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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**A BOTTOM-UP ASSESSMENT APPROACH TO
IMPROVE SAFETY CULTURE ONBOARD
SHIPS**

By

SOE HTUT

Myanmar

A dissertation submitted to the World Maritime University in partial
fulfilment of the requirement for the award of the degree of

MASTER OF SCIENCE

In

MARITIME AFFAIRS


(MARITIME SAFETY AND ENVIRONMENTAL ADMINISTRATION)

2019

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 own personal views, and are not necessarily endorsed by the University.

A handwritten signature in black ink, appearing to be 'See', with some faint, illegible text underneath.

(Signature):

(Date):

24th September 2019

Supervised by:

Professor Dr. Jens-Uwe Schröder-Hinrichs

Supervisor's affiliation:

Vice-President Academic Affairs

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Abstract

Title of Dissertation: **A Bottom-up Assessment Approach to Improve Safety Culture Onboard Ships**

Degree: **Master of Science**

Extensive prior research has highlighted that maritime accidents are primarily attributed to human errors which deteriorate the safety culture onboard ships. The problem still exists, although many regulations have been applied over past years. The human element can be observed to remain the key issue affecting the safety condition onboard ships. Therefore, if managed effectively, it can vastly improve overall safety conditions. Onboard ships, senior officers play a vital role in enhancing the safety culture. Yet there are currently limited mechanisms available to assess their performance. By soliciting onboard performance feedback and suggestions from junior officers and ratings through the use of a bottom-up assessment approach, the maritime industry can significantly improve the safety culture onboard ships. This research focuses on the safety elements of leadership, teamwork, and communication and the feasibility of a bottom-up assessment approach to improve these elements was explored through relevant literature reviews and feedback from samples of seafarers and senior managers from various international institutions. Extensive questionnaire surveys and personal interviews were concluded to obtain relevant data. The research found all three elements are essential for overall shipboard safety. Furthermore, the leadership capability of senior officers was usually dependent on the individual with limited input from crew. Factors like simple, anonymous, direct and regular-intervals reporting were also accepted as necessary for the approach. The main conclusion derived from this research was that the majority of respondents believed that feedback and suggestions from junior officers and ratings to senior officers could be beneficial for the performance of senior officers and operating companies. They also overwhelmingly agreed that a bottom-up assessment approach is feasible and could be implemented for the purpose of enhancing the safety culture onboard ships. Therefore, a bottom-up assessment approach should be applied as a starter programme for enhancing the safety culture onboard ships.

KEYWORDS: Bottom-up assessment approach, Leadership, Teamwork, Communication, Safety culture

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List of Abbreviations

ATSB	Australian Transport Safety Bureau
ALARP	As Low as Reasonably Practicable
BIMCO	The Baltic and International Maritime Council
BRM	Bridge Resource Management
COC	Certificate of Competency
CRM	Crew Resource Management
DPA	Designated Person Ashore
IAEA	International Atomic Energy Agency
ILO	International Labour Organization
IMO	International Maritime Organization
INTERTANKO	International Association of Independent Tanker Owners

ISM	International Safety Management
ISO	International Organization for Standardization
ITF	International Transport Workers' Federation
MARPOL	International Convention on Prevention on Pollution from Ships
NTSB	National Transport Safety Board
OCIMF	Oil Companies International Marine Forum
OCI	Organizational Culture Inventory
SCEQ	Safety Culture Enactment Questionnaire
SMS	Safety Management System
SOLAS	International Convention for the Safety of Life at Sea
STCW	International Convention for Standards of Training, Certification and Watchkeeping for Seafarers
TAIC	Transport Accident Investigation Commission
WMU	World Maritime University

1 Introduction

1.1 Background

Shipping is the lifeblood of the worldwide economy. The transport of raw materials, food and manufactured goods would not be possible without the help of shipping. In 2018, world merchandise exports accounted for US\$19.67 trillion (World Trade Organization, 2019) and around 90% of global trade is conducted through the international shipping industry (United Nations Conference on Trade and Development, 2018). To meet this demand, over 50,000 seagoing ships are trading globally and are manned by more than a million seafarers of virtually every nationality (International Chamber of Shipping, 2019). Although shipping represents a global business, the publicity of its operating nature is relatively limited. Of all the 50,000 seagoing vessels, the number of crews is typically between 15 to 26 persons depending on the size and complexity of the ship (Deloitte Global Services Limited, 2011). The shipping industry heavily relies on human resources and therefore, human elements become essential factors for the transportation of the global economy.

Humans occupy an integral role in shipping and it is, therefore, impossible to eliminate human error. Studies have shown that human error accounted for 84-88% of tanker accidents, 79% of towing vessel grounding and 89-96% of ship collisions (Apostol-Mates & Barbu, 2017). These accidents arise when a breakdown happens in the socio-technical network, and these breakdowns can be due to:

- ‘Human-Technology’ factors such as inadequate design of machinery;
- ‘Work practice-Organization’ elements like conflict between work process and written conduct;
- ‘Human-Organization’ factors such as crew stress caused by company pressures;
- ‘Human-Group’ causes like the lack of communication and cooperation between crewmembers;

- ‘Human-Group-Work environment’ factors such as fatigue caused by vibrations, noise and insufficient rest hours.

A study about searching for causes of maritime casualties (Barnett, 2005) highlights that more research is needed to find the root sources associated with organizational factors onboard ships. Schröder-Hinrichs, Baldauf & Ghirxi (2011) also pointed out the need for a societal component of safety-critical systems in maritime accidents that is concerned with crew cohesion onboard vessels. Furthermore, a research review of 20 studies on various seafaring topics such as communication and safety culture concluded that safety of shipping can be enhanced by reducing or moderating the individual and organizational behaviours common to accidents (Hertherington, Flin, & Mearns, 2006). Therefore, this research focuses on a particular societal factor of the shipboard organization known as ‘Human-Group’.

To grasp how breakdowns happen within the ‘Human-Group’, a comprehensive understanding of the organizational structure onboard a ship is essential. The generalized characteristics of a shipping company consist of fundamental divisions such as administration/management, technical, operation, chartering and crewing (Panayides, 2017). Although the organization of companies can vary depending on their needs, the operational structure of a ship remains relatively uniform with three primary departments, namely, deck, engine and catering. The deck and engine divisions work together to navigate and operate the ship efficiently while the catering department supports both deck and engine departments.

The management hierarchy onboard consists of the captain at the top management level; chief deck officer, chief engineer and second engineer at the middle management level; and navigation supervision officers, supervision engineers, members of navigation and engine room represent the operational level (Bisticic, Jugovic, & Kuzman, 2011). The top four positions, namely Captain, Chief Engineer, Chief Officer and Second Engineer are traditionally known as senior officers. Onboard ships, the organizational structure is traditionally hierarchic due to the need for obligational leadership in emergency situations. Therefore, safety considerations depend primarily

on the actions of the masters and senior officers, and their interactions with the land-based organization (Raisanen, 2009). Thus, because of the hierarchic organizational structure and authority of senior officers, communication and cooperation between senior and junior crew members are limited; these limitations can cause maritime accidents.

There are a number of grounding cases which can be, at least in part, attributed to a lack of communication and cooperation between senior and junior crew members. In 2000, the containership 'Bunga Teratai Satu' grounded because of the chief mate's distraction from navigation of the ship during a telephone conversation with his wife. At the time of the accident, an Able Body seaman was plotting their course during bridge watch and needed assistance. However, the seaman was frightened to interrupt the phone conversation of the chief mate to get help due to the existence of strict hierarchy between senior officers and junior crew members (Australian Transport Safety Bureau [ATSB], 2001). Again in 2015, the Passenger ship 'Hamburg' grounded due to the lack of navigational awareness which was compounded by non-existence of teamwork among the officers on the bridge (Maritime Accident Investigation Branch, 2016).

Collision cases such as the passenger ship 'L'Austral' in 2017 and the sinking of the cargo vessel 'SS El Faro' in 2015, were also attributed due to similar circumstances. The reluctance of bridge team members to intervene in the actions of the master existed in the 'L'Austral' case, which in turn led to poor Bridge Resource Management (BRM) and caused the collision (Transport Accident Investigation Commission [TAIC], 2018). The sinking of the cargo ship 'SS El Faro' occurred due to ineffective BRM including the Captain's failure to adequately consider more junior officers' recommendations. This accident ultimately caused the deaths of 33 people (National Transport Safety Board [NTSB], 2017).

The afore-mentioned maritime accidents highlight how a lack of communication and teamwork between senior and junior crew members can deliver catastrophic results. Investigation reports from these cases conclude that the consequences of these

accidents could have been reduced or eliminated by better communications and teamwork between senior officers and other crew members.

Moreover, unabated hierarchic authority of senior officers of a ship can also cause severe consequences to individuals as well as companies. According to the Department of Justice under the United States Attorney's Office, recent illegal discharge cases have been attributed to senior engineers' decisions and orders to knowingly and willingly pollute. Cases such as the Cruise ship 'Caribbean Princess' in 2013, the Cargo ship 'Ocean Hope' case in 2015 and Tanker ship 'Hai Soon 39' in 2017 all resulted in the respective shipping companies receiving millions of US dollars fines and multiple years trade probations within the region. In some cases, the responsible senior officers also received multi-year prison sentences for these wrongful acts. (Office of Public Affairs, 2017a; Office of Public Affairs, 2017b; U.S Attorney's Office: District of Hawaii, 2018).

The consequences of these cases are not only harmful to individual seafarers and companies, but also negatively impact the environment. Therefore, finding a way to improve leadership, communication, and teamwork among crew members, particularly senior officers, is essential. A cooperative reporting and evaluation system between ship's crew and operating company can reduce accidents, strengthen accountability and improve safety conditions for the maritime industry.

1.2 Problem Statement

The above-mentioned cases illustrate the need for a reduction of human errors and better accountability. 'Human-Group' breakdowns among crew members result in maritime accidents and deteriorate the stability of safety culture onboard ships. Since the safety culture concept is primarily dependent on the attitude and performance of seafarers, as well as the culture of the shipping companies (International Maritime Organization [IMO], 2019a), IMO has adopted a number of instruments dealing with the human element including the International Convention for Standards of Training, Certification and Watchkeeping for Seafarers (STCW) in 1978 (IMO, 2019b) and the International Safety Management (ISM) Code in 1993 (IMO, 2019c). Although both

instruments deal with human elements aspects, there is no prescribed mechanism that can assess the individual management and leadership capabilities of senior officers onboard vessels.

Research consisting of the analysis of 188 maritime incident and accident reports (Puisa, Lin , Bolbot, & Vassalos, 2018) concludes that the most prominent cause of accidents is a deficiency in control and feedback mechanisms between the ship management company and the vessel. In addition, a study of 94 maritime accidents (Batalden & Syndes, 2014) also described the main challenges in improving safety onboard ships being local shipboard management practices, crew members cohesiveness and the ability of the firm to verify it. Therefore, assessment mechanisms for senior officers from junior officers and crew members under the supervision of the operating company become necessary. The bottom-up assessment can assist in the prevention of maritime accidents and reduce the risks of fines and trade probation. Moreover, a similar assessment scheme known as the evaluation process has been applied successfully in the maritime education and training sector. Many maritime training institutes have incorporated their Quality Management Systems in accordance with the International Organization for Standardization (ISO) standards in which students have the opportunity to evaluate their instructors so that the competency of the teachers can be improved by feedback from the students (Tuljak-Suban & Suban, 2013).

In regards to the necessity of a bottom-up assessment scheme of senior officers' onboard vessels, it could be argued that the ISM Code already adequately enforces shipboard safety culture aspects onboard ships relating to human elements. However, accidents related to human elements are still happening at a significant rate within the shipping industry. Therefore, additional solutions need to be explored for improving safety (Tzannatos and Kokotos, 2009; Kokotos and Linardatos, 2011; Berg, 2013; and Batalden and Syndes, 2014;). A bottom-up assessment scheme for senior officers by junior officers and ratings can enhance safety culture onboard ships as it will help cut through individual personalities and hierarchical formalities that are inherited to vessels. Furthermore, it can provide shipping companies with the relevant information

essential for achieving the proper leadership and management capabilities of shipboard personnel.

1.3 Aim and Objectives

This research aims to determine the need for a bottom-up assessment approach in enhancing the safety culture onboard ships. Several maritime accidents and incidents continue occurring due to lack of communication, cooperation and teamwork between senior and junior crew members onboard vessels. This condition can be improved by creating a bottom-up assessment scheme, under the supervision and guidance of the relevant ship management company that allows for improved feedback mechanisms to senior officers from their shipboard colleagues. The scheme can be beneficial to all involved members by enhancing the leadership capabilities of senior officers, improving teamwork and facilitating better communication between crew members. These results, in turn, can enhance safety culture (i.e. fewer accidents and incidents) for the participating company.

To achieve the desired purpose, this dissertation progresses according to the following objectives.

- Identify the importance of leadership, teamwork and communication in improving safety culture onboard ships and highlight the crucial role of senior leadership in promoting onboard safety culture;
- Introduce the concept of bottom-up assessment approach, applicability of the approach and relevant applications in high-risk industries;
- Develop surveys and interviews for seafarers and senior managers regarding the onboard working relationships amongst crew members; seek their opinions about the validity and feasibility of the bottom-up assessment approach of senior officers;
- Analyze the findings from both surveys and interviews and make recommendations for the implementation of a bottom-up assessment approach.

1.4 Composition of the thesis

The thesis consists of five chapters. Chapter one comprises the background, the problem statement, the objectives and the structure of the dissertation.

Chapter two is a literature review focusing on the importance of leadership, teamwork and communication for overall safety culture onboard ships. It also introduces the bottom-up assessment approach and relevant applications in the maritime industry as well as other high-risk industries.

Chapter three discusses the methodology for this study and explains detailed processes for the questionnaires survey and personal interviews of the participants.

Chapter four describes and analyses the results of the questionnaires and interviews according to five main themes, namely, teamwork, communication, leadership, a bottom-up assessment approach and how to implement the approach.

