resources <ul style="list-style-type: none"> - Financial resources - Human resources - Physical resources - Knowledge resources

5.3. Preparedness on MASS

5.3.1. Regulatory Framework

5.3.1.1. International Regulatory Framework

At the international level, Maritime Safety Committee (MSC), IMO’s senior technical body on safety-related matters (IMO, MSC), has already approved the outcome of the scoping for the use of MASS (MSC, 2021).

5.3.1.2. National Regulatory Framework

All countries under study are aware and anticipate the introduction of future MASS in the shipping industry waiting for the approval of the STCW for MASS and subsequently, guidance from IMO for implementation of the new STCW before formulating their guidelines and thereafter for implementation of METIs.

P1: “we always strive to be the best in the country and to supply the... qualified seafarers. And for the mass. Since the government has not yet fully introduced

it in the regulation... we still have to adhere and wait whatever the government is imposing to us. So... we can say, wait and see for us, but we keep on continuous improvement. And looking forward because if that is the direction of the government towards the international compliance, then we have to adhere and prepare for it. But for now, we can still wait and see... for the regulations.”

Nevertheless, seafarers’ top supplying countries like Philippines offer in-house training or conducting training with the absence of a regulatory framework. India is also offering courses for future MASS. Though China does not offer courses for future MASS but is conducting familiarization to their cadets and seafarers about the future MASS in the shipping industry.

Other METIs and the MARAD had proactive measures in providing probable required competency for MASS. However, all the countries do not have an existing regulatory framework for future MASS based on both the quantitative and qualitative findings as stated in Chapter 4 as they have other priorities for their seafarer's career at present.

P4: “... one of the priorities of MARINA now is to make the Philippine be accepted by EMSA [European Maritime Safety Agency] or by the European Union. So, at this time ... the focus here is to make sure that it will pass the EMSA inspection for... Filipino seafarer be accepted to those European vessel or vessels that are visiting European or European Union countries...”

5.3.2. Resources

5.3.2.1. Financial Resource

It was found that funds are the source of other resources necessary for METI in implementing the required education and training of seafarers for MASS.

P6: “... right now, there is no... specific convention... for that training... So, if we're developing the autonomous ship... it will be related to all training facility or resources just like the simulator... That's why the training standard wherever you require, and another one is a facility... it will... include... simulators... and also the human resources... the instructor... will have a fully knowledge of their surface ship. That's why we need the human resources. And also, we will need a certification guidelines... And the other one is the cost. So it will be distributed from the budget that we can achieve. So, we have to... distribute... the cost...”

On the other hand, other METIs being self-sustainable, opt to remain in status quo due to uncertainties of resources needed for MASS without the regulatory framework so as not to waste time and resources. Investing in resources needs strategic analysis to be more effective and efficient in implementing the required education and training of seafarers for MASS.

Non-governmental institutions are found to be more generous than the government. Utilizing the resources effectively and efficiently can build trust and confidence in their partnership that can inspire the investors and attract more to invest which is essential in METI's sustainability. Further, the economic resources of the country impact the availability of resources of METIS (Sampson, 2004). Presently, METIs of either small or top supplying countries of seafarers is yet to invest for resources needed for MASS.

5.3.2.2. Human Resource

A qualified and committed employee is the real asset of the company (Coffman, 2000) but a less attractive salary is a challenge in recruitment. METIs with limited funds are inclined to invest in facilities rather than in human resources. Yet, acquiring a sophisticated simulator without a qualified lecturer does not make any sense (Sampson, 2004) in providing required competency for seafarers. Human

resources as an essential element in achieving the equifinality of METIs must continuously update their qualification to remain relevant to the needs of the industry.

On the other hand, the result based on empirical research as shown in Chapter 4.2.4.4 is an indication that only a few METIs can afford to hire a full-time qualified lecturer depending on their capability to pay the high salary while only few can hire part-time qualified lecturers due to unattractive salary that the METI can offer. It is one of the challenges that the METI is facing in human resources per Chapter 2.

As mentioned earlier, there is no preparation being undertaken for the qualification of human resources due to uncertain skills needed for MASS.

5.3.2.3. Physical Resources

Student's academic performance and learning space was found to have a high degree of relationship. However, its adequacy and quality vary widely particularly between private and public METIs which can impact on the standard set by STCW. As a result of the survey, METIs have all the requirements needed in providing standard training for seafarers. They will not be allowed to operate without the standard requirement set by the maritime administration. Investing in physical resources can be very expensive and having uncertainties on its specifications can lead to a waste of money and time as well which necessitates METI to remain in status quo. Either small or top supplying country of seafarers, it is necessary to undergo strategic analysis to invest effectively and efficiently in physical resources. The simulator was found to be the biggest concern for physical resources.

In conclusion, investing in plausible resources of METIs for MASS that is still uncertain due to the absence of a regulatory framework can result to waste of time and money. To summarize the preparedness of small and top supplying countries, they are still waiting for the top management to enforce new requirements and no preparations are being undertaken yet.

5.3.2.4. Knowledge resources

During the transformation process, in an open system, the students acquire the optimum learning experience. Seafarer's tacit knowledge is very essential in their nature of work to ensure the safety of navigation on board ship but they have to be with the latest trend in the industry to remain relevant. Incorporation of other sources of knowledge is necessary as a tool in the delivery and acquisition of knowledge. To remain relevant in the industry, top supplying countries like Philippines, China and India offered courses for MASS.

P4: "I would know maritime institutions, both schools and training institutions or training centers, who... are giving their seafarers... a specific training... on in-house category. It means it's not yet regulated. It's not yet accredited or part of the standardized mandatory courses being controlled by either CHED and Marina."

In India, the policy is already in place and the METI is already offering courses for degree one of MASS.

P2: "...we have already syllabus in place... making the syllabus, we have a standard policy for that [degree one for MASS]"

P2: "whatever is pertaining to degree one, we are already in place and our METIs are doing these courses related to covering this syllabus related to the degree one. But, as a... proactive step we have come up with something called robotics... autonomous AI and robotics which are taught to our basic level officers and ratings... so robotics... automation and artificial intelligence, blockchain technologies, these are included as based on the requirement of industry, it is not the STCW requirement, but these are proactively brought because of the industry's requirement."

Internal factors directly impact the METIs that produce synergy. Physical resources can be a source of information that is used by the lecturer as an aid in teaching. Interaction between students and teachers with the aid of physical resources creates tacit knowledge to the students. Each internal factor must co-exist to meet the equifinality and sustainability of the METIs. However, unevenness of resources can affect the quality standard or uniformity of the learning experience based on the availability of qualified lecturers and a well-equipped environment. It can be viewed that the top supplying countries are more proactive compared with the small supplying countries as shown in Appendix 'C.'

5.4. Challenges

Challenges cannot be considered as internal or external factors but they are present in some of the factors that influence the preparedness of METI. Some countries are already in place for degree one of MASS and generally, the regulatory framework appears to be the triggering factor in the implementation of the METIs of standard training. Without the legal framework, there are uncertainties on the required resources of METIs in the implementation of required education and training of seafarers for MASS. Thus, the absence of which impedes the preparedness of the METIs.