Finally, the outcomes of the research are discussed in chapter five. In addition, it provides conclusions and recommendations for the research.

2 Literature Review

2.1 Introduction

Essential elements for improving safety culture are varied throughout research depending on the nature of study samples and methods. Wang & Liu (2012) determined 18 safety factors including safety leadership, safety communication and teamwork, and found that these elements play significant roles in safety culture. In addition, through an extensive literature review, comparison and analysis, He, Xu & Fu (2012) found 13 components, including the above-mentioned three elements, which

can improve safety culture. Therefore, the selection of three critical elements, namely leadership, teamwork and communication for improving safety culture onboard ships is in line with these relevant studies. The following sections explore the significance of each element in detail and examine how a bottom-up assessment approach can improve safety culture onboard ships.

2.2 Leadership and its importance in safety onboard ships

2.2.1 Definition of leadership

The world is entering into a new era, known as the Anthropocene epoch, where humans play a greater impact on the Earth's ecosystems. The enormous capability of humankind in areas like technology and industrialization can transform the current situation of the planet. Therefore, leadership of a different calibre is becoming essential to organizations, where rapidly evolving advancements in technologies, multi-national workforce and permeable organizational boundaries are taking place (Cameron & Green, 2017). As the shipping industry is one of the fastest-growing and ever-evolving businesses in the world, it will continue requiring high-performance leadership to carry out operations effectively.

The word 'leadership' is a single term with no precise definitions. Many researchers throughout history have defined leadership from diverse perspectives as a social influence process, a capacity, art and an ability to achieve the intended purposes (Xhelilaj & Sakaj, 2018). However, the concept of leadership can be generally accepted as, "the leadership lies in mastering a wide range of skills and how to make the most of opportunities to learn, lead and achieve your goals" (Bellefontaine, 2008, p. 3).

2.2.2 Theories of leadership

It is not only their definitions but also the theories of leadership that are diverse. One of the earliest efforts in the study of leadership was the 'Trait approach' where the traits common to great leaders were learnt. Researchers believed that by studying and analysing the unique traits that leaders possess, they could identify the reasons behind

successful leadership (Northhouse, 2013). Subsequently, 'Behavioural theory' was introduced; according to this theory, leaders are not born with special traits that make them leaders. Their success in leadership does not depend on inherited traits but on learned behaviours and actions.

In 1998, Bass presented the 'Transformational theory', which introduces a leader who generates a vision, distributes this vision among their followers and establishes a leadership rapport as well as a mentorship between them. 'Transactional theory' was applied to people who are generally inspired by the means of reward and punishment (Hollander, 1964). Finally, 'Contingency' and 'Situational' philosophies were introduced. Contingency theory illustrates that leaders can either be efficient and successful or fail based on the situation, while situational theory proposes the choices of suitable actions by leaders depend on the nature of tasks to be fulfilled and capability of the followers (Hersey & Blanchard, 1982).

2.2.3 Leadership in the maritime context

In the context of leadership onboard ships where well-defined rules, regulations, procedures, authorities and responsibilities are explicitly established, not all principles are compatible. Among them, two leadership theories, transactional theory and transformational theory, can best be considered applicable to senior officers closely associated with supervision and control of actual operations (Kim & Gausdal, 2017; Lu, Hsu, & Lee, 2016). According to Lu, Hsu, & Lee (2016), seafarers perceived that transformational leadership style is useful to reduce injuries and is positively related to safety behaviour among crew members. This perception is consistent with other studies regarding work safety (Barling et al., 2002; Kelloway et al., 2006; Lu & Yang, 2010). For the transactional leadership method, it does not have as much significance in relation to the safety attitudes of seafarers. While research on these leadership approaches has only been done on the bulk carrier shipping fleet in Taiwan, one could hypothesize that this trend is similar amongst seafarers, as most people favour their leaders to be mentors rather than implementing punitive leadership styles.

The leadership style of senior officers depends primarily on the preferences of the individual who possesses four out of five social powers (excluding referent power) (French & Raven, 1959), namely, legitimate power due to their position; reward power due to their authority; coercive power due to their accountability; and expert power due to their experience and competence among the crew onboard. In addition, the existence of the traditional commanding nature, expectation of compliance and obedience and the hierarchical organizational structure onboard ships give few chances for junior officers and ratings to suggest or give feedback about the leadership style that senior officers choose (Ermal & Bledar, 2018).

Likewise, the senior officers, who possess strong social powers, have little chance to receive feedback or evaluate their own leadership style. If senior officers choose a wrong leadership approach, severe consequences can result not only for the senior officers but also for the entire crew and shipping company. A number of cases described in the introduction chapter including the ‘Caribbean Princess’, ‘Ocean Hope’ and ‘Hai Soon 39’ are examples where senior engineers made inappropriate leadership decisions and using their exceptional legitimate power coerced crew members into participating in the illegal dumping of oil into the sea. These cases resulted in millions of dollars in fines and regional trading bans for the shipping company as well as imprisonment of the senior engineers themselves (Office of Public Affairs, 2017a; Office of Public Affairs, 2017b; U.S Attorney's Office: District of Hawaii, 2018).

Cases like these clearly highlight the need for providing feedback on the leadership of senior officers onboard vessels. This can be achieved by using suggestions and feedback from crew members with oversight from the shipping company, which can influence the actions of senior officers. Therefore, the goal of improving overall safety culture onboard ships can be achieved with efficient leadership.

2.3 Teamwork and its importance in safety onboard ships

2.3.1 Definition of teamwork

Due to extreme economic motivators and an ardent desire to transport goods faster and more efficiently, one could reasonably argue that the shipping industry can be considered as an error-inducing system. Promoting the essence of teamwork is essential for improving the error-prone nature of the shipping industry. Furthermore, teamwork also plays a central role in influencing safety performance from the training of crew onboard ships to the daily operational processes involved in navigating a vessel (Perrow, 1990).

According to Dyer (1987), the term ‘team’ can express as the collections of people who must rely on group collaboration if each member is to experience the optimum of success and goal achievement. In 1993, Katzenbach and Smith also defined a team, but with a greater emphasis on accountability; “a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable” (Katzenbach & Smith, 1993, p. 45). Definitions of team are evolving as time progresses. Generally, a team can be defined as two or more people working together interdependently to obtain a common objective.

2.3.2 Theories of teamwork

Theories for achieving good teamwork are also diverse, from the traditional models of the 1990s to current designs. Traditional models primarily consist of humanist or task-oriented perspectives (Gladstein, 1984). In humanist theory, the models describe the quality of interaction as well as relationships among the members of the team. These models mainly focus on maintenance functions as well as norms, namely equivalent participation, cohesiveness, open communication and commitment.

Task-oriented group models are usually presented with the input-throughput-output paradigm. Elements for ‘Input’ include composition and structure of a group, job and environment; ‘throughput’ consists of the processes within the group; and ‘output’

comprises performance, development of the group and effects on members. For theorists who favour the task-based theory, this 'input-throughput-output' model, with group process acting as the resolving variable between input and output, has become the standard (Hackman & Morris, 1976).

2.3.3 Teamwork in the maritime context

The teamwork model that has traditionally been closely associated with ships is the task-oriented approach as all operation procedures (throughput) are standardized; targets (output) such as numbers of planned maintenance periods, port destinations, safe navigation routes and amount of cargo transferred are determined; and elements like seafarers, working structure and responsibilities (input) are organized according to the international conventions. Therefore, teamwork onboard will not focus heavily on relationships between crew members, open communication and cohesiveness like in humanist theory, which can enhance the spirit of teamwork (Nazir, Sorensen, Øvergård, & Manca, 2015).

Moreover, there are very few activities onboard ships that can be done by individuals and most operations require a minimum of two people for completion. Therefore, it can be affirmed that teamwork is involved in nearly every aspect of shipboard operations. Teamwork also occupies a significant role in providing safety as the level of safety in a job operating with two or more people is higher than those done alone. Therefore, a strategy guided by senior officers, like a requirement for supervision in every operation, has been introduced in working practices to improve safety as well as teamwork among the crew. This clearly illustrates the importance of senior officers, particularly Masters, who are in charge of an entire vessel for developing and correcting the principles of teamwork. The Master alone has the power, authority and experience to inspire and direct team activities in the safest way possible. The necessity of possessing capabilities for both teamwork and leadership in responsible persons for implementing the safety policies of the ship is becoming essential (Hanzu-Pazara, Popesu, & Anastasia, 2014).

The theory of high authority gradient postulates that teamwork and leadership can deteriorate due to the possession of extensive power, authority and experience which in turn can cause maritime accidents (Schröder-Hinrichs, Hollnagel, & Baldauf, 2012). Recent maritime accident cases, like ‘L'Austral’ and ‘SS El Faro’ as discussed in Chapter 1, provide evidence for such circumstances. In both cases, the masters of the ships had more than 20 years of seafaring experience. One of them had been working with the same company for more than 10 years and the other for 20 years. In the case of ‘SS El Faro’, poor decisions were made by the master without considering the suggestions of other officers. Additionally, ‘L'Austral’ inadvertently encroached upon an area the master had intended to avoid because the ship’s position was not being adequately monitored, highlighting the existence of poor BRM (NTSB, 2017; TAIC, 2018).

These accidents highlight that even the most seasoned and experienced masters can execute impoverished decisions. To reduce these kinds of accidents in the future, teamwork and open communication, both up and down the chain of command, should be welcomed and encouraged.

2.4 Communication and its importance in safety onboard ships

2.4.1 Definition of communication

Communication supports mutual and effective interaction among people in completing various tasks, processes and systems necessary to accomplish desired health, safety and environmental objectives. The approach and language we use for communication regarding safety will not only impact the level of understanding and participation of persons in the process but also determine whether the process is accepted or rejected. Training people on safe work practices is not by itself sufficient because motivation and responsibility for self and that of colleagues are also essential. Moreover, different methods will be needed to establish a working environment which promotes, emphasizes and boosts safe behaviour among employees and entire organizations (Vecchio-Sadus, 2007).

Based on its etymology, the term ‘communication’ descends from the Latin word ‘communicare’ which means to share or to be in relation with. It also relates to English words such as ‘common’, ‘commune’ and ‘community’ and these terms all suggest the notion of bringing together (Beattie, 1981). However, this broad definition is not the only one that emerges from the advancement of etymology. Peters (1996) derives the meaning of ‘communication’ from the Latin noun ‘communicato’ which means ‘sharing’ or ‘imparting’. This ‘communicato’ has little connection with terms like union or unity but rather relates to Latin ‘munus’ which has its roots in the English meaning of change or exchange. Therefore, the interpretation of the word can be slightly varied from the different views of communication science.

2.4.2 Theories of communication

The two fundamental concepts of communication, known as transmission and constitutive models explain the meaning of communication using two alternative methods. In the transmission model, communication is normally accepted as “a process in which some content (thought, information) is transmitted from a sender through a medium or channel to a receiver” (Craig, 2013, p. 40). Therefore, the communication between two parties having conflict can be positive as long as they interpret each other’s information correctly.

However, communication theorists who support the constitutive model critiqued that the transmission approach views communication is just a technical procedure. From the constitutive view, all components within the action of communication such as senders and receivers exist interdependently, and all of them are involved in the communication (Pearce, 2007). The constitutive theorists stand with the fact that not only the process, but also the interaction within the process, has to be considered to construct the reality of communication.

2.4.3 Communication in the maritime context

In high-risk industries like the transportation sector, and particularly the shipping industry, one of the prominent characteristics of the workplace structure is the level of visibility between supervisors (shipping companies) and their workers (crew

members) (Sharon & Natassia, 2019). The level of visibility can be described as the degree to which the physical arrangement of the working environment allows the direct observation from a supervisor to the workers (Luria, Zohar, & Erev, 2008). In the shipping industry, the physical detachment of the vessels from the shipping companies gives a low level of visibility. Communication is usually carried out by way of the transmission model rather than the constitutive one. Therefore, communication between ships, as well as within the ship, will focus more on technical processes such as completion rates rather than interactions of the components along the process of communication.

The role of senior officers who are in charge of communication between ship and shore as well as within the ship is crucial in safe operations. The frequent verbal exchange between supervisors (senior officers) and employees (crew members) can certainly influence safety behaviours and safety culture within the group (Zohar & Polacheck, 2014). Communication can not only improve safety culture but also empower team members to carry out their duties to their fullest potential in support of effective team performance (Øvergård, Nielsen, Nazir, & Sorensen, 2015). Furthermore, the effectiveness of communication largely depends on the leadership styles of senior officers as many junior officers and ratings from different nationalities and cultures are reluctant to argue against or provide input to senior officers who have better competence, more experience and a higher authoritative position. Factors like the fear of being blamed and getting penalized are also included (Eugen & Nicolae-Voicu, 2016).

Communication has been observed as a significant factor in maritime accidents (McCrae, 2009). Moreover, all cases highlighted in Chapter 1 are related to a general lack of communication between crew members and senior officers due to factors such as strict shipboard hierarchy and a reluctance to intervene. Effective communication can be achieved through nurturing and sustainable exchanges between leaders and subordinates. Leadership can be effective only if essential elements such as trust, respect and commitment exist between leaders and followers (Northhouse, 2016).

2.5 Safety culture and its importance in shipping

2.5.1 Definition of safety culture

The term ‘culture’ emanates from the Latin word ‘colere’ which means ‘to grow or to process’ (Eriksen, 1998). Although ‘culture’ is only one word, it has one of the most complex and debated meanings in social sciences. In its broadest meaning, ‘culture’ can be defined as anything that is not concerned with nature. Under the context of sociology, the cultural concept can be defined as the values that individuals within a group share, the norms they pursue and the physical matters they construct (Giddens, 1994).