P4: "Well, first of all the... policymaking... after... the IMO resolutions... on the implementation of mass... after developing that and then setting... the local policies... we will be very clear on what are going to be the needs... for this implementation."

Financial resources determine the capability of the institutions to invest in the resources that are necessary for their sustainability. It is a challenge to invest for something that is uncertain and unknown.

P2: "So we don't know what it [resources needed] is and how funding will be done and what will be the funding, what investment will be required"

P6: *“We cannot... estimate how much cost will be in the future in the implementation of the... training standard costs and human resources will be the challenge in the future.”*

Another challenge that the METI is facing is on how to invest and attract a qualified lecturer for a qualification that is yet to exist.

P2: *“... How will you set up your training pool because you will need specialized training instructors who will train them...”*

Without the regulatory framework of MASS for imposition, METIs will remain in status quo. Policies and guidelines take time for approval. The introduction of MASS will lead to lesser demand of seafarers having irrelevant knowledge and skills.

The partnership creates collaboration and cooperation; sharing of assets and resources for their development and sustainability. It can close the gap in maritime skills. Challenges can more or less impact the resources but partnership with stakeholders can lessen its effect (Mthuli, 2018).

P8: *“... maybe we need to have a... holistic approach. It is not fitting that it would only be the administration, it should be with education provider, training provider and even the end user or the ship owners or the manning agency. It should be a holistic if that would really be the shipping in the near future. So we need to do it holistically to leverage over the challenges.”*

5.5. Outlook on the introduction of MASS

The introduction of MASS in the shipping industry threatened seafarers of losing their job brought about by the probable new set of required competences for MASS. Unemployment is expected to increase poverty in the country. The regulatory framework can take time before its implementation that can extend the relevance of

seafarer's competency. However, the operation of MASS in the industry would require new qualifications from seafarers without the regulatory framework. METIs who are not offering the relevant courses will become unattractive. This can directly impact the institution and would necessitate them to offer relevant courses.

On the other hand, younger generations are perceived to be more engaged in gadgets; more excited to work with MASS. New competences can offer new job opportunities to qualified seafarers earning the same amount of money while working onshore base. It could be a safer and more accessible working environment compared to onboard ship.

P1: "because the Philippines or our institutions specifically dependent on the demand of the manpower demands of the shipping industry, if the demands will slow down because of automated ships, then... the school or the administration or our campus will also strive in that situation, you can adopt and maybe change"

The member states are waiting for the imposition of legal framework and are open to embrace the changes in the future

P2: "... we are waiting for the outcome of the MSC and legal committee as what is going to come then..."

P1: "Since the government has not yet fully introduced it in the regulation for the MASS, we still have to adhere and wait, whatever the government is imposing to us. So... we can say, wait and see for us... And looking forward because if that is the direction of the government towards the international compliance, then we have to adhere and prepare for it. But for now, we can still wait and see for the... regulations."

Chapter 6 Conclusions and Recommendations

6.1. Introduction

This chapter will summarize the findings based on the literature review and empirical research conducted by the researcher followed by the research contribution and recommendations that the countries may apply in preparing for the implementation of the newly required competency of seafarers for MASS.

6.2. Research Questions

Answers to research questions are presented to ensure that the aim and objectives of the research is achieved.

6.2.1. RQ1: How does the METI system work?

The seafarer's competency is being regulated internationally by the IMO and being promulgated by the country. A regulating body framed policies, rules and regulations in the implementation of STCW by the METIs. External and internal factors influence the implementation METIs of STCW to achieve its equifinality. External factors are regulatory framework while internal resources are financial resources, human resources, physical resources, financial resources and knowledge resources.

METI system is working in an open system interacting with its stakeholders in a larger environment. METI is a close system as it can function independently from the larger system. Likewise, the absence of one element in the form of its resources will degrade the result of its output.

Human resources is essential in delivering the knowledge to seafarer with the aid of physical and knowledge resources. Physical resources are an essential aid for lecturers during delivery of curriculum. Some knowledge resources can be in the form of physical resources such as books as an aid of lecturer during curriculum delivery. Financial resources are used to invest in all other resources. METI's goal in providing

required education and training for seafarers is operating in a closed system that each resources must co-exist with one another. The absence of one element will disrupt the operation of the METI. The preparedness must not be in one element but must be balanced and dynamic to create synergy for its equifinality.

6.2.2. RQ2: What are internal and external factors affecting the MET system that can be considered for preparedness in the introduction of MASS?

This study found that the internal and external factors affecting METI in the implementation of new required competency for seafarers in general is summarized in Table 4.

Table 4.

A Summary of Factors Affecting METIs Based on this Research

External factors
Regulatory framework <ul style="list-style-type: none"> - International regulatory framework <ul style="list-style-type: none"> o International Legal Instruments - National regulatory framework <ul style="list-style-type: none"> o National Policy - Environment <ul style="list-style-type: none"> o Social o Political o Economic - Constraints <ul style="list-style-type: none"> o Law and Policy o Expectation of parents o Values and Goals o Society's existing knowledge
Internal factors
Resources <ul style="list-style-type: none"> - Financial resources <ul style="list-style-type: none"> o Tuition Fee o Donation - Human resources <ul style="list-style-type: none"> o Lecturers o Staff - Physical resources

- | |
|--|
| <ul style="list-style-type: none"> ○ Facilities ○ Utilities - Knowledge resources <ul style="list-style-type: none"> ○ Curriculum Delivery ○ Sea phase |
|--|

6.2.3. RQ3: What are the challenges of the METIs in preparation for the introduction of MASS?

Challenges cannot be considered as internal or external factor but it has presence in some of the factors that influence the preparedness of METI as follows:

Table 5.

Challenges in the Preparedness of METIs in the Introduction of MASS

Factors Affecting the Preparedness of METIs	Challenges
Regulatory Framework	<ul style="list-style-type: none"> • The absence of international regulatory framework impedes the implementation of STCW course for MASS and the METI for taking proactive measures to provide STCW courses due to uncertainties of the future without the policy
Financial Resources	<ul style="list-style-type: none"> • Lack of financial capability can lead to inability to invest in human and physical resources that can affect the teaching and learning experience of the students. • In most countries, METIs are self-sustainable and resources are not distributed equally that likewise affects the teaching and learning experience of students that subsequently affect the output of the METIs. • Sourcing out of funds needed
Human Resources	<ul style="list-style-type: none"> • How and who will train the lecturers to teach for a competency of seafarers that is yet to exist. • How can the lecturers upgrade their skills for a competency that is yet to exist. • Capability to hire a lecturer with appropriate qualification is a challenge due to unattractive remuneration offered by the METI.

Physical Resources	<ul style="list-style-type: none"> • To invest in facilities and equipment that still uncertain due to absence of regulatory framework impedes the METIs in providing the required competency of seafarers for MASS.
--------------------	---

Regulatory framework is a triggering factor to determine the future needs of the METI in implementing the STCW courses. METIs are unable to invest due to uncertainties as it could lead to waste of time and money. In addition, resources are not evenly distributed which affects the quality of output of the METIs. However, challenges can be leverage by cooperation and partnership.

6.2.4. RQ4: What is the outlook of seafarers and cadets on the introduction of MASS and how it will affect their competences?

Introduction of MASS was viewed negatively and positively due to the probability of new required competency of seafarers in the future. Without the required competency, it can be viewed negatively resulting to unemployment that could lead to increase in poverty, but with the required competency for MASS, it can open a window of opportunity for more jobs on shore. In addition, younger generations are more excited to acquire competency for MASS being perceived as more engaged in technology like gadgets nowadays.

6.2.5. RQ5: What is the preparation of the government in the introduction of MASS?

Generally, with the hierarchy in implementing the regulatory framework for MASS from international level, most countries are waiting for the international regulatory framework as a reference for adoption to remain relevant in the future. All countries perceived that investing into something that is uncertain is a waste of time and resources. Thus, presently, the proactive measures of participating countries are to at least remain relevant in supplying seafarers in the industry. Small suppliers remain in status quo while there are some evidences of measures taken by top suppliers

such as offering MASS related courses. The absence of regulatory framework for MASS and the uncertainties of the future requirements of METIs in providing required education and training of seafarers for MASS, it can be concluded that no participating country is prepared yet to provide competent seafarer for MASS.

6.3. Conclusion

In order to remain relevant in the future, the regulatory framework and the necessary requirements for the preparedness of the country must be put in place. Investing into something uncertain can waste time and resources.

In conclusion, MASS was introduced in the shipping industry to solve the problem on safety, security and protecting the environment. Manning the automated ship requires new competency of seafarers. Generally, the METIs are not making any preparations with the absence of regulatory framework that provides necessary guidelines and specific requirements for their implementation. To invest in uncertainties can waste time and resources. Regulatory framework must be in place to make necessary preparation in the implementation of seafarer's competency for MASS.

6.4. Contribution to literature

The researcher aims to provide awareness, specifically to the METIs of top supplying countries of seafarers, of their level of preparedness in providing competent seafarers for MASS. Likewise, to provide factors for assessment of their capability to sustain the adequate number of seafarers to man the automated ships. The theoretical and conceptual framework can be a reference guide of the METIs and of the government to be taken into consideration for their strategic analysis during their preparation stage in the introduction of MASS.

6.5. Recommendation

Government and METIs should consider the following in preparing for the automated future of shipping industry:

1. Embrace change and technologies of the future;
2. Conduct comprehensive analysis for the needed resources to provide optimum learning experience for the students;
3. Use a bottom-up approach for policy making to address the concerns of all stakeholders and to optimize resources;
4. To study the developed countries that are already using the MASS for proactive measures to be taken;
5. To seek consultation from technical experts in making regulations.
6. Maintain close collaboration and cooperation with stakeholders.

6.6. Limitation and future research

This study did not cover the preparedness undertaken by METIs of developed countries specifically those who are already using the MASS. It can aid the METIs of developing countries to plan for their proactive measures to remain relevant in the future.

References

- Agbonghale, G. O. & Adavbiele, J.A. (2018). Relationship Between Resource Availability and Academic Performance of Students in Wood Work in Technical Colleges in Delta State, Nigeria. *International Journal of Education, Learning and Development*, 6(2), 14-25. <https://www.eajournals.org/wp-content/uploads/Relationship-between-Resource-Availability-and-Academic-Performance-of-Students-in-Wood-Work-in-Technical-Colleges-in-Delta-State-Nigeria.pdf>
- Alop, A. (2019). The Challenges of the Digital Technology Era for Maritime Education and Training. https://www.researchgate.net/publication/333152469_The_Challenges_of_the_Digital_Technology_Era_for_Maritime_Education_and_Training
- Amadi, E. (2019). Physical Resources Availability and the Academic Performance of Students in the Universal Basic Education Scheme, Rivers State. *International Journal of Innovative Development and Policy Studies*, 7(1), 13-23. <https://seahipaj.org/journals-ci/mar-2019/IJIDPS/full/IJIDPS-M-2-2019.pdf>
- Asiabaka, P.I. & Mbakwem, J. (2008). Assessment of Facility Needs of Government Primary Schools in Imo State, Nigeria: Some Neglected Areas. *New York Science Journal*. http://www.sciencepub.net/newyork/0102/03_0367_Asiabaka_Assessment.pdf
- Bhardwaj, S., Bhattacharya, S., Lijun Tang, L. & Howell, K.E. (2019). Technology introduction on ships: The tension between safety and economic rationality. *Safety science*, 115, 329 - 338. <https://doi.org/10.1016/j.ssci.2019.02.025>
- Baltic and International Maritime Council (BIMCO) and International Chamber of Shipping (ICS) and. (2021). New BIMCO/ICS Seafarer Workforce Report warns of serious potential officer shortage. <https://www.bimco.org/news/priority-news/20210728---bimco-ics-seafarer-workforce-report>
- Basak, S.K. (2017). A Framework on the Factors Affecting to Implement Maritime Education and Training System in Educational Institutions: A Review of the Literature. *10th International Conference on Marine Technology, MARTEC 2016*. *Procedia Engineering*, 194(2017) 345 – 350. <http://doi.org/10.1016/j.proeng.2017.08.155>
- Basalla, G. (1988). *The Evolution of Technology*. Cambridge University Press
- Bartusevičienė, I. (2020). Maritime Education and Training as a Tool to Ensure Safety at Sea in the Process of Introduction of Maritime Autonomous Surface Ships