The meaning of ‘safety’ does not stand alone and it is always accompanied by the existence of some hazard or risk. In order to understand the meaning of ‘safety’, one must see the rationale behind the risk. Risk can simply be defined as a function of the possibility of an event occurring and the intensity of the impact from that incident. If the theory of risk is linked with analysing dangers and accessing the probability of their occurrence, the concept of safety deals with controlling these perils (Antonsen, 2009). In general, the following three elements can describe the definition of safety:

1. A state or situation in which the calculated risk is expected to be acceptable or as low as reasonably practicable, the ALARP Principle (Reason, 1997);
2. A feeling of security and control. This kind of feeling relates to the degree of trust in safety systems and not in line with ALARP principle (Drottz-Sjøberg, 2003);
3. A form of practice which refers to our capability to reduce or eradicate the possibility of dangerous events happening.

Therefore, the term ‘safety culture’ can be recognized socially as the safety values that the individuals within a group share and pursue and the physical matters they construct.

2.5.2 Safety culture in the maritime context

The structure of safety culture in the maritime context is not a simple one as the concerns and objectives from different stakeholders are not always aligned. The diverse players within the shipping industry include international organizations like IMO and International Labour Organization (ILO); private entities such as ship owners, charterers and shippers; non-governmental organizations, namely classification societies and insurers; and government entities such as flag states, port states, coastal states; and most importantly, seafarers (Veiga, 2002).

Due to human error, which is arguably the primary cause of most maritime accidents today, more consideration is being given to improving management criteria and human factors. Legislative framework has progressed from the technical based conventions like the International Convention for the Safety of Life at Sea (SOLAS), the International Convention on Prevention of Pollution from Ships (MARPOL) and the International Convention on Load Lines to the inclusion of management tools for seafarers such as ISM Code and certification and training of crew members like STCW. Now the shipping industry must deal with both the hardware (vessel) and software (people) for effective implementation of the international instruments (Veiga, 2002).

Although the ISM Code, which many believe to be the primary instrument for implementing safety culture in the maritime industry, became effective 20 years ago, its principles and aims have not been fulfilled satisfactorily (Teperi, Lappalainen, Puro, & Perttula, 2019). There is no doubt that implementing the ISM Code benefitted international communities (Kongsvik et al. 2014; Størkersen 2018), however, several studies have found that safety management practices in the ISM Code can be improved (Lappalainen 2016; Schröder-Hinrichs et al. 2012). The most recent accidents highlighted in the introduction chapter also point out that regulations alone do not promise absolute maritime safety. Regulations combined with practical implementation is necessary to satisfy the full essence of safety culture onboard ships.

Since all crew members onboard ships have to work, sleep and live on the same vessel throughout the contract, the interaction between crew and senior officers is closer than in other occupations. Furthermore, senior officers who are working together with the crew can shape the safety attitudes and behaviours of the crew members (Bielić, Predovan, & Čulin, 2017). However, in order to change the attitudes of crew members about safety, senior officers themselves should practise appropriate leadership styles. As described in the aforementioned literature review, leadership capabilities are interconnected with teamwork and communication abilities and all of them are important elements in improving the safety culture. The interconnection between three elements and that of safety culture is illustrated in Figure 1. Therefore, a practical tool like bottom-up assessment approach where the evaluation of senior officers' performance, including the aspects of leadership, teamwork and communication, from junior officers and ratings with the assistance of shipping companies, can be a valuable practical process for enhancing safety culture onboard ships.



Figure 1: Relationship between elements and safety culture

2.6 Bottom-up assessment approach

2.6.1 Rationale behind the approach

Several studies have found that maritime accidents in the shipping industry are primarily caused by human error. Therefore, it is clear that human errors must be reduced to lessen maritime accidents. Having said this, the shipping industry relies heavily on human resources and there is no man or woman who can perform things perfectly all the time. Therefore, to some extent, human error will always be present within the maritime business. The key question then becomes how can the shipping industry best minimize these errors?

The maritime industry has far too often followed a reactive approach to eliminate risks and human-related errors which can be described as a Safety-I approach (Hollnagel, 2014). However, implementation of a proactive safety II-approach which recognizes human as a valuable resource, must be invested in for successful performance is extremely rare. This is true particularly in the context of the ISM Code, which acts as the main instrument for safety culture onboard ships (Schröder-Hinrichs, Praetorius, Graziano, Kataria, & Baldauf, 2015).

Onboard ships, the role of senior officers is extremely important as they can directly influence and determine the safety behaviour and culture of the crew. However, the degree of influence can significantly vary depending on the leadership style of each individual. Although leadership and teamwork elements are already incorporated under the latest version of STCW (IMO, 2018), there is still no practical instrument for accessing the leadership and teamwork capability onboard ships. Therefore, the leadership, teamwork and communication abilities of senior officers, which are essential elements for improving the safety culture, should be monitored and accessed on a regular basis.

In nearly every shipping company, an Up-down evaluation approach is utilized to determine the performance and promotion potential of officers and crew onboard ships. However, a bottom-up assessment approach in which junior officers and ratings evaluate senior officers' performance is an extremely rare process. Therefore, a

complete closed-loop evaluation (up-down and bottom-up) process is lacking, leaving the performance assessment of senior officers to land-based administration.

Figure 2 depicts the Up-down evaluation process on the left side of the figure and closed-loop evaluation process on the right side. Red arrows represent the assessment process and green arrows show feedback process. By comparing both left and right side of the figure, it can be seen that by utilizing a closed-loop evaluation system, shipping company's representatives can obtain two additional assessments within a ship and two extra feedbacks between the ship and the shore.

Only those who are working together on a day-to-day basis can thoroughly understand the characteristics of leadership, teamwork and communication, which each individual possesses. Onboard vessels, junior officers and ratings work under the supervision of senior officers. Therefore, by seeking suggestion and feedback from crew members on the performance of senior officers, operating companies gain valuable insight and provide feedback to their senior officers on perceived performance.

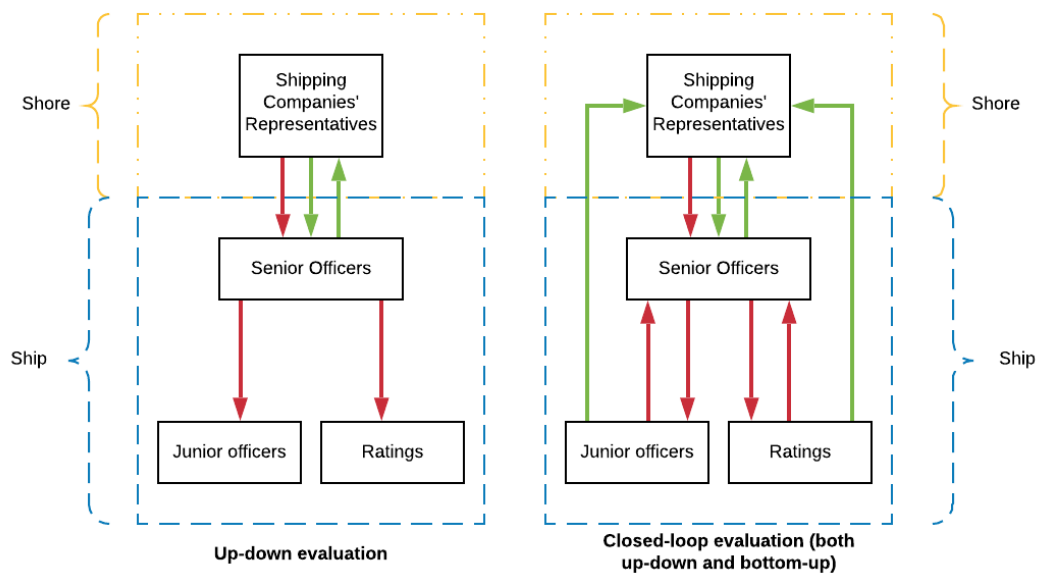


Figure 2: Comparison between Up-down and Closed-loop evaluation

2.6.2 Similar methods currently applied to improve safety culture onboard ships

Although the bottom-up assessment approach is not currently being implemented on a wide-scale basis in the shipping industry, similar approaches like a near-miss reporting system for reducing maritime accidents and behavioural competency assessment in tanker fleets have been applied for the purpose of improving safety culture.

Near miss reporting

Near-miss can be defined as “a sequence of events and/or conditions that could have resulted in loss” (IMO, 2008, p. 1) and the resulting losses can be human, environmental as well as material. The essence of near-miss reporting derives from the incident reporting principle known as iceberg model or accident pyramid. This model was initially introduced by H.W. Heinrich who concluded that behind every serious accident, there are about 300 near misses and 29 less serious accidents (Heinrich, 1959).

IMO recognized the importance of near-miss reporting and included an excerpt in the ISM Code which made it obligatory for all ships under the SOLAS convention. Near-miss reporting acts as a proactive tool for fulfilling the idea of continuous improvement which is the fundamental principle of the ISM Code (IMO, 2008). However, the issue of under-reporting still exists for near-miss reporting. Many authors pointed out that this issue is arguably the most prominent deficiency regarding the implementation process of the ISM Code (Bhattacharya 2009; Ek & Akselsson 2005; Oltedal & McArthur 2011). This problem can be hypothesized to be linked at least in part, to senior leadership wanting to insulate itself from potential blame and wrong doing. Therefore, the reasons behind the under-reporting of near-misses, such as complicated reporting processes and confidentiality, should be carefully considered when contemplating the implementation process of the bottom-up assessment approach.

The researcher hypothesized that a bottom-up assessment approach could vastly improve the rate of near miss reporting as senior officers will likely be more forthcoming for fear someone in the crew might report it during anonymous

assessments, which would be sent directly from the crew member to the operating company.

Behavioural Competency Assessment and Verification for Vessel Operators

Beginning in 2018, the first edition of the Behavioral Competency Assessment and Verification for Vessel Operators' practice guide was jointly issued and used by the Oil Companies International Marine Forum (OCIMF) and the International Association of Independent Tanker Owners (INTERTANKO). Both organizations were founded in the 1970s. OCIMF, with a membership of 109 companies worldwide, secured consultative status at IMO (OCIMF, 2019) and INTERTANKO, with 198 full members and 244 associate members, holds observer status at IMO (INTERTANKO, 2019). The tanker industry recognized the importance of soft skills such as personal behaviour and attitude as the key components of a positive safety culture; this has the possibility to enhance the overall working environment. Both organizations claimed that 'Behavioral Competency Assessment and Verification for Vessel Operator' can serve as the best practice guide for evaluating officers' soft skills by monitoring their behaviour.

According to the practice guide, behaviours are organized in a hierarchical structure at three levels: (1) competencies domains; (2) elements; and (3) behavioural indicators. Under competencies domains, there are six main themes including leadership, teamwork and communication. Then, a number of elements relevant to each competency domain will be listed. Again, under each element, positive and negative behavioural indicators will be considered (OCIMF & INTERTANKO, 2018).

For the implementation process, four key principles of assessment are considered as follows:

1. Individual assessment of each officer
2. Training and qualification of assessors
3. Openness of the system to auditing or external verification
4. Capability of the system to be incorporated into the existing system like Safety Management System (SMS)

For the operation process, four areas are required to be assessed under a five-tier rating scale which includes ‘Exceptional’, ‘Exceeds expectations’, ‘Meets expectations’, ‘Needs improvement’ and ‘Unsatisfactory’ (OCIMF & INTERTANKO, 2018). The four areas to be assessed include:

1. Navigation
2. Mooring
3. Cargo operations
4. Engineering

The difficulty in implementation and the application of the complex and heavily-resourced ‘Behavioural Competency Assessment’ in the tanker industry highlights that the need for a more simplified and less resource-dependent process like a bottom-up assessment approach, which can easily be implemented and applied on a large scale throughout the shipping industry.

2.6.3 Relevant assessment approaches in high-risk industries

The bottom-up assessment scheme of senior officers from junior officers and ratings can be said to be a relatively new mechanism in the maritime context. However, other high-risk industries including the aviation, nuclear, and health care sectors have been using similar assessment schemes to improve the organizational safety culture for quite some time.

Aviation industry

In the aviation industry, psychology has been utilized to identify and develop the required characteristics of aviators since World War I. The concept of Crew Resource Management (CRM), formerly known as Cockpit Resource Management was developed in the 1970s (Helmreich, Merritt, & Wilhelm, 1999). Since that time, six generations of CRM (Helmreich, 2006) have evolved and stakeholders such as pilots, crew, and mission commanders are required to complete this training. CRM addresses topics such as training, automation, human error, risk management, leadership, teamwork and communication for the purpose of improving safety culture (Muñoz-Marrón, 2018).

Nuclear Industry

Since 1991, the International Atomic Energy Agency (IAEA) has been developing self-assessment documents with detailed questions for numerous entities including various governments, organizations, nuclear research, and design facilities (Mariscal, Herrero, & Otero, 2012). In addition, IAEA publishes and distributes safety best practice guidelines. It is also important to note that the nuclear industry created the most widely recognized assessment questionnaires for safety culture such as the Organizational Culture Inventory (OCI) and Safety Culture Enactment Questionnaire (SCEQ). The questionnaires contain five main dimensions namely, management, training, communication, risk, and support. Leadership and teamwork criteria are included under the management and support elements (López de Castro Urrea, 2017).

Health care Industry

The concepts forming the foundation of CRM training in aviation were transferred and implemented by the healthcare industry in the 1980s as ‘anaesthesia crisis resource management’ (Howard, et al., 1992). Unlike aviation, there is no standard format for safety culture assessment. However, 14 common topics for assessing including communication, teamwork and leadership can be identified through the review of the 64 renowned healthcare, psychological, and educational publications (Gross, et al., 2019). The assessments include the participation of all key stakeholders including healthcare management, physicians, hospital staffs and patients (Nieva & Sorra, 2003).

2.7 Conclusion

There are three primary aspects for the improvement of safety culture within the maritime context, namely, leadership, communication and teamwork. All the elements are directly related to the overall enhancement of safety culture and leadership which plays a vital role in the development and success of the other two elements. The current situation in which near-misses are being under-reported, and the complexity of the Behavioural Competency Assessment being used by tankers, indicate the need for a simple bottom-up assessment approach in the maritime sector which can be applied on a broad scale. Finally, the establishment and advancement of safety culture

assessments in other high-risk industries highlight the need for similar assessments in the maritime industry. The next chapter will illustrate how to determine the condition of leadership, teamwork and communication among seafarers' onboard ships as well as examine the feasibility of implementation of a bottom-up assessment approach in the maritime industry.