- in Shipping. Proceedings of 24th International Scientific Conference. Transport Means 2020, 368-374. https://www.researchgate.net/publication/349120238_Maritime_Education_and_Training_as_a_Tool_to_Ensure_Safety_at_Sea_in_the_Process_of_Introduction_of_Maritime_Autonomous_Surface_Ships_in_Shipping
- Betts, F. (1992). How Systems Thinking Applies to Education. <https://www.ascd.org/el/articles/how-systems-thinking-applies-to-education>
- Bielić, T., Hasanspahić, N. & Čulin, J. (2017). Preventing marine accidents caused by technology-induced human error. *Scientific Journal of Maritime Research*, 31(2017), 33-37. https://pdfs.semanticscholar.org/7e55/c6fa0fa583670b42a9507c451c86520a7d44.pdf?_ga=2.206902869.797584755.1627804867-1608420757.1627804867
- Catal, C. and Tekinerdogan, B. (2019). Aligning Education for the Life Sciences Domain to Support Digitalization and Industry 4.0. *Procedia Computer Science*, 158(2019), 99–106. <http://doi.org/10.1016/j.procs.2019.09.032>
- Chan, S.R., Hamid, N.A. & Mokhtar, K. (2016). A Theoretical Review of Human Error in Maritime Accidents. *Advanced Science Letters*, 22, 2109–2112. <https://doi.org/10.1166/asl.2016.7058>
- Chatfield, T. (2019). Technology in deep time: How it evolves alongside us. <https://www.bbc.com/future/article/20190207-technology-in-deep-time-how-it-evolves-alongside-us>
- Chaudhary, G.K. (2015). Factors affecting curriculum implementation for students. *International Journal of Applied Research*, 1(12), 984-986. <https://www.allresearchjournal.com/archives/2015/vol1issue12/PartN/2-5-158-343.pdf>
- Ćorović, B. & Djurović, P. (2013). Research of Marine Accidents Through the Prism of Human Factors. *Promet – Traffic & Transportation*, 25(4), 369-377. https://www.researchgate.net/publication/272807445_MARINE_ACCIDENT_S_RESEARCHED_THROUGH_HUMAN_FACTOR_PRISMA/link/5877c9d708aebf17d3bbaf01/download
- Coffman, C.W. (2000). People Aren't Your Greatest Asset. Gallup Press
- Davenport, T.H. & Prusak, L. (2000). Working Knowledge. How Organizations Manage What They Know. https://books.google.com.ph/books?hl=en&lr=&id=-4-7vmCVG5cC&oi=fnd&pg=PR7&ots=mAi7TZ7nM1&sig=wD4C6F-R5PYNVmbaAv0xXrGTyfy&redir_esc=y#v=onepage&q&f=false

- David, F.P. (2005). *Understanding and Doing Research: A Handbook for Beginners* (n.p.)
- Deling, W., Dongkui, W., Changhai, H. & Changyue, W. (2020). Marine Autonomous Surface Ship - a Great Challenge to Maritime Education and Training. *American Journal of Water Science and Engineering*, 6(1), 10-16. <https://doi.org/10.11648/j.ajwse.20200601.12>
- Demirel, E. & Mehta, R. (2009). Developing an Effective Maritime Education and Training System- TUDEV Experiment. https://www.marifuture.org/Publications/Papers/Developing_an_effective_maritime_education_and_training_system_IMLA_2009.pdf
- Emad, G.R., Khabir, M. and Shahbakhsh, M. (2020). Shipping 4.0 and Training Seafarers for the Future Autonomous and Unmanned Ships. 21th Marine Industries Conference (MIC2019). https://www.researchgate.net/publication/338395285_Shipping_40_and_Training_Seafarers_for_the_Future_Autonomous_and_Unmanned_Ships?enrichId=rgreq-93b251d08c3f55a5e5f1de427740ee4c-XXX&enrichSource=Y292ZXJQYWdlOzMzMzODM5NTI4NTtBUzo4NDY0ODU3ODQ2NTM4MjVAMTU3ODgyOTM0NjYxOO%3D%3D&el=1_x_2&_esc=publicationCoverPdf
- Garcia, A.M., Nuevo, J.J.M. & Sapa, E.N. (2007). *Research for all disciplines*. Mutya Publishing House
- Garcia, C.D. (2003). *Fundamentals of Research and Research Designing*. Katha Publishing Co., Inc.
- Geneva Center for Security Sector Governance (DCAF). (n.d.). *Regulatory Frameworks*. <https://securitysectorintegrity.com/standards-and-regulations/procurement-monitoring-evaluation/>
- Goundar, S. (2012). Chapter 3 – Research Methodology and Research Method. https://www.researchgate.net/publication/333015026_Chapter_3_-_Research_Methodology_and_Research_Method?enrichId=rgreq-9ec500343941443d8807b4b01b64663e-XXX&enrichSource=Y292ZXJQYWdlOzMzMzMzAxNTAyNjtBUzo3NTcyMTY4MjI5NzI0MTZAMTU1NzU0NTk2NzY5Ng%3D%3D&el=1_x_2&_esc=publicationCoverPdf
- Herzberg, F. (1987). *One More Time: How do you Motivate Employees?*. *Harvard Business Review*. https://www.academia.edu/6906939/One_More_Time_How_Do_You_Motivate_Employees_dud

- Higher Education in Context: Economic Factors, An Era of Competition, Demographic Realities, Governmental Political and Legal Challenges, Religious Factors. (n.d.). <https://education.stateuniversity.com/pages/2041/Higher-Education-in-Context.html>
- International Commission on Shipping. (2000). Inquiry into Ship Safety: Ships, Slaves and Competition. http://seafarersrights.org/wp-content/uploads/2018/03/INTERNATIONAL_REPORT_SHIPS-SLAVES-AND-COMPETITION_2000_ENG.pdf
- International Maritime Organization (IMO). <https://www.imo.org/>
- International Maritime Organization (IMO). (2021). Outcome of the Regulatory Scoping Exercise for the use of Maritime Autonomous Surface Ships (MASS). [https://wwwcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/MSC.1-Circ.1638%20-%20Outcome%20Of%20The%20Regulatory%20Scoping%20ExerciseFor%20The%20Use%20Of%20Maritime%20Autonomous%20Surface%20Ships...%20\(Secretariat\).pdf](https://wwwcdn.imo.org/localresources/en/MediaCentre/HotTopics/Documents/MSC.1-Circ.1638%20-%20Outcome%20Of%20The%20Regulatory%20Scoping%20ExerciseFor%20The%20Use%20Of%20Maritime%20Autonomous%20Surface%20Ships...%20(Secretariat).pdf)
- International Maritime Organization (IMO). (n.d.-a). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Conv-LINK.aspx>
- International Maritime Organization (IMO). (n.d.-b). International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978. <https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Convention.aspx>
- International Maritime Organization (IMO). (n.d.-c). Verification of validity and authenticity of certificates. <https://www.imo.org/en/OurWork/HumanElement/Pages/Maritime-Administrations.aspx>
- Joint Commission on Higher Education (CHED) - Maritime Industry Authority (MARINA) Memorandum Circular No. 01. (2019). <https://ched.gov.ph/wp-content/uploads/JCMC-No.-1-s.-2019-PSG-BSMT-BSMarE.pdf>
- Kaltasso, T.L. (2014). Financial Resources Utilization Challenges: in Some Selected Government Primary Schools of Damot Pullasa Woreda in Southern Nations, Nationalities and People's Region. <http://213.55.95.56/handle/123456789/11600>

- Kothari, C.R. (2004). *Research Methodology: Methods and Techniques* (Second Revised Edition). New Age International Publishers. [https://books.google.com.ph/books?hl=en&lr=&id=hZ9wSHysQDYC&oi=fnd&pg=PA2&dq=Kothari,+C.R.+\(2004\).+Research+Methodology:+Methods+and+Techniques.+New+Age+International+Publishers.&ots=1tW9nChYB1&sig=goN7hTVvGH2qc3ANxOWuzWvnkvE&redir_esc=y#v=onepage&q&f=false](https://books.google.com.ph/books?hl=en&lr=&id=hZ9wSHysQDYC&oi=fnd&pg=PA2&dq=Kothari,+C.R.+(2004).+Research+Methodology:+Methods+and+Techniques.+New+Age+International+Publishers.&ots=1tW9nChYB1&sig=goN7hTVvGH2qc3ANxOWuzWvnkvE&redir_esc=y#v=onepage&q&f=false)
- Kumar, R. (1996). *Research Methodology: A Step-by-Step Guide for Beginners*. Longman
- Kumar, R. (2019). *Research Methodology: A Step-by-Step Guide for Beginners* (Fifth Edition). SAGE. https://books.google.com.ph/books?hl=en&lr=&id=J2J7DwAAQBAJ&oi=fnd&pg=PP1&dq=RESEARCH+METHODOLOGY+a+step-by-step+guide+for+beginners+Ranjit+Kumar&ots=cvoiBAJHej&sig=43wmNiefNaaB6l_bUKJFNrBtDs&redir_esc=y#v=onepage&q=RESEARCH%20METHODOLOGY%20a%20step-by-step%20guide%20for%20beginners%20Ranjit%20Kumar&f=false
- Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. *Journal of Industrial Information Integration*, 6, 1-10. <https://doi.org/10.1016/j.jii.2017.04.005>
- Lunenburg, F.C. (2010). Schools as open systems. <http://www.nationalforum.com/Electronic%20Journal%20Volumes/Lunenburg,%20Fred%20C.%20Schools%20as%20Open%20Systems%20Schooling%20V1%20N1%202010.pdf>
- Lušić, Z., Bakota, M., Čorić, M. & Skoko, I. (2019). Seafarer Market – Challenges for the Future. *Trans. marit. sci.*, 07, 62-74. <https://doi.org/10.7225/toms.v08.n01.007>
- Ma, S. (2021). *Economics of Maritime Business*. Routledge
- Manuel, M.E. & Baumler, R. (2020). The Evolution of Seafarer Education and Training in International Law. *Maritime Law in Motion*, 471-494. https://doi.org/10.1007/978-3-030-31749-2_22
- McLeod, S. (2020). Maslow's Hierarchy of Needs. *Simply Psychology*. <https://www.simplypsychology.org/maslow.html>
- Meadows, D.H. (2009). *Thinking in systems*. Earthscan
- Ministry of Education. (1994). *Education and training policy*. Addis Ababa: St. George Printing Press.

http://www.africanchildforum.org/clar/policy%20per%20country/ethiopia/ethiopia_education_1994_en.pdf

- Ministry of Education. (2007). Education sector development policy. Addis Ababa. https://planipolis.iiep.unesco.org/sites/default/files/ressources/ethiopia_esdp_iv.pdf
- Mthuli, S.A. (2018). A systems thinking exploration of the challenges facing maritime education and training: The case of public higher education institutions in Kwazulu-Natal.
- Muhuri, P.K., Shukla, A.K. & Abraham, A. (2019). Industry 4.0: A bibliometric analysis and detailed overview. *Engineering Applications of Artificial Intelligence* 79, 218-235. <https://doi.org/10.1016/j.engappai.2018.11.007>
- Munge, M.N., Kimani, M. & Ngugi, D.G. (2016). Factors Influencing Financial Management in Public Secondary Schools in Nakuru Country, Kenya. *International Journal of Economics, Commerce and Management*, IV(9), 91-114. <http://repository.embuni.ac.ke/bitstream/handle/123456789/1266/FACTORS%20INFLUENCING%20FINANCIAL%20MANAGEMENT%20IN%20PUBLIC%20SECONDARY%20SCHOOLS.pdf?sequence=1&isAllowed=y>
- Ngcobo, L.A. (2018). Response to technology advancement in Maritime Education and Training: A case study of the South African National Maritime Institutes. World Maritime University Dissertations. https://commons.wmu.se/all_dissertations/660
- Nippon Express. (2019). Maritime Autonomous Surface Ships. <https://www.nipponexpress.com/press/report/10-Dec-19.html>
- NYK Line. (2019). NYK Conducts World's First Maritime Autonomous Surface Ships Trial. https://www.nyk.com/english/news/2019/20190930_01.html
- Obanya, P. (2009). Fundamentals of teacher education development: Brining back teacher to the African school. International Institute for Capacity Building in Africa: UNESCO. https://teachertaskforce.org/sites/default/files/2020-07/bringing_back_the_teacher.pdf
- Organisation for Economic Co-operation and Development (OECD). (2018). Chapter 7: Measuring external factors influencing innovation in firms. *Oslo manual 2018* (4), 145-162. https://read.oecd-ilibrary.org/science-and-technology/oslo-manual-2018_9789264304604-en#page1
- Pateña, A.J. (2019, January 16). *Collective push to boost PH maritime education system sought*. Phil News Agency. <https://www.pna.gov.ph/articles/1059141>

- Rayner, R. (2019). Competence assurance for ship's crew. *IDESS Interactive Technologies, Splash*. <https://splash247.com/competence-assurance-for-ships-crew/>
- Republic Act 10635 (Phl). <https://www.officialgazette.gov.ph/2014/03/13/republic-act-no-10635/>
- Riley, C. (2020). The History of Navigation. <https://www.boatsafe.com/history-navigation/>
- Sampson, H. (2004). Romantic rhetoric, revisionist reality: the effectiveness of regulation in maritime education and training. *Journal of Vocational Education and Training*, 56(2), 245-267. <https://doi.org/10.1080/13636820400200256>
- Sanders, J. (2016). Defining Terms: Data, Information and Knowledge. *SAI Computing Conference 2016*. <http://doi.org/10.1109/SAI.2016.7555986>
- Sarwar, S. (2011). Internal and External Influences on the University Teachers in Semester System. *International Journal of Emerging Sciences*, 1(1), 11-22. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.301.2228&rep=rep1&type=pdf>
- Sgouropoulou, C., Feldman, G.G. and Amini, A. (2016). Higher Education Provision Using Systems Thinking Approach – Case Studies. *European Journal of Engineering Education*. <http://doi.org/10.1080/03043797.2016.1210569>
- Starr, K. & White, S. (2008). The Small Rural School Principalship: Key Challenges and Cross-School Responses. *Journal of Research in Rural Education*, 23(5), 1-12. https://www.researchgate.net/publication/237544752_The_Small_Rural_School_Principalship_Key_Challenges_and_Cross-School_Responses
- Strasser, T.F., Panagopoulou, E., Runnels, C.N., Murray, P.M., Thompson, N., Karkanias, P., McCoy, F.W. and Wegmann, K.W. (2010). Stone age seafaring in the Mediterranean: evidence from the Plakis Region for lower palaeolithic and mesolithic habitation of Crete. *Hesperia J Am School Classical Stud Athens*, 79(2), 145–190. <https://www.ascsa.edu.gr/uploads/media/hesperia/40835484.pdf>
- Strzelczyk, J.J. (2020). Radiation Safety. *Clinical Engineering Handbook (Second Edition)*. <https://www.sciencedirect.com/topics/engineering/financial-resource>