3 Methodology

3.1 Introduction

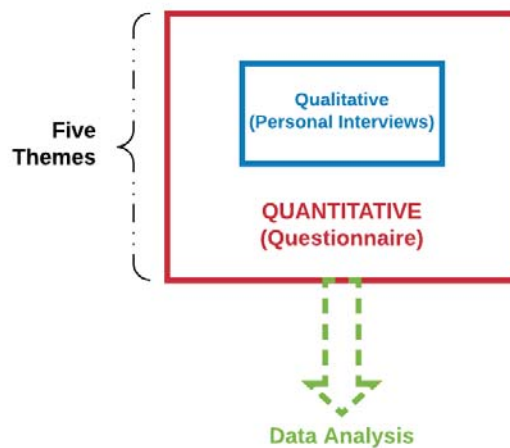
The purpose of this research is to highlight the need to apply a bottom-up assessment approach for enhancing safety culture onboard ships. The literature review, through the examination of multiple marine casualties and illegal discharge cases, illustrates the importance of teamwork, communication and leadership for safety culture and the need for the assessment of senior officers' performance onboard ships by junior officers and ratings. However, it is still necessary to survey the opinions of seafarers and senior managers in the international maritime community to validate any hypotheses derived from the literature review. The research methodology is organized into the following sections such as research strategy, ethical issues, data collection, data analysis, and validity and reliability.

3.2 Research strategy

The philosophical idea behind the stated purpose is to introduce an application for solving the problems arises out of human-related maritime accidents. This idea is in line with 'Pragmatic' worldwide view, where the underlying principle is problem-centred and real-world practice-oriented. Furthermore, the nature of pragmatism is not entrusted to any individual philosophy, and it draws its conclusion from both

quantitative and qualitative assumptions. Therefore, a survey consisting of mixed methods research was applied in this thesis, which has its root in the pragmatic worldwide view (Creswell J. W., 2014).

A concurrent embedded design, in which qualitative methods (personal interviews) are embedded within quantitative methods (questionnaires) were used for achieving the objectives (Creswell J. W., 2014). The design is based on five main themes, namely (1) communication, (2) teamwork, (3) leadership, (4) the bottom-up assessment approach, and (5) how the approach can be implemented. The visual illustration of the research design is displayed in Figure 3.



*Figure 3: Concurrent Embedded Design
Source: Adapted from Creswell et al. (2003)*

Through the use of the multi-faceted data collection approach, several advantages can be obtained. For example, questionnaire surveys are inexpensive, can provide anonymity to responders and can be distributed to large groups of people. Interviews are more appropriate for complex situations and useful for extracting in-depth information. Likewise, disadvantages for utilizing questionnaires, like limited application and lack of opportunity to clarify issues, and the time-consuming and expensive nature of interviews, were also considered.

This research aims to improve the safety culture onboard ships and the people primarily responsible for achieving this goal are seafarers. Therefore, seafarers in

various positions, as well as senior managers from a variety of international maritime institutions, were included in this research to obtain diverse perspectives on the topic. Using available communication channels including e-mail and social media, the respondents were contacted through maritime training centres in the researcher's home country; international organizations such as The Nautical Institute, International Transport Workers' Federation (ITF), and the World Maritime University (WMU) alumni network.

The subject of this research is a relatively novel concept in the maritime industry. Therefore, there were no significant number of prior studies available for the reference. As such, both primary and secondary sources will be utilized to explore the objectives of the thesis. Secondary sources like government-affiliated studies, non-governmental organization publications as well as books and journal articles were applied in the literature review. Primary resources such as online questionnaires and personal interviews were carried out to enrich the pool of available data and ensure a reliable outcome can be achieved in this research.

3.3 Ethical issues

This research required the involvement of the human element; as such, considerations of 'ethical issues' became an essential factor in the data collection process. The approval of the survey and interviews required rigorous review to ensure adherence to the highest ethical standards. Every aspect of the survey and interview questions were scrutinized by the WMU Ethics Committee before any action related to human activity was carried out. In addition, considerations such as confidentiality, anonymity, data protection, and flexibility to withdraw from participation were also strictly adhered to protect the rights and privacy of the participants. Furthermore, all contributions made by the participants were voluntary, and no fees were paid for participation in the research. Finally, no alternations or editions were made in the received data and all information will be deleted following the final submission deadline of this dissertation. The WMU Research Ethic Committee Protocol is attached in Appendix A.

3.4 Data collection

Data collection for both questionnaire survey and personal interviews began on 28th June 2019 and was completed by the end of August 2019. In this section, both methods are described in details.

3.4.1 Questionnaire survey

The questionnaire survey aims to maximize the participation of seafarers as the research is primarily focused on the human elements of shipboard operations. The sample size was 250 participants and the stratified sampling was focused on a variety of different ranks and nationalities to ensure the diverse representation of seafarers worldwide.

The questionnaire survey is composed of three parts:

- The first section obtained personal information of the participant;
- The second part pertained to teamwork and communication between senior officers, junior officers and ratings and sought feedbacks regarding assessment schemes they have encountered onboard ships;
- The final part gathered opinions regarding the feasibility for implementation and effectiveness of the bottom-up assessment scheme.

Of all 30 questions, only 4 requested a brief explanation about the selected answer choice; the rest were pure multiple-choice questions. In order to best capture the varying opinions of seafarers, the Likert scale was utilized to rate responses based on how much the participant agreed or disagreed with a particular inquiry. The following scaled responses: ‘Strongly agree’, ‘Agree’, ‘Neutral’, ‘Disagree’ and ‘Strongly disagree’ were used for most of the questions. Multiple-choice questions were used primarily for ease of participation and electronic data collection, specifically google forms, were utilized for time-saving and to accommodate the busy schedules of seafarers who participated. The consent form and sample template of the questionnaire survey are shown in Appendix B.

3.4.2 Personal interviews

Using quota sampling, a total of 10 personal interviews for both senior officers and senior managers in the maritime industry were carried out to explore the different perspectives within the maritime industry. Six interviews for senior officers were done face-to-face while the rest for senior managers were carried out via ‘Skype’ software. The perspectives of the senior officers were vital as they are the ones who are going to be assessed and valuable inputs can be obtained from the insightful experience of international players.

Two types of personal interviews for senior officers and managers were carried out. Firstly, the personal interview of senior officers was composed of six parts with 22 semi-structured questions eliciting personal information, shipboard organizational structure, leadership, teamwork, a bottom-up assessment scheme, and process of the scheme. Then, personal interviews consisting of six questions for senior managers were formulated with a primary focus on the bottom-up assessment approach. The consent form and question templates for personal interviews are shown in Appendix C.

3.5 Data analysis

All questions concerning with the five themes are categorized accordingly and the results from each question from the questionnaires surveys and the findings from personal interviews were presented and analysed with respect to each theme. Finally, based on the analysis from each theme, the following research questions were to be answered.

1. What are the current conditions of teamwork, communication and leadership onboard ships?
2. Is bottom-up assessment approach necessary to improve safety culture onboard ships?
3. How can bottom-up assessment approach be implemented onboard ships by shipping companies?

3.6 Reliability and validity

The data obtained from both questionnaire surveys and interviews were prepared systematically before analysing. For questionnaire surveys, each individual response was checked for missing data and necessary arrangements for analysis such as categorization of nationalities, division of age groups and selection of the valuable remarks from open-ended questions were made. For personal interviews, voice-recordings were carried out for each participant. Then, the interviews were transcribed using the software application ‘Transcribe’ and open coded to categorize key themes and identify patterns. Furthermore, the inclusion of relevant stakeholders for the research such as seafarers and senior managers in the maritime industry and the utilization of both questionnaire surveys and interviews, lead to achieving a valid and reliable outcome.

3.7 Limitations

The study aims to highlight the need for a bottom-up assessment approach to improve safety culture onboard ships. Therefore, the need and essential factors are emphasized rather than the details about the assessment.

There are many aspects for assessing the safety culture and only the main three elements such as leadership, teamwork, and communication are discussed. For the implementation process, a generalized area for reporting and how to carry out feedback was introduced although the details regarding data collection, reporting and analysis are omitted.

The respondents for the questionnaire survey and interviews are mainly from Asia. Therefore, the opinions and results can be said not entirely representing the viewpoints of seafarers from all over the world.

4 Data description and analysis

4.1 Introduction

The results from the questionnaires and interviews, carried out by specific means explained in the previous chapter, were revealed to determine the actual conditions onboard ships and the necessity of the bottom-up assessment approach in enhancing the safety culture onboard vessels. Firstly, general demographics of the data obtained were illustrated. Then, the details from each question were represented in a highly structured way with five themes, namely teamwork, communication, leadership, bottom-up assessment approach, and ways to implement the approach. Finally, a brief analysis of the five main themes was described in the last section of the chapter.

4.2 Research respondent demographics

The demographics and generalized main information about the participants for the questionnaire surveys and personal interviews were portrayed in this section accordingly.

4.2.1 Questionnaire survey

A total of 250 seafarers from 19 countries participated in the questionnaire survey. The summary results of the total respondents' data such as gender, age, nationality, number of shipping companies, ranks and sea service experiences were shown in the following sections.

Gender

An overwhelming majority of the respondents (96%) were male while the rest (3.6%) were female and one person as diverse. Figure 4 illustrates the proportion of participants.

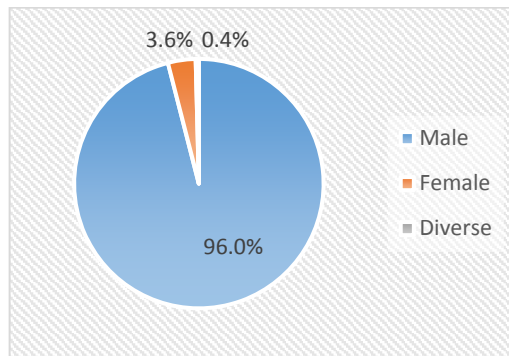


Figure 4: Gender Proportion

Age Groups

The age group of ‘26 to 35’ represented the highest percentage (52.8%) among all participants. Then it was followed by groups of ‘36 to 45’, ‘18 to 25’, ‘46 to 55’, ‘56 to 65’ and ‘Above 66’ respectively. Figure 5 presents the percentages of each group.

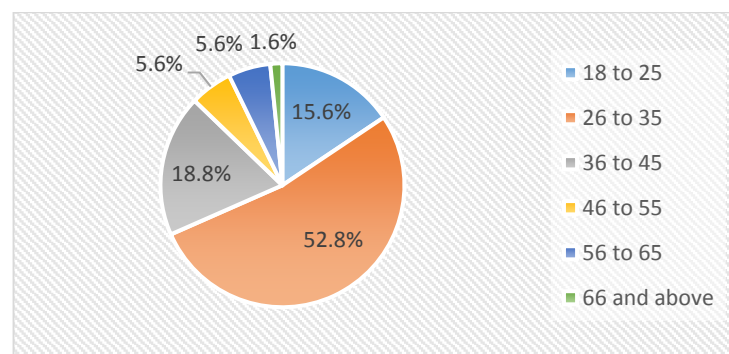


Figure 5: Age Groups

Nationality Groups

A total of 19 different nationalities participated in the survey. While Myanmar seafarers stood at the top position with 136 participants (54.4%), countries such as Turkish, I-Kiribati, Latvian, Beninese and New Zealand stood at the last with only one respondent. Figure 6 depicts the numbers of participants for each nationality.

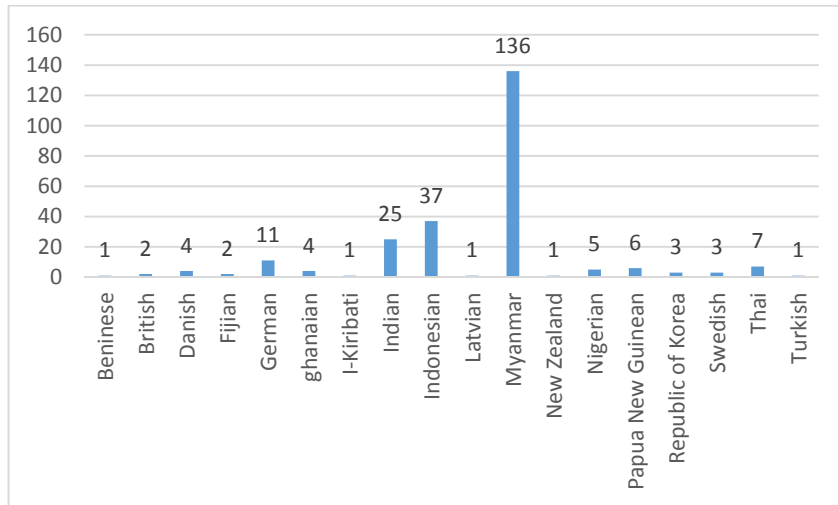


Figure 6: Nationality Groups

Shipping Companies

Respondents were working under 175 different companies, which are based in 31 countries with Singapore representing the dominant home-based nation. Figure 7 illuminates the distribution of shipping companies for each nation.

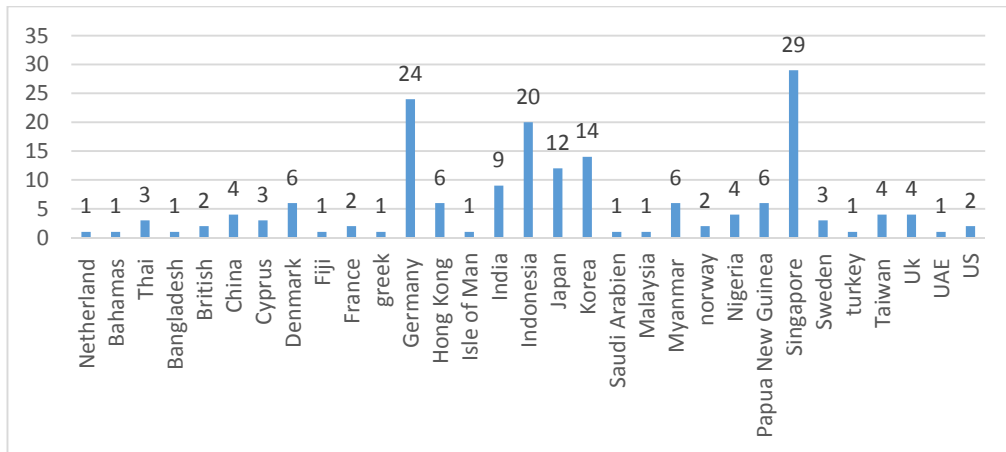


Figure 7: Shipping Companies

Positions of seafarers

Junior officers represented 58% of the respondents; 37.2% were senior officers and the rest (4.9%) were ratings. Figure 8 shows the proportion of the results.