- The Maritime Executive. (2019). First Commercial Crossing of the North Sea by Autonomous Vessel. <https://maritime-executive.com/article/first-commercial-crossing-of-the-north-sea-by-autonomous-vessel>
- Usman, Y.D. (2016). Educational Resources: An Integral Component for Effective School Administration in Nigeria. *Research on Humanities and Social Sciences*, 6(13). <https://files.eric.ed.gov/fulltext/ED578024.pdf>
- Wariishi, K. (2019). Maritime Autonomous Surface Ships: Development Trends and Prospects - How Digitalization Drives Changes in Maritime Industry - . Mitsui & Co. Global Strategic Studies Institute Monthly Report. MGSSI
- Wisdom, J. & Creswell J.W. (2013). Mixed Methods: Integrating Quantitative and Qualitative Data Collection and Analysis While Studying Patient-Centered Medical Home Models. *Patient Centered Medical Home*. <https://pcmh.ahrq.gov/page/mixed-methods-integrating-quantitative-and-qualitative-data-collection-and-analysis-while>
- Yizengaw, J.Y. and Agegnehu, M.A. (2021). Practices and challenges of school financial resource management implementation in Bahir Dar City administration of Ethiopia: A comparative study between government and private secondary schools. *Teacher Education and Development*. <https://doi.org/10.1080/2331186X.2021.1884340>

Appendices

Appendix A: Interview Instrument

Investigation of the Preparedness of Maritime Education and Training Institutions (METIs) of Seafarer's Top Supplying Countries in the Introduction of Maritime Autonomous Surface Ship (MASS)

Dear Participant,

Greetings!

I am Perlita Cinco currently a student of World Maritime University in Malmö, Sweden taking up Masters of Science in Maritime Affairs, specializing in Maritime Education and Training. I am researching on the preparedness of Maritime Education and Training Institutions (METI) of seafarer's top supplying countries in the introduction of Maritime Autonomous Surface Ship (MASS) in partial fulfilment of the requirements of my degree. This questionnaire will determine at what level of preparedness are the top suppliers of seafarers in the shipping industry considering the internal and external factors that affect the implementation of standard of training for seafarers by the METI.

You are cordially invited to participate in answering the questionnaire. It is purely voluntary and will take 20 minutes to complete. All the information that you will provide in this questionnaire will be solely used for my research purposes and the results will form part of my dissertation, which will be published online and made available to the public. Your personal information will not be published. All the data will be treated with utmost confidentiality and anonymity and will be deleted as soon as the degree is awarded. Research data will be securely stored for protection. You may withdraw from the research at any time, and your personal data will be immediately deleted.

The questions will ask about the government and METI's proactive measures in the preparation of seafarer's training for MASS. The questionnaire contains 45 questions and divided into four parts. The first part will be the external factors affecting the METIs in the implementation of MASS. The second part will be the internal factors that affect the preparedness of METIs and the challenges in implementing the seafarer's standard training for MASS. Third part is divided into two parts, the internal factors that affect the private and public METI's preparedness in implementing the seafarer's standard training for MASS. The fourth part will be participants' personal information that will be used to quantify the socio-demographic variable of all participants.

Your contribution for giving feedback on the questionnaire is very valuable and will form an important part in the realization of my research.

<https://forms.gle/1RCWP5eXNgYXKdJwhMdHgKdgVrGuQXjgJv9LUBLqaFDMi/edit>

1/23

Thank you very much for your participation. It is highly appreciated.

* Required

QUESTIONNAIRE

Please click on the box for your answer/s on multiple choice questions and write your answer on the space provided for essay question.

PART I

External factors affecting Maritime Education and Training Institution (METI) in the implementation of MASS

1. To what extent does the Maritime Authority prioritize the regulatory framework of MASS in preparation for the automated future of shipping industry? 0 points

Mark only one oval per row.

	Not a priority	Low priority	Moderate priority	High priority	Essential priority
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. To what extent are you familiar with Maritime Autonomous Surface Ship (MASS)? 0 points

Mark only one oval per row.

	Not at all familiar	Moderately familiar	Very familiar	Extremely familiar
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. What percentage of regulatory framework for MASS had been completed if there is any? 0 points

Mark only one oval.

- I have no knowledge
- None at all
- 1% to 25%
- 26% to 50%
- 51% to 75%
- 76% to 100%

4. To what extent does the government provide fund to support the resources needed by the Maritime Education and Training Institution (METI) in implementing standard training for seafarers on MASS?

Mark only one oval per row.

	Strongly oppose	Somewhat oppose	Neither oppose nor favor	Somewhat favor	Strongly favor
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. What government agency/agencies is/are providing support for the resources needed by the Maritime Education and Training Institution (METI) in implementing standard training of seafarers for MASS?

6. To what extent does the government provide support to the METIs on the following if there is any? *

Mark only one oval per row.

	No support at all	Slight support	Moderate support	Extreme support
Financial resources/Fund	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Simulator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide training for lecturers to become a qualified MASS instructor/Personal development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
WiFi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Classroom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
References/Books/Reading materials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Library	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multimedia projector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. What are other items provided by the government to support the needs of the METIs if there is any? *

8. To what extent will the non-government institution provide a fund to support the resources needed by the METIs in implementing the standard training of seafarers for MASS?

Mark only one oval per row.

	Extremely unlikely	Unlikely	Somewhat likely	Likely	Extremely likely
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. What are the non-government institution/s that provide fund to support the resources needed by the METIs in implementing the standard training of seafarers for MASS?

10. What are the support provided by the non-government institution to the METIs if there is any? *

Mark only one oval per row.

	No support at all	Slight support	Moderate support	Extreme support
Financial resources/Fund	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provide training for lecturers to become a qualified MASS instructor/Personal development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Classroom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
WiFi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
References/Books/Reading materials	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Library	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Simulator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multimedia projector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

PART II

Internal factors affecting METI in the implementation of MASS

11. How many METIs are there in your country?

Mark only one oval.

- I have no idea
- 1 - 20 METIs
- 21 - 40 METIs
- 41 - 60 METIs
- 60 - 80 METIs
- More than 80 METIs

12. How many METIs do you know offer required courses/curriculum for MASS?

Mark only one oval.

- None
- 1 -10 METIs
- 11 - 20 METIs
- 21 - 30 METIs
- 31 - 40 METIs
- 41 - 50 METIs
- 50 and more

13. When did/will the METI start offering the course?

Mark only one oval.

- 2 years ago
- 1 year ago
- Just recently
- In the near future

14. To what extent does the METI consider in designing curriculum for MASS?

Mark only one oval per row.

	Would not consider	Might not consider	Might or might not consider	Might consider	Definitely consider
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15. What are the MASS related courses being offered by METIs?

Check all that apply.

- Computer Science
- Robotics
- Communication theory and skills
- Math
- Science
- Soft skills (e.g. teamwork, leadership, decision making and problem solving)

Other: _____

16. What are the facilities that the METIs have?

Check all that apply.

- Simulator
- Building
- Conducive classroom for learning (Well ventilated and illuminated, not overcrowded)
- Adequate number of computer
- Uninterrupted electrical supply (standby generator in case of power interruption)
- Multimedia projector
- WiFi
- Library
- Books

Other: _____

17. What are the challenges that hinder METI in implementing the standard training requirement of seafarers for MASS?

Check all that apply.

- None
- Lack of financial support from the government
- Not on the priority list of the METI administration
- Corruption on the part of the government
- Not on the priority list of the government's program
- Lack of physical resources
- Lack of qualified lecturers
- Lack of support for Personal Development (training) of lecturers
- Uncertainty on the curriculum for MASS
- Economic status of the country
- Poor management
- Corruption on the part of the institution

Other: _____

PART III

Internal factors affecting METI (For public METI only)

18. To what extent does the government provide your institution's needed resources for the implementation of standard training of seafarers for MASS?

Mark only one oval per row.

	No effort at all	Slight effort	Moderate effort	Extreme effort
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. To what extent will your institution seek additional fund from outside sources to support the needed resources in implementing the standard training of seafarers for MASS?

Mark only one oval per row.

	Extremely unlikely	Unlikely	Likely	Extreme likely
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20. How many are qualified lecturers for MASS in your institution?

Mark only one oval.

- 1 - 5 lecturers
 6 - 10 lecturers
 11 - 15 lecturers
 16 - 20 lectures
 More than 21 lecturers

21. How many lecturers for do you have in your institution?

Mark only one oval.

- 1 - 20 lecturers
 21 - 40 lecturers
 41 - 60 lecturers
 61 - 80 lecturers
 81 - 100 lecturers
 More than 100 lecturers

22. How many qualified lecturers for MASS are required by your institution?

Mark only one oval.

- 1 - 5 lecturers
- 6 - 10 lecturers
- 11 - 15 lecturers
- 16 - 20 lectures
- More than 21 lecturers

23. How many qualified lecturers for MASS are working in full-time basis in your institution?

Mark only one oval.

- 1 - 5 lecturers
- 6 - 10 lecturers
- 11 - 15 lecturers
- 16 - 20 lectures
- More than 21 lecturers

24. How did the full-time qualified lecturers for MASS in your institution acquire his/her qualification?

Mark only one oval.

- At his/her own expense
- At the government's expense
- At the institution's (private METI) expense
- Through sponsorship
- Other: _____

25. To what extent will your institution hire part-time qualified lecturers for MASS? *

Mark only one oval per row.

	Extremely unlikely	Unlikely	Slightly likely	Likely	Extremely likely
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26. How many qualified lecturers for MASS are working in part-time basis in your institution?

Mark only one oval.

- 1 - 5 lecturers
 6 - 10 lecturers
 11 - 15 lecturers
 16 - 20 lectures
 More than 21 lecturers

27. How many qualified lecturers for MASS are working in part-time basis in your institution?

Mark only one oval.

- 1 - 5 lecturers
 6 - 10 lecturers
 11 - 15 lecturers
 16 - 20 lectures
 More than 21 lecturers

28. What is the probability of qualifying your lecturers to be MASS instructor?

Mark only one oval per row.

	Not probable	Somewhat improbable	Somewhat probable	Probable	Very probable
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

29. If there is a probability of qualifying your lecturers for MASS, will it be:

Check all that apply.

- At the lecturers expense?
- At the institutions (private METI) expense?
- At the government's expense?
- Through sponsorship?

Other: _____

30. What are the facilities that your institution intends to procure? *

Mark only one oval per row.

	Readily available	Within year 2021	After 1 - 3 years	After 4 - 5 years	After 5 years
WiFi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Simulator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conducive classroom for learning (Well ventilated and illuminated, not overcrowded)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Adequate number of computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uninterrupted electrical supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multimedia projector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Library	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Books	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31. What are other facilities for MASS your institution intends to procure ?

32. What percentage of curriculum process had been completed?

Mark only one oval.

- None
- 1% to 25%
- 26% to 50%
- 51% to 75%
- 76% to 100%

33. Most likely, when will the curriculum for MASS be implemented/approved?

Mark only one oval.

- Within this year
- Next year
- After 1 - 2 years
- After 3 - 5 years
- After more than 6 years

Untitled Section

Internal factors affecting METI (For private METI only)

34. Does the government provide support for your institution's needed resources in implementing the standard training of seafarers for MASS?

Mark only one oval per row.

	No effort at all	Slight effort	Moderate effort	Extreme effort
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

35. To what extent will your institution seek additional fund from outside sources to support the needed resources in implementing the standard training of seafarers for MASS?

Mark only one oval per row.

	Extremely unlikely	Unlikely	Likely	Extreme likely
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

36. How many lecturers for do you have in your institution?

Mark only one oval.

- 1 - 20 lecturers
 21 - 40 lecturers
 41 - 60 lecturers
 61 - 80 lecturers
 81 - 100 lecturers
 More than 100 lecturers

37. How many are qualified lecturers for MASS in your institution?

Mark only one oval.

- 1 - 5 lecturers
 6 - 10 lecturers
 11 - 15 lecturers
 16 - 20 lectures
 More than 21 lecturers

38. How many qualified lecturers for MASS are required by your institution?

Mark only one oval.

- 1 - 5 lecturers
- 6 - 10 lecturers
- 11 - 15 lecturers
- 16 - 20 lectures
- More than 21 lecturers

39. How many qualified lecturers for MASS are working in full-time basis in your institution?

Mark only one oval.

- 1 - 5 lecturers
- 6 - 10 lecturers
- 11 - 15 lecturers
- 16 - 20 lectures
- More than 21 lecturers

40. How did the full-time qualified lecturers for MASS in your institution acquire his/her qualification?

Mark only one oval.

- At his/her own expense
- At the government's expense
- At the institution's (private METI) expense
- Through sponsorship
- Other: _____

41. To what extent will your institution hire part-time qualified lecturers for MASS? *

Mark only one oval per row.

	Extremely unlikely	Unlikely	Slightly likely	Likely	Extremely likely
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

42. How many qualified lecturers for MASS are working in part-time basis in your institution?

Mark only one oval.

- 1 - 5 lecturers
- 6 - 10 lecturers
- 11 - 15 lecturers
- 16 - 20 lectures
- More than 21 lecturers

43. What is the probability of qualifying your lecturers to be MASS instructor?

Mark only one oval per row.

	Not probable	Somewhat improbable	Somewhat probable	Probable	Very probable
Row 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

44. If there is a probability of qualifying your lecturers for MASS, will it be:

Check all that apply.

- At the lecturers expense?
- At the institutions (private METI) expense?
- At the government's expense?
- Through sponsorship?

Other: _____

45. What are the facilities that your institution intends to procure? *

Mark only one oval per row.

	Readily available	Within year 2021	After 1 - 3 years	After 4 - 5 years	After 5 years
WiFi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Simulator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conducive classroom for learning (Well ventilated and illuminated, not overcrowded)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Adequate number of computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uninterrupted electrical supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multimedia projector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Library	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Books	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

46. What are other facilities for MASS your institution intends to procure ?

47. What percentage of curriculum process had been completed?

Mark only one oval.