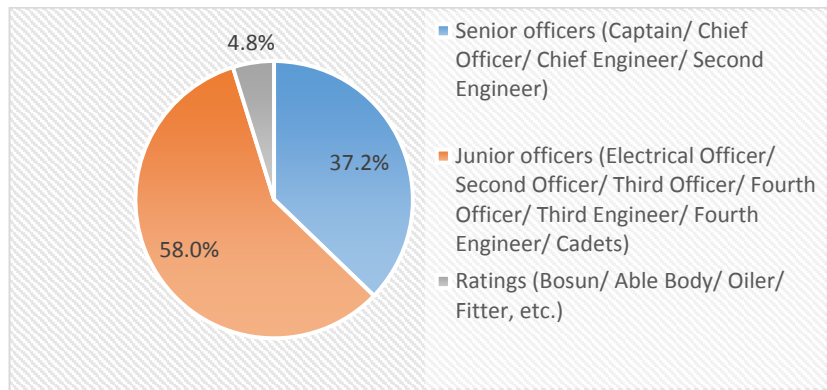


Figure 8: Position of Seafarers

Sea service experience

Seafarers who possess seafaring experience of ‘9 years and above’ occupied the highest percentage (30.2%) while the ‘less than 3 years’ group stood as the least per cent with 14.8%. Figure 9 depicts the percentages for each group.

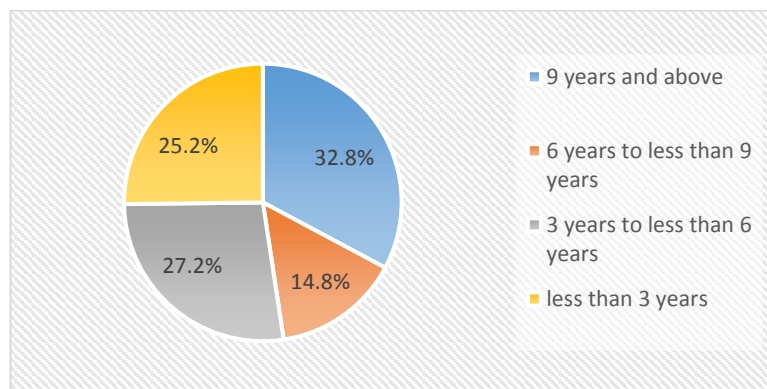


Figure 9: Sea service Experience

4.2.2 Interviews

The interviews for senior seafarers were focused on all five elements while the ones for the institutional players were primarily emphasized on the topic of a bottom-up assessment approach for senior officers. A total of 6 interviews for senior seafarers and 4 interviews for senior managers were carried out. The following Tables 1 and 2 describe the essential information about the participants. The names of the participants are adapted to keep anonymity.

Table 1: Information about the participants for seafarers' interviews

No	Name	Nationality	Maritime Experience
1	Andy	Ghana	Ex-Master Mariner Certificate of Competency (COC) class I with 10 years' experience and currently works as a pilot in a port
2	Brian	India	Master Mariner (COC class I) with 14 years' experience
3	Charles	India	Ex-Master Mariner (COC Class I) with 15 years' experience and currently works in Maritime Administration
4	Dorothy	Singapore	Chief Engineer (COC Class I) with 9 years' experience
5	Eric	Tuvalu	Master Mariner (COC Class I) with more than 17 years' experience
6	Henry	India	Chief Engineer (COC Class I) with 16 years' experience

Table 2: Information about the participants for institutional players' interviews

No	Name	Nationality	Maritime experience
1	Adrian	Indian	Manager of Maritime technology and regulations department in BIMCO (The Baltic and International Maritime Council) and former Master Mariner (COC Class I) with 13 years' experience
2	Bryan	USA	Director of Projects in the Nautical Institute with 20 years at sea (Master Mariner) and 20 years with the Nautical Institute

3	Carlos	Polish and Manx	Secretary-general of InterManager with 34 years in Maritime industry
4	Dennis	UK	Marine director within INTERTANKO with 30 years in Maritime industry

4.3 Themes

The results from the questionnaire survey and personal interviews are structured into five main themes namely, teamwork, communication, leadership, bottom-up assessment approach, and ways to implement the approach for data description and analysis of the research. In addition, the influence of Myanmar respondents on the outcome of the questions is also illustrated since respondents from Myanmar alone occupied 54.4% of the total participants.

4.3.1 Teamwork

Teamwork can be measured in a variety of ways. In this section, opinions regarding teamwork especially suggestions and feedback condition between senior officers, junior officers and ratings were explored. Table 3 describes a brief overview of all questions for the data description.

Table 3: Summary data for teamwork

No	Questions
1	Questionnaire survey Part1 No. 5, 6, 7 and 9
2	Interviews (seafarers) No. 10 and 11
3	Interviews (institutional players) No. 4

1. Questionnaire survey

Question No. 5 affirmed that senior officers do not take suggestions and feedback from junior officers and ratings. 49.6% of the respondents disagreed; 22.8% agreed, and the

rest were in 'neutral position' with the statement. A similar proportion result without Myanmar participants and Figure 10 illustrates the specific results.

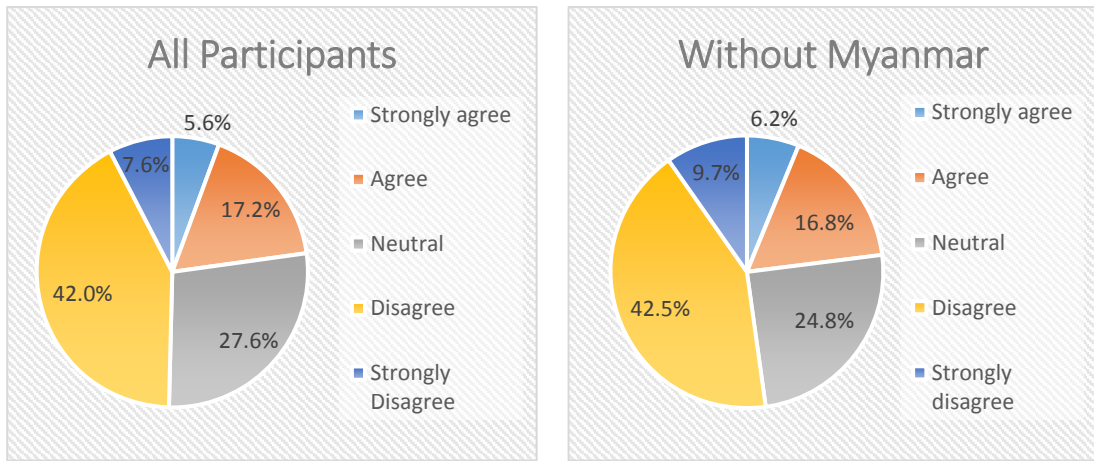


Figure 10: Opinions on senior officers (with and without Myanmar Participants)

Question No. 6 stated that junior officers do not provide their opinions or feedback to senior officers. 67.2% of respondents disagreed; a quarter of them chose 'neutral' option, and only 8% agreed with the statement. A similar proportion represents without Myanmar participants and Figure 11 reveals the percentages for each situation.

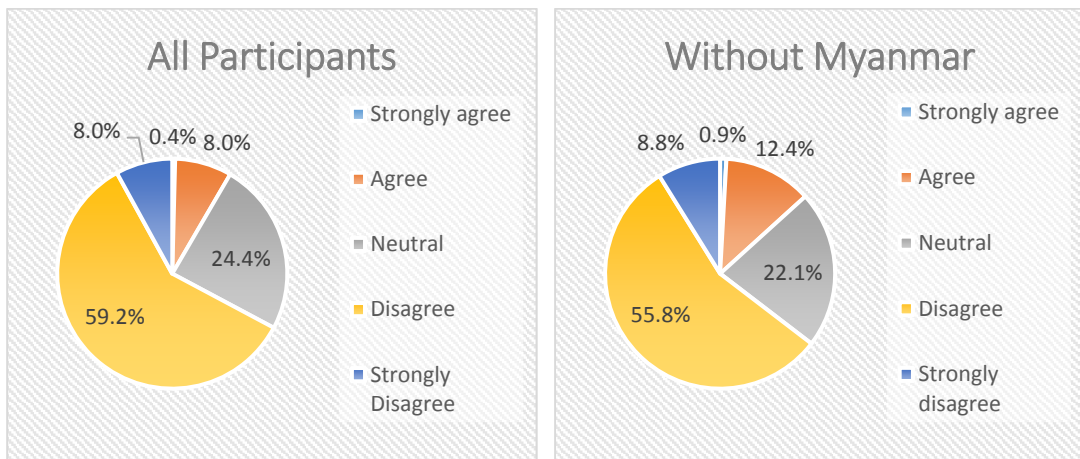


Figure 11: Opinions on junior officers (with and without Myanmar Participants)

Question No. 7 described that ratings do not provide their opinions or feedback to senior officers. 55.2% of respondents disagreed; a quarter of them neither agreed nor disagreed, and the rest (19.2%) agreed with the statement. A similar proportion produce without Myanmar participants and Figure 12 depicts the detailed outcomes.

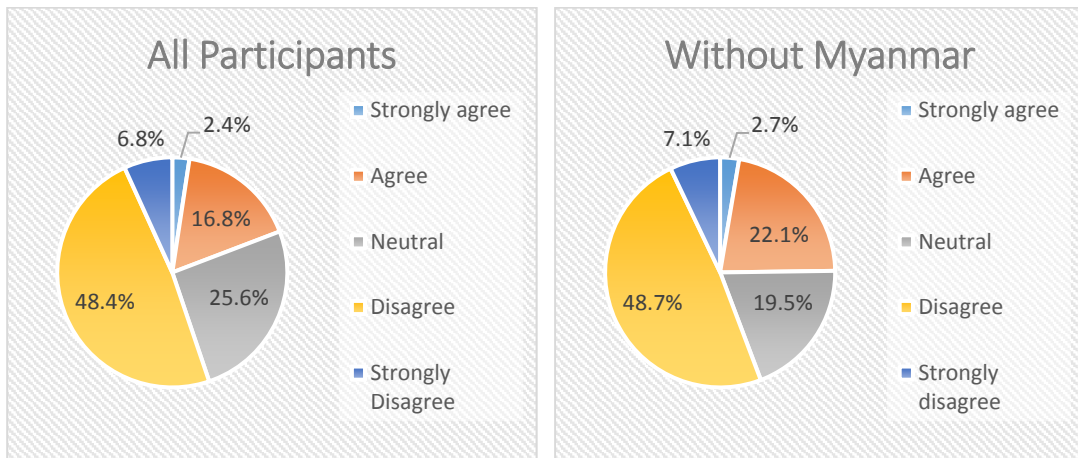


Figure 12: Opinions on Ratings (with and without Myanmar Participants)

Question No. 9 stated that effective teamwork has existed on ships for which I have served. 87.2% of the participants agreed; only 2.8% disagreed, and the rest were in the position of ‘neutral’ with the statement. A similar proportion represent without Myanmar participants and Figure 13 displays the results of both situations.

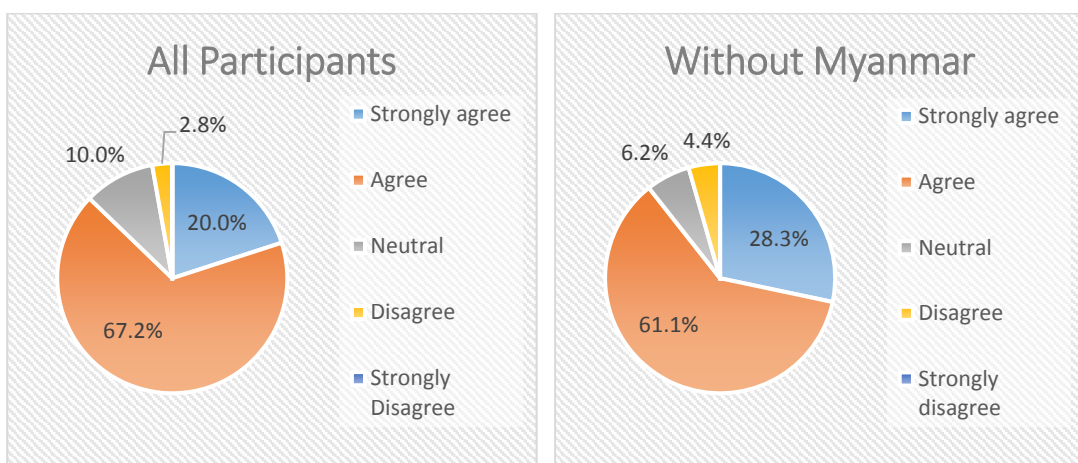


Figure 13: Opinions on teamwork (with and without Myanmar Participants)

2. Interviews (seafarers)

Question 10 asked about the importance of teamwork for seafarers. All participants responded ‘Yes’. They also stated the following sentences such as “ship cannot move without teamwork”; “every job requires two people”; “if no teamwork, desired output will not be achieved”; “ship will not operate effectively without teamwork”; and

“teamwork is required in every operation such as manoeuvring, cargo operations and emergency situations”.

Question 11 explored the efficiency of teamwork on ships they have sailed. Only one person said ‘Yes’; three participants said ‘Mostly’; and the rest two said ‘No’. Therefore, teamwork has not always been efficient based on their experience. The person who said ‘Yes’ is Charles from India and he had sailed only in government ships where all crews are the same nationality, whereas the rest sailed with an international crew.

For the reasons behind the inefficiency of teamwork, four out of six participants provided responses. One stated the ‘leadership’ from senior officers and the rest regarded ‘communication’ as a crucial factor in establishing teamwork. Brian from India also stated that “If the environment of the... the ship is not good then it's like a hell living onboard for...for the rest of your contract”, which indicates the tremendous impact of ineffective teamwork.

3. Interviews (institutional players)

Question no. 4 asserted that teamwork is an important element for assessing the performance of senior officers. All four participants agreed with the inquiry and one respondent highlighted that it should be based on behavioural questions rather than right or wrong.

4.3.2 Communication

There are many criteria for assessing communication aspects. In this section, opinions regarding communication especially interaction among crew members were examined. Table 4 describes a brief overview of all questions for the data description.

Table 4: Summary data for communication

No	Questions
1	Questionnaire survey Part.1 No. 1, 2, 3 and 8
2	Interviews (seafarers) No. 12, 13 and 14

3	Interviews (institutional players) No. 4
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1. Questionnaire survey

Question No. 1 stated that junior officers and ratings always obey and respect orders from senior officers. 85.6% of respondents agreed; only a fraction (4%) disagreed, and one-tenth were in ‘neutral’ position about the statement. A similar proportion result without Myanmar participants and Figure 14 shows the situation in each case.

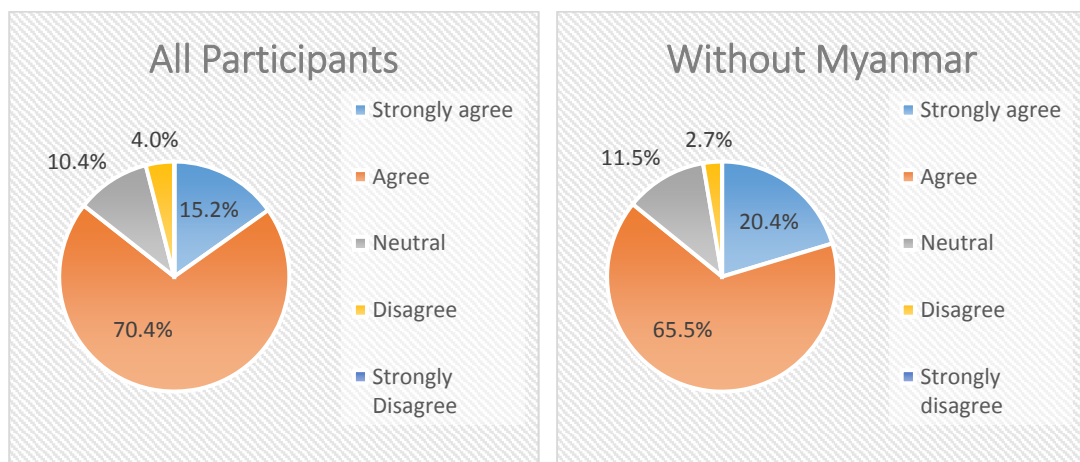


Figure 14: Opinions on obey and respect (with and without Myanmar Participants)

Question No.2 described that the strict hierarchy of shipboard organizational structure limits the ability of junior officers to provide feedback or suggestions to senior officers. Almost 60% of respondents agreed; 14.8% were in a neutral position, and a quarter of them did not agree with the statement. A marginally different proportion obtain (with 10% decrease in agreement and 11% increase in disagreement) without Myanmar participants and Figure 15 displays the results.

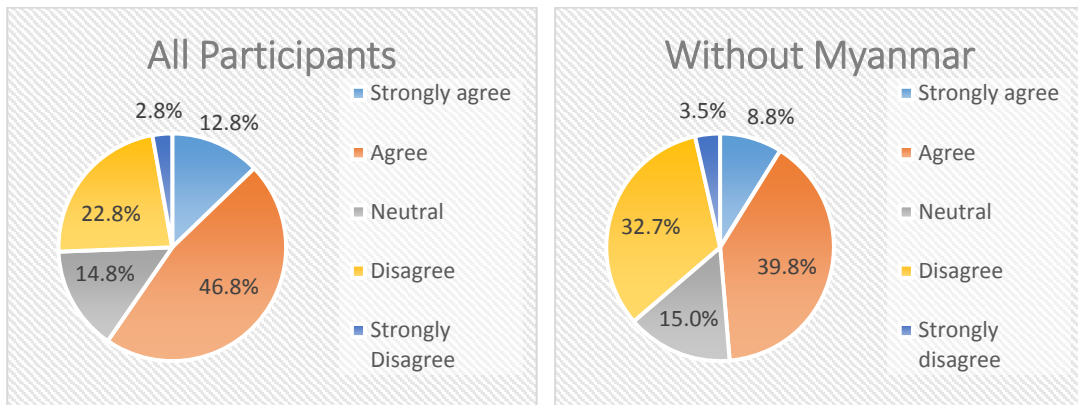


Figure 15: Opinions on feedback or suggestions from junior officers (with and without Myanmar Participants)

Question No. 3 articulated that the strict hierarchy of shipboard organizational structure limits the ability of ratings to provide feedback or suggestions to senior officers. 61.2% of respondents agreed; around one-fifth disagreed, and 15.6% are in ‘neutral’ with the statement. A marginally different proportion (with 10% decrease in agreement and 9% increase in disagreement) result without Myanmar participants and Figure 16 depicts the resulted percentages.

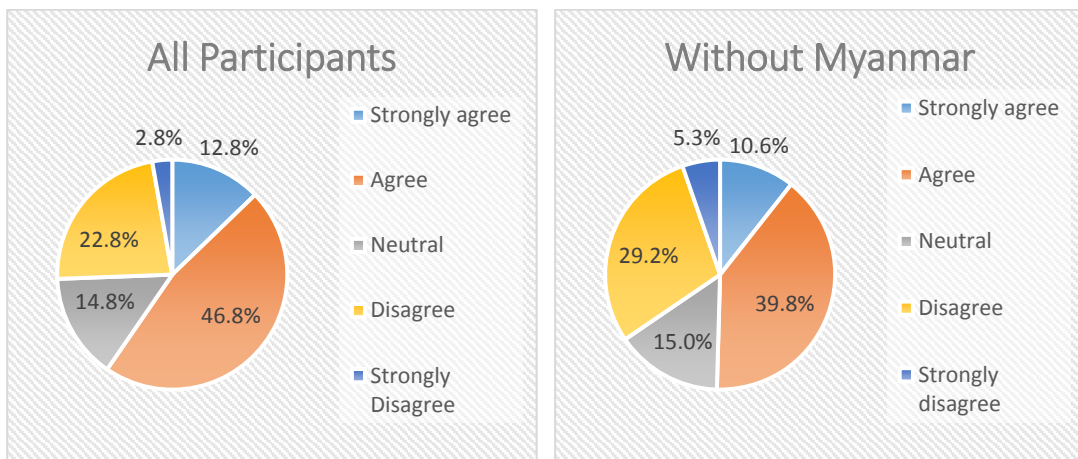


Figure 16: Opinions on feedback or suggestions from ratings (with and without Myanmar Participants)

Question No. 8 presented the statement that in general, communication amongst crew members has been open and effective onboard ships on which I have served. 78% of respondents agreed; only 4% disagreed, and nearly one-tenth did not express their opinion about the statement. A similar proportion represent without Myanmar participants and Figure 17 presents the outcomes for both situations.

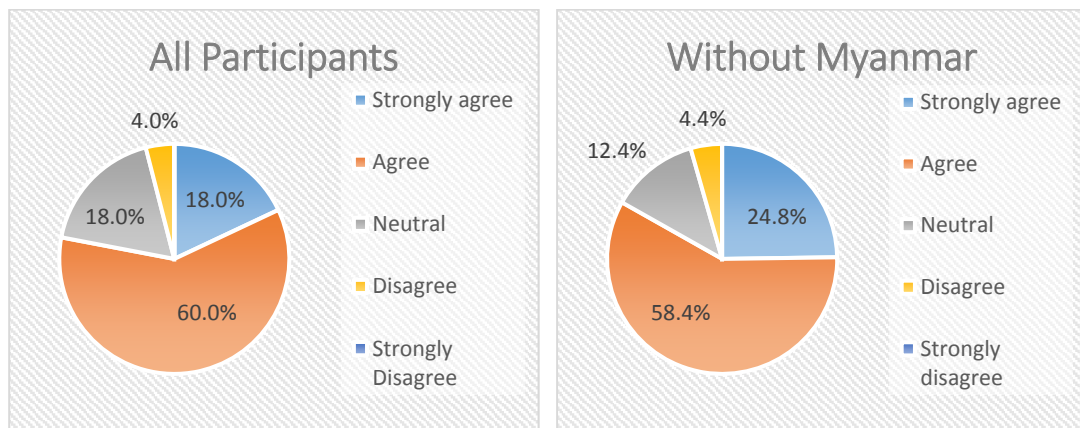


Figure 17: Opinions on communication (with and without Myanmar Participants)

2. Interviews (seafarers)

Question no. 12 sought opinions about senior officers regarding communication. All respondents agreed that not all senior officers sought advice and feedback from other crew members and it is depended on the characteristics of the individuals. They highlighted some characteristics of individuals like “ego” and “overconfident” prevent open and effective communication. They also agreed that there were some senior officers who never took advice and suggestions from junior officers and ratings.

Question no. 13 examined opinions about junior officers and ratings regarding giving feedback and suggestions to senior officers. All participants said that they usually gave feedback to the senior officers. However, this condition primarily rests on senior officers as participants explaining with supporting sentences like “they will give when they are not scolded or punished or exposed”; “it depends on the individuals who are at the top”; and “usually they try at first and later they act depending on the seniors”.

Question no. 14 tried to discover the link between the strict hierarchical organizational structure and the willingness of junior officers and ratings to offer feedback and suggestions to senior officers. All respondents said that the strict hierarchy was necessary onboard ships. Four out of the six respondents said that it depended on actions of the senior officers with explanations like “for some captains, nobody can challenge”; “it depends on senior officers how they act or react with subordinates”;

and “the guy sitting at the top should have a good leadership skill so as to communicate people”; the rest said that it depended on the company and the feedback process.

3. Interviews (institutional players)

Question no.4 affirmed about other important factors for assessing the performance of senior officers. All respondents said that the communication element should be included in assessing the performance of senior officers.

4.3.3 Leadership

The importance of leadership for improving safety culture onboard ships is prominent. Therefore, questions for leadership were omitted in the questionnaire survey. Insightful information regarding effective and ineffective leadership was obtained from personal interviews. Table 5 describes a brief overview of all questions for the data description.

Table 5: Summary data for leadership

No	Questions
1	Interviews (seafarers) No. 6, 7, 8 and 9
2	Interviews (institutional players) No. 4 (a)

1. Interviews (seafarers)

Question no.6 asked about the importance of leadership of senior officers. All participants said that it was a very crucial element. They also highlighted with interesting statements such as “Without a leader, that ship will be detained”; “There has to be a leader who has...who has the vision in the objectives of what needs to be done by the priority”; and “without leadership, the subordinates will also not perform”.

Question no.7 sought to find out whether all senior officers know how to lead effectively junior officers and ratings or not and the reasons behind them. All participants agreed that not all senior officers knew how to lead effectively. Four of

them said that it depended on the individual and the rest told that some lack communication and charisma.

Question no.8 explored the characteristics of effective and ineffective leadership of senior officers. For effective characteristics, five of them emphasized communication with the team or subordinates such as “communication with teams in both ways and feedback from the team”; “proper communication with lower rank crews”; and “understand your subordinates, support and motivate them”. The remaining one highlighted fair, integrity, and clear focus. For ineffective characteristics, they said that the opposite of effective attributes was the same as ineffective characteristics.

Question no.9 explored how to improve the leadership capabilities of senior officers. Most of the participants referred to the above-mentioned characteristics of effective leadership. One of them explained that senior officers should not keep the leadership style too tight, nor too loose and managed like flying a kite. Another participant highlighted that the company should conduct specific training programmes regarding leadership to enhance ability.

2. Interviews (institutional players)

Question no. 4 stated that leadership is an important element for assessing the performance of senior officers. All participants agreed with the statement, and one participant expressed that not only leadership skills, but also soft skills, need to be considered for better performance. He even specified ‘Behavioural Competency Assessment and Verification for Vessel Operators’ for obtaining necessary details about elements for assessing the performance of senior officers.

4.3.4 Bottom-up assessment approach

The up-down assessment approach is prominent in the shipping industry and has been using for a long time. In this section, opinions from respondents regarding the necessity and importance of the bottom-up assessment were examined. Table 6 describes a brief overview of all questions for the data description.

Table 6: Summary data for bottom-up assessment approach

No	Questions
1	Questionnaire survey Part1 No. 4, 10, 11, 12 and 13
2	Interviews (seafarers) No. 15, 16, 17, 18, 19 and 20
3	Interviews (institutional players) No. 1 and 2

1. Questionnaire survey

Question No.4 stated that suggestions and feedback provided to senior officers from junior officers and ratings could improve the efficiency of shipboard operations and enhance overall workplace climate. 93.2% of respondents agreed; only 6.4% were in neutral and one person (0.4%) disagreed. A similar proportion occurs without Myanmar participants and Figure 18 illustrates the results.