- None
- 1% to 25%
- 26% to 50%
- 51% to 75%
- 76% to 100%

48. Most likely, when will the curriculum for MASS be implemented/approved?

Mark only one oval.

- Within this year
- Next year
- After 1 - 2 years
- After 3 - 5 years
- After more than 6 years

PART IV

Socio-demographic

49. Country/Nationality

50. Name of Company/Organization/Institution

51. Is it public or private?

Mark only one oval.

Private

Public

52. What is your occupation?

Check all that apply.

Employee/Staff

Seafarer

Cadet

Other: _____

53. Number of years of experience at sea

Mark only one oval.

No experience

1-3 years

4-5 years

5-9 years

10-14 years

15-20 years

More than 20 years

Other: _____

54. Number of years of experience in the organization/institution

Mark only one oval.

- Less than 1 year
- 1-3 years
- 4-5 years
- 5-9 years
- 10-14 years
- 15-20 years
- More than 20 years
- Other: _____

55. Working experience in MASS

Mark only one oval.

- No experience
- On shore
- On board ship

56. Number of years of experience in MASS

Mark only one oval.

- No experience
- Less than a year
- 1 - 2 years
- More than 3 years

57. What is your gender?

Mark only one oval.

- Male
- Female
- I prefer not to say

58. What is your age?

59. Thank you very much for your participation. Any corrections, suggestions and recommendations that can be contributed to the topic as well as this questionnaire are welcome and very much appreciated. You may reach me through e-mail: w2005701@wmu.se Perlita CINCO, MSc in Maritime Affairs (Maritime Education and Training)

This content is neither created nor endorsed by Google.

Google Forms

Appendix B: Interview Instrument

Dear Participant,

Thank you for agreeing to participate in this research, which is carried out in connection with a Dissertation which will be written by the researcher, in partial fulfilment of the requirements for the degree of Master of Science in Maritime Affairs at the World Maritime University in Malmö, Sweden. It is purely voluntary and will take 30 to 40 minutes. All the information that you will provide in this interview will be solely used for my research purposes and the results will form part of my dissertation, which will be published online and made available to the public. Your personal information will not be published. All the data will be treated with utmost confidentiality and anonymity and will be deleted as soon as the degree is awarded. Research data will be securely stored for protection. You may withdraw from the research at any time, and your personal data will be immediately deleted.

The topic of the Dissertation is Investigation of the Preparedness of Maritime Education and Training Institutions (METIs) of Seafarer's Top Supplying Countries in the Introduction of Maritime Autonomous Surface Ship (MASS).

The guide questions is in relation to the preparations of METIs and government in providing seafarer with standard training for MASS. The questionnaire contains 8 sets of questions for Maritime Administration (MARAD) and higher education or supervising authority of METI and the other questionnaire is another 8 sets of questions intended for METIs. The third part is the personal information of the participant.

Your participation in the interview is highly appreciated.

Student's name: Perlita Cinco
Specialization: Maritime Education and Training (MET)
Email address: w2005701@wmu.se

* * *

I consent to my personal data, as outlined above, being used for this study. I understand that all personal data relating to participants is held and processed in the strictest confidence, and will be deleted at the end of the researcher's enrolment.

Name:
Signature:
Date:

Questionnaire for MARAD and Ministry of Education

1. What is the role of your institution in the implementation of STCW courses?
2. Where does your institution/organization stand/situate in the organizational structure based on national level and international level in relation to the implementation of STCW?
3. What are the proactive measures of your institution/organization in order to support METIs in providing relevant trainings for seafarers specifically on MASS? What is/are the progress/status at present?
4. Who are responsible in providing support for the resources needed by the METIs in the implementation of standard training of seafarers for MASS?
5. What are the possible resources needed by the METIs in the implementation of standard training of seafarers for MASS?

6. In what way do the other institution/organization provide support for the needed resources of the METI in order to remain relevant in the future in providing standard training for seafarers for MASS?
7. What are the present and future challenges that your institution is facing in the implementation of seafarer's standard training for MASS?
8. What are the preemptive measure/s taken by your institution/organization to meet the challenges in the implementation of standard training of seafarers for MASS?

Questionnaire for METIs

1. What is the role of your institution in the implementation of STCW courses?
2. Where does your institution/organization stand/situate in the organizational structure based on national level and international level in relation to the implementation of STCW?
3. What are the proactive measures of your institution/organization in order to provide relevant trainings for seafarers specifically on MASS? What is/are the progress/status at present?
4. Who are responsible in providing support for the resources needed by your institution in implementing standard training for seafarers for MASS?
5. What are the possible resources needed by your institution in implementing standard training for seafarers for MASS?
6. What is the outlook of seafarers and cadets in the introduction of MASS in the shipping industry?
7. What are the challenges that your institution is facing in the implementation of seafarer's standard of training in MASS?
8. What are the preemptive measure/s taken by your institution/organization to meet the challenges in the implementation of standard training of seafarers for MASS?

Appendix C: Summary of Country's preparedness for MASS

Preparedness	Country				
	Philippines	China	India	Indonesia	Chile
External factors					
International regulatory framework	- Approved Scoping Exercise from IMO	- Approved Scoping Exercise from IMO	- Approved Scoping Exercise from IMO	- Approved Scoping Exercise from IMO	- Approved Scoping Exercise from IMO
National regulatory framework	- Not a priority. - Not yet prepared. - Awaiting for the national level's implementation of new STCW	- Provide guidelines for MASS	- Policy is in place for degree one. - Awaiting for the national level's implementation of new STCW	- Not making any preparations yet.	- Not making any preparations yet.
Internal factors					
Financial resources	- METIs are self-sustainable and can probably provide financial resources when necessary	- METIs are self-sustainable and can probably provide financial resources when necessary	- METIs are self-sustainable and can probably provide financial resources when necessary	- METIs are self-sustainable and can probably provide financial resources when necessary	- METIs are self-sustainable and can probably provide financial resources when necessary
Human resources	- Prepared with the current MASS	- Not prepared for future MASS	- Has competent lecturer for degree one of MASS	- Not making any preparations yet. - Awaiting possible STCW requirement of future MASS	- Not making any preparations yet. - Awaiting possible STCW requirement of future MASS
Physical resources	- Not prepared for future MASS	- Not prepared for future MASS	- Prepared for degree one of MASS	- Not making any preparations yet. - Awaiting possible STCW requirement of future MASS	- Not making any preparations yet. - Awaiting possible STCW requirement of future MASS
Knowledge resources	- Adhere to the highest standard set by the current STCW. - Some METIs are offering in-house courses for MASS.	- Conduct orientation to the students about MASS.	- Offering courses for plausible competency requirement of seafarers for future MASS. - Syllabus are in place for degree one.	- Not making any preparations yet. - Awaiting possible STCW requirement of future MASS	- Not making any preparations yet. - Awaiting possible STCW requirement of future MASS