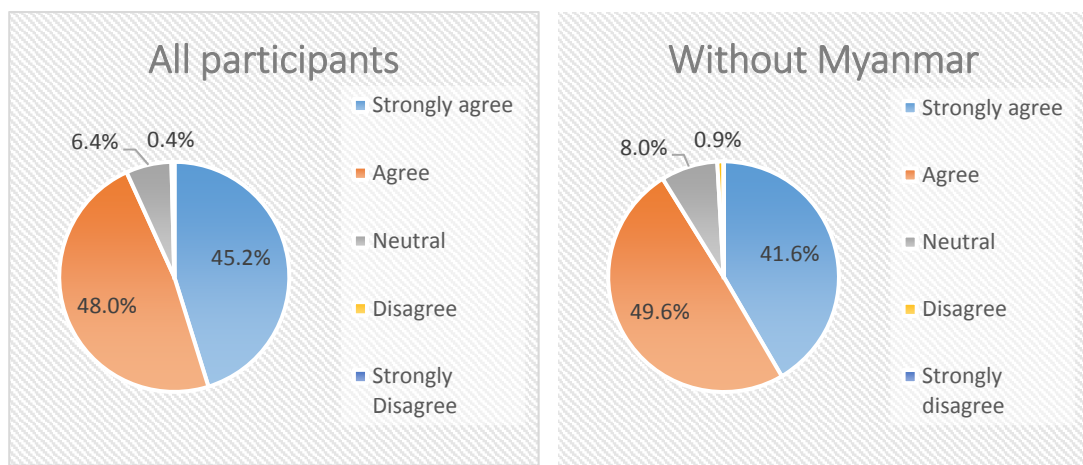


Figure 18: Opinions on suggestions or feedback from junior officers and ratings (with and without Myanmar Participants)

Question No. 10 affirmed that the establishment of formal evaluation schemes both up and down the chain of command could greatly improve the workplace climate onboard ships. 85.6% of participants agreed; only 2.8% disagreed and 11.2% were in neutral position with the statement. A similar proportion results without Myanmar participants and Figure 19 exhibits the outcomes.

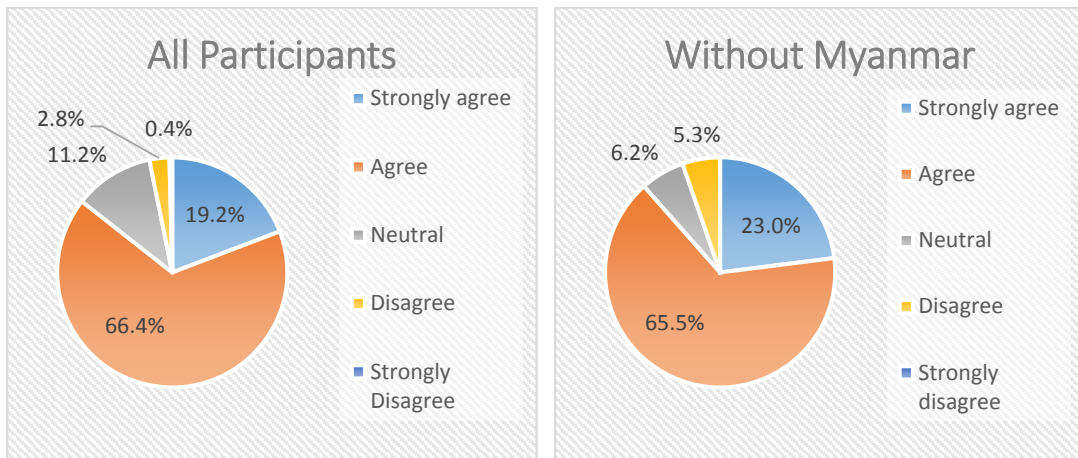


Figure 19: Opinions on evaluation schemes (with and without Myanmar Participants)

Question No.11 presented that an anonymous assessment scheme for ratings and junior officers designed to evaluate the leadership and performance of senior officers would be useful for operating companies in assessing shipboard efficiency and crew cohesiveness. 84% of respondents agreed; 8.8% were in neutral and 7.2% disagreed with the statement. A similar proportion achieves without Myanmar participants and Figure 20 depicts the percentages for both conditions.

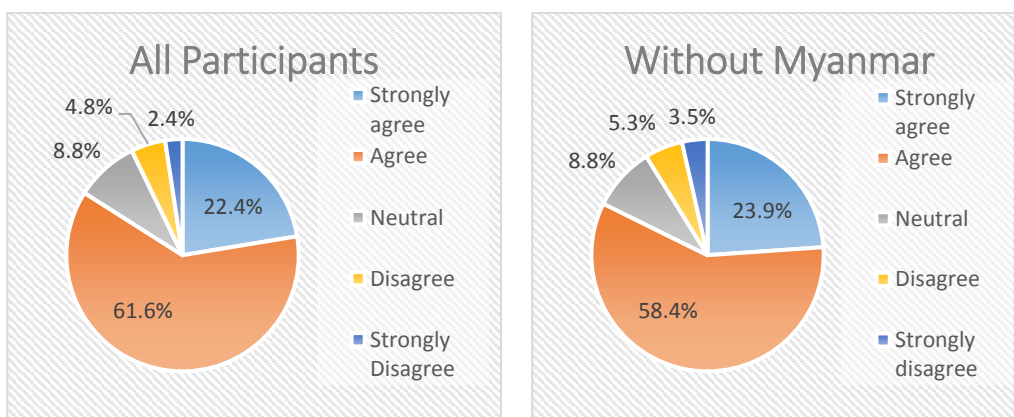


Figure 20: Opinions on the importance of anonymous assessment scheme (with and without Myanmar Participants)

Question No.12 asked about the existence of the evaluation scheme in their shipping companies where senior officers can assess the performance of junior officers and ratings. 87.2% of respondents said that there was an evaluation scheme, while 3.6%

answered 'No' and 9.2% chose 'Not sure'. A similar proportion results without Myanmar participants.

Question No.13 asked about the existence of an evaluation scheme in their shipping companies where junior officers and ratings can assess the performance of senior officers. 72.4% of participants said that there was no evaluation scheme in their shipping companies while 16.4% replied 'Yes' and 11.6% said 'not sure'. A marginally different proportion (7% decrease in 'No' and 10% increase in 'Yes') produce without Myanmar participants.

2. Interviews (seafarers)

Question no. 15 explored the suggestions and feedback provided by junior officers and ratings to senior officers. All participants agreed that suggestions and feedback were significant for improving shipboard efficiency and workplace climate. Two participants described specific ways like 360-degree feedback, which requires all seafarers to evaluate each other and give informal feedback. One interviewee even highlighted that it could improve the safety culture as senior officers did not realize their weakness but junior officers and ratings knew about them.

Question no.16 asked about the existence of an assessment scheme for junior officers and ratings by senior officers. They all said 'Yes' and it was part of the company procedures. The interval of carrying out such assessment varies from monthly, every sign-off, and quarterly, and all have to send to the shipping offices for evaluation.

Question no. 17 asked about the existence of an assessment scheme for senior officers by junior officers and ratings. All six participants said 'No'. They also said that junior officers and ratings could only comment on the assessment from senior officers regarding their performance.

Question no. 18 gathered the fact whether the feedback from junior officers and ratings can be beneficial or not for senior officers. Three participants said 'Yes and essential'. One said that the feedback would be beneficial if it is executed in the proper way. The rest two said that "very hard to tell" and "senior officers don't like feedback".

Question no. 19 sought the opinions of participants regarding the fact whether it will be beneficial or not for the shipping companies. Four participants said ‘Yes’; one said “Sometimes” and the rest two said “Not practicable”.

Question no. 20 explored the implementation process of shipping companies regarding the bottom-up assessment. Four out of six participants said that it could be implemented and one respondent also highlighted that “starting will be difficult; should start as a semi-formal and then formal; and should be encouraged”; and the remaining two said that it should be conducted in an unofficial way.

3. Interviews (institutional players)

Question no.1 inquired about an assessment scheme onboard ships where senior officers can assess the performance of junior officers and ratings. Three out of four participants said ‘Yes’ while the remaining one stated: “most of the shipping companies have”. All participants agreed that it was an important process for the company, and two of them gave specific explanations about its importance in areas such as promotion, recruitment, job completion and competent operations.

Question no.2 asked about an assessment scheme onboard ships where junior officers and ratings can assess the performance of senior officers. Two persons mentioned “it is very tricky” and “it is very difficult to answer” while the rest said “some companies have and some do not have it”. Therefore, only a few companies applied this type of assessment scheme onboard ships. With respect to the importance of the assessment scheme, three out of four participants said that it was an important process, and one person said that it depended on the company. They also added valuable inputs like “it should not use as a tool for personal matter like juniors attacking senior officers”; “the assessment process is very important but having juniors directly assessing the seniors, I believe it is a very dangerous practice”; and One participant affirmed that some leading-edge companies already applied 360-degree feedback.

4.3.5 How to implement a bottom-up assessment approach

A bottom-up assessment approach is like an appraisal form for an employee. However, essential elements and ways to implement it were different from an appraisal. In this

section, opinions from participants regarding the above-mentioned points were obtained. Table 7 describes a brief overview of all questions for the data description.

Table 7: Summary data for how to implement a bottom-up assessment approach

No	Questions
1	Questionnaire survey Part 2 No.1 to 10 and Part 1 No. 14
2	Interviews (seafarers)No. 21 and 22
3	Interviews (institutional players) No. 3, 5 and 6

1. Questionnaire survey

Question No.1 stated that the bottom-up assessment scheme must be ‘simple’ and ‘anonymous’ to ensure active participation. 80.4% of respondents agreed; only 6% disagreed, and the rest were in neutral condition with the statement.

Question No.2 explored the opinions of seafarers regarding the ‘direct reporting’ process of the bottom-up assessment between company representatives and participants. 87.2% of respondents agreed; 8% disagreed, and 14.8% were in neutral position with the statement.

Question No.3 declared the importance of ‘regular basis reporting’ for the assessment scheme. 77.2% of participants agreed; only 4.2% disagreed, and 18.4% chose neutral opinion with the statement.

Question No.4 highlighted the importance of shipping companies in providing ‘adequate means’ for effective implementation for the assessment scheme. 84.3% of respondents agreed; only 2.8% disagreed, and 12.9% were in a neutral position regarding the statement.

Question No.5 confirmed the importance of ‘anonymous’ together with ‘electronic means’ for reporting in the assessment scheme. 76.8% of respondents agreed; 7.8% disagreed, and 15.6% chose ‘neutral’ for the statement.

Question No. 6 stated that the company should analyse all assessments of senior officers by junior officers and ratings ‘objectively’. 80.3% of respondents agreed; 4.4% disagreed, and 15.3% were in a neutral position with the statement.

Question No. 7 described that senior officers should be rewarded for their continual good performance. 81.2% of respondents agreed; 5.2% disagreed, and 14% were in a neutral position with the statement.

Question No.8 asserted that the company should offer feedback to senior officers on poor performance and give them an opportunity to improve. 85.2% of respondents agreed; only 2.8% disagreed, and 12% did not express their opinions with the statement.

Question No.9 expounded senior officers should accept feedback from the company and adjust their leadership accordingly. 85.2% of respondents agreed; only 2.4% disagreed, and 12.4% were in a neutral position with the statement.

For all questions from No.1 to No.9, a similar proportion, with 80% of respondents, agreed to the statements, was achieved without Myanmar participants. Therefore, the outcome of the results were not influenced by Myanmar seafarers.

Question No.10 from Part 2 and No.14 from Part 1 asked about the remarks regarding the bottom-up assessment scheme of senior officers from junior officers and ratings. Generally, the remarks could be summarized into three categories namely, supporting, opposing, and alternative comments.

For supporting comments, they all expressed that a bottom-up assessment scheme should be established. One of the respondents told regarding a case where senior officers did not care about rest hours, and cadets had to work up to 16 hours on some days. However, cadets did not want to complain about the problem due to the performance appraisal which may impact his or her future promotion. He also highlighted that a system like a bottom-up assessment can inform about the problem without knowing who is reported. Further, supporting comments stated that its important for company policies and management reviews.

The opposing comments offered ideas to consider regarding the assessment scheme. One of the participants highlighted that conducting the assessment must be avoided to prevent causing the disturbance in the chain of command, which is vital according to the working environment and undesired social conditions onboard. Further opposing comments such as ineffectiveness, the involvement of personal matters and feasibility were also expressed.

For alternative comments, respondents agreed with the process of a bottom-up assessment approach. However, they thought that a kind of modification is needed for effective implementation. Valuable inputs such as confidentiality instead of anonymous; a suggestion box that can be sent directly to DPA (Designated Person Ashore); common in one form for all shipping companies; inclusion in SMS; a form of closed questionnaire survey and 360-degree feedback evaluation were also revealed for thorough consideration.

2. Interviews (seafarers)

Question no. 21 explored how the bottom-up assessment should be implemented. Three out of six participants stated that the assessment should be ‘anonymous’, while two said anonymous function could also cause problems, and the last one said that it depended on the company. One respondent also said that the assessment should be made official and transparent for effective implementation. Three out of six participants mentioned the importance of ‘simplicity’ in the reporting process, while the rest did not state it. For the reporting process, two of them replied that reporting after signing off was convenient, otherwise senior officers can influence the report and make troubles with junior officers and ratings; another two said that the assessment should be carried out like appraisals; one remarked that “it is a tricky one”, and the last one said that “it is not practical as companies do not care about the leadership capabilities of the senior officers, and they will not take action until an accident occurs”.

Question no.22 asked about how the company should give feedback regarding the results of the assessment and the time interval required to complete the assessment.

Five participants agreed that rewarding is a good approach, while one said that rewarding also could generate a conflict if there are no precise guidelines. Regarding warning for poor performance, all of them said it would not be as effective as rewarding.

3. Interviews (institutional players)

Question no.3 extracted opinions about the implementation process of the assessment scheme. Three participants said that the assessment can be implemented, while one mentioned that it would be very difficult and probably a little bit dangerous. Two participants explained more details about the implementation process such as “the company should not do like an assessment, but like a feedback survey focusing on soft skills rather than technical skills of senior officers” and “they should do like 360-degree feedback. It can be implemented, but it will take long time to sort of bedin and make it work properly”.

Question no.5 asked about two elements, namely anonymous and direct reporting arrangement of the bottom-up assessment scheme for senior officers. For anonymous element, two out of four participants agreed, while other two participants highlighted confidential reporting as well as a 360-degree report where all individuals can assess each other. For a direct reporting system, three out of four participants agreed with it, and one referred to a 360-degree feedback system which is neither anonymous nor direct reporting. Valuable inputs like using software and database for assessment and online forms were expressed. Ways for reporting, such as through DPA, the whistleblowing scheme, and independent onboard assessors, were also described.

Question no.6 explored rewarding, warning or fines, and time-intervals for implementing the bottom-up approach. Three out of four participants agreed that the implementation approach should be based on a rewarding system instead of warning or fines while one stated that it should just be a 360-degree feedback, which is neither rewarding nor giving warnings or fines. The same proportion as above expressed the need of regular time-intervals: once in six months or a year; beginning, middle or end

of a contract; and regular linkage. The remaining one told that it entirely depended on the company's culture and style.

4.4 Brief analysis of five main themes

According to the results obtained, all three elements, namely, teamwork, communication and leadership, are essential and important for seafarers and the enhancement of safety culture onboard ships. Moreover, they all are interrelated with each other. Therefore, they play a vital role in assessing the performance of senior officers, which in turn can influence safety culture. The majority of the respondents agreed that a bottom-up assessment was necessary and can be implementable. However, the implementation methods can be varied based on nature and concept of the operating company. The above-mentioned facts represent the generalized analysis regarding the five main themes, and the following chapter will discuss the findings in detail.

5 Discussion and conclusion

5.1 Discussion

A total of 250 seafarers took part in the questionnaire survey, and 10 personal interviews were carried out regarding the five key themes, namely, teamwork, communication, leadership, bottom-up assessment approach and how to implement the approach. Among all participants, only 3.6% were female (Figure 4). This condition reflects the current situation of the overwhelming number of male workers in the maritime industry where the women make up only an estimated 2% of the worldwide maritime workforce (ITF, 2019).

To attain a comprehensive understanding of the core themes, various angles for perspectives such as different nationalities, age, shipping companies, ranks and sea service were considered for achieving a reliable data source. As a result, respondents from 19 countries (Figure 6), representing three continents, namely Asia, Europe and Africa, participated. Valuable opinions from a broad range of age groups, from 18 to 66 years and above, were presented, and a majority of the respondents (92.8%) were in the age range of 18 to 55, which is normally considered as the working-age group in the maritime industry (Figure 5). Therefore, current situations onboard ships can be obtained from different nationalities as well as from diverse age groups.

Moreover, the following properties of the survey, such as the representation of 175 different shipping companies (Figure 7); inclusion of various ranks; and a proper distribution over a range of sea service experiences further enrich the data. A questionnaire survey can extract extensive general information about the main themes. However, personal interviews are essential for gathering the implicit knowledge. Interviewees, representing the top management level from both engine and deck departments (Table 1) and senior managers from highly recognized organizations such as BIMCO, Nautical Institute, InterManager and INTERTANKO were involved in the personal interviews (Table 2). Therefore, the acquired data-set covers diverse information from various perceptives regarding the main themes.

Seafarers from 19 different nationalities were represented in the survey. However, the proportion of the nationalities are not balanced as 83.6% of the respondents were from the Asian region and furthermore, Myanmar alone occupied 54.4% of the total (Figure 6). Therefore, the influence of the Myanmar participants regarding the outcome of the survey was considered. The outcome of each question with and without Myanmar respondents were compared, analysed and presented in the previous chapter. According to the results, it can be concluded that the influence of Myanmar seafarers did not alter the final outcome of the results and a similar proportion of the data were obtained with and without Myanmar participants. The following paragraphs will present the answers to the research questions based on the results of the five themes.

Condition of Teamwork

A majority of the respondents from the questionnaire survey agreed that teamwork has been efficient in the ships they have served. However, the perception of teamwork from the interviews is not as efficient as in the survey. Moreover, only half of the respondents (Figure 10 and Figure 12) believed that the interaction between crew members was efficient onboard ships. As described in the literature review, the shipping industry is used to recognize teamwork as a process rather than relationships among crew members. Therefore, the majority of the respondents believed that teamwork has been efficient based on the process-based perspectives instead of the relationship between them. In order to improve the safety culture aspects onboard ships, the underlying principle of teamwork should not only focus on the process, but also on the relationship among crew members. Therefore, teamwork among crew members based on the relationships still needs improving a lot. The results from the interviews also revealed that teamwork is related to communication as well as leadership.

Condition of Communication

From the results of the questionnaire survey, a majority of the participants agreed that in general, communication has been open and effective onboard ships. However, the majority acceptance of the facts that junior officers and ratings need to obey the orders from senior officers (Figure 14); and the agreement of around 60% respondents regarding the limitation of organizational structure for providing feedback or suggestions to senior officers from junior officers and ratings (Figure 15 and Figure 16) show that communication among crew members is not so as much effective as general communication. The results also agree with the literature review that describes the preferred technical process-based communication model of the shipping industry rather than the interactions of components (seafarers) along the process of communication. Therefore, communication among crew members needs to improve for enhancing the safety culture. The explicit explanation from interviewees also highlighted that the rigid hierarchical structure is essential for shipboard operations,

but communication among the crew members is primarily dependent on the leadership style of the senior officers.

Condition of Leadership

The results from the interviews regarding the crucial importance of leadership coincide with the literature review. They revealed that not all senior officers know how to effectively lead junior officers and ratings, and the majority agreed that it also depends on the individuals. Therefore, the leadership element should be improved for enhancing the safety culture. The connection of leadership with teamwork and communication were also highlighted. These results further matched the causes of the accidents cases described in the introduction chapter, where the leadership of senior officers' influences communication and teamwork among crew members. Furthermore, the results are in line with the findings of Manuel (2011) that significant positive correlations were presented between team psychological safety, worker engagement, leader inclusiveness and organizational learning.

Necessity and Feasibility of Bottom-up assessment approach

Regarding a bottom-up assessment approach, a majority of the respondents affirmed the importance of the approach (Figure 20) and the necessity of establishing formal evaluation schemes both up and down the chain of command for enhancing the safety culture (Figure 19). The elements such as simple, anonymous, direct reporting for the contents of the approach were also majorly accepted. They substantially agreed that it should be reported on a regular basis and via electronic means. For the interviews, the results were not as clear as those of surveys for the above-mentioned elements. However, most of the interviewees agreed with the necessity and importance of the bottom-up assessment. They also highlighted other options such as a confidential report, feedback survey and 360-degree feedback. Therefore, a bottom-up assessment approach is necessary and can be implementable. The feedback approach, such as rewards for good performance; and giving an opportunity to improve for unsatisfactory performance, were also accepted as effective ways for the implementation process.

5.2 Conclusion

The overall aim of the research was to highlight the importance of a bottom-up assessment approach in improving the safety culture onboard ships. Relevant literature and studies covering the essence of the overall aim, as well as specific objectives regarding the necessity of three main elements (leadership, teamwork and communication) in the process of assessing the senior officers were identified and the factors required to consider for the implementation procedure of the bottom-up assessment were explored. In addition to the literature review, questionnaire surveys and interviews were also carried out to get the insights from seafarers and institutional players. Finally, the importance of a bottom-up assessment approach for enhancing the safety culture onboard ships is highlighted together with the data results.

According to the discussion results, leadership, teamwork and communication, which are essential for enhancing the safety culture onboard ships, need improving considerably. This is due to the preferred priority of the shipping industry on the process-based perceptive of the safety culture. For enhancing safety culture, the shipping industry should start focusing not only on the processes but also on relationships of the components between the processes. Since the main component among the processes is seafarers, an application like a bottom-up assessment can be a valuable method for enhancing the safety culture. Furthermore, a majority of the respondents agreed that the approach was necessary, implementable, and beneficial to seafarers and shipping companies.

It is the undeniable truth that a bottom-up assessment approach is not a perfect solution for eliminating the problems of human errors. However, it can act as a proactive approach and be applied as a starter programme where human elements are used as a resource to improve safety culture onboard ships. In addition, the approach is flexible and less-demanding than the current implying assessment programs such as near-miss reporting and the Behavioural Competency Assessment and Verification for Vessel Operators in the tanker trade. Therefore, an assessment like a bottom-up approach for

improving safety culture should be implemented into the maritime industry for the benefits of seafarers, shipping companies and the industry itself.

5.3 Recommendations

This dissertation describes the theoretical framework for the practical implementation of the bottom-up assessment approach. However, the detail application criteria regarding the bottom-up assessment approach are not explored. Both the theoretical framework and detail implementation measures are necessary for producing a complete assessment scheme. Further research regarding the implementation criteria of the bottom-up assessment approach, such as elements for leadership, communication, and teamwork; a template for the assessment; and detailed reporting, analysing, and feedback processes, are highly encouraged. Only then, a complete assessment scheme can be produced and applied in the maritime industry for the benefits of all stakeholders.

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Appendices

Appendix A: WMU Research Ethnic Committee Protocol



WMU Research Ethics Committee Protocol

Name of principal researcher:	Soe Htut
Name(s) of any co-researcher(s):	No
If applicable, for which degree is each researcher registered?	Maritime Safety and Environmental Administration
Name of supervisor, if any:	Professor Dr. Jens-Uwe Schröder-Hinrichs
Title of project:	Bottom-up assessment approach to improve safety culture onboard ships
Is the research funded externally?	No
If so, by which agency?	No
Where will the research be carried out?	The research will be carried out during the field trips and in henrik smith residence.
How will the participants be recruited?	Seafarers, Shipping companies and maritime institutions. The persons will be recruited by phone, email and social media such as facebook.
How many participants will take part?	Around 100 participants
Will they be paid?	No
If so, please supply details:	No
How will the research data be collected (by interview, by questionnaires, etc.)?	The research data will be collected by questionnaires from seafarers and shipping companies; and personal interviews with seafarers and maritime related people.
How will the research data be stored?	The research data will be stored on my personal computer and on external drives with protected passwords
How and when will the research data be disposed of?	on completion of MSc Programme (3 Nov 2019)
Is a risk assessment necessary? If so, please attach	No

Signature(s) of Researcher(s): *Soe*

Date: 14/04/2019

Signature of Supervisor: *W. Schröder-Hinrichs*

Date: 14/06/2019

Please attach:

- A copy of the research proposal
- A copy of any risk assessment
- A copy of the consent form to be given to participants
- A copy of the information sheet to be given to participants
- A copy of any item used to recruit participants

Appendix B: Questionnaire survey

CONSENT FORM

Dear Participant,

Thank you for agreeing to participate in this research survey, which is carried out in connection with a Dissertation which will be written by the interviewer, in partial fulfilment of the requirements for the degree of Master of Science in Maritime at the World Maritime University in Malmo, Sweden.

The topic of the Dissertation is A Bottom-up assessment approach to improve safety culture onboard ship. The purpose of this survey is to know about the interactions among senior officers, junior officers and ratings onboard ships and the opinions about the assessment scheme for senior officers from junior officers and ratings.

The information provided by you in this interview will be used for research purposes and the results will form part of a dissertation, which will be published online and made available to the public. Your personal information will not be published. You may withdraw from the research at any time, and your personal data will be immediately deleted.

Anonymized research data will be archived on a secure virtual drive linked to a World Maritime University email address. All the data will be deleted as soon as the degree is awarded.

Your participation in the interview is highly appreciated.

Student's name	Soe Htut
Specialization	Maritime Safety and Environmental Administration
Email address	w1802442@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 SURVEY (For seafarers)

<Personal Information>

1. What is your nationality?

2. What is your gender?

- Male
- Female
- Diverse

3. What is your age?

4. Which position are you working or have you worked onboard?

- Senior officers (Captain/ Chief Officer/ Chief Engineer/ Second Engineer)
- Junior officers (Electrical Officer/ Second Officer/ Third Officer/ Fourth Officer/ Third Engineer/ Fourth Engineer/ Cadets)
- Ratings (Bosun/ Able Body/ Oiler/ Fitter, etc.)

5. How many years have you worked at sea?

- less than 3 years
 - 3 to less than 6 years
 - 6 to less than 9 years
 - 9 years and above
6. Which shipping company are you working or have you worked and its location? (e.g. MAERSK/ Denmark)

<Part1: Assessment scheme for senior officers from junior officers and ratings>

Please provide your valuable opinion for the following statements regarding shipboard operation.

1. Junior officers and ratings always obey and respect orders from senior officers.
Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

2. The strict hierarchy of shipboard organizational structure limits the ability of junior officers to provide feedback or suggestions to senior officers.
Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

3. The strict hierarchy of shipboard organizational structure limits the ability of ratings to provide feedback or suggestions to senior officers.
Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

4. Suggestions and feedback provided to senior officers from junior officers and ratings could improve the efficiency of shipboard operations and improve overall workplace climate.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

5. Senior officers do not ask for suggestions and feedback from junior officers and ratings.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

6. Junior officers do not provide their opinions or feedback to senior officers.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

7. Ratings do not provide their opinions or feedback to senior officers.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

8. Communication amongst crew members has been open and effective onboard the vessels for which I have served.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

9. Effective teamwork has existed on ships for which I have served.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

10. The establishment of formal evaluation schemes both up and down the chain of command would greatly improve workplace climate onboard ships.

Yes/No

11. An anonymous assessment scheme for ratings and junior officers designed to evaluate the leadership and performance of senior officers would be useful for operating companies in accessing shipboard efficiency and crew cohesiveness.

Yes/No

12. There is an evaluation scheme in my shipping company where senior officers can assess the performance of junior officers and ratings.

Yes/ No

Please explain briefly for your answer above.

13. There is an evaluation scheme in my shipping company where junior officers and ratings can assess the performance of senior officers.

Yes/ No

Please explain briefly for your answer above.

14. Do you have any other remarks regarding the consideration of the assessment scheme of senior officers from junior officers and ratings?

<Part 2: Design consideration of assessment scheme for senior officers from junior officers and ratings>

Please provide your valuable opinion for the following statements regarding shipboard operation.

1. An assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings must be simple and anonymous to ensure active participation.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

2. An assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings must be directly sent between company representatives and participants to ensure anonymity and avoid retaliatory actions from senior officers.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

3. An assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings should be completed on a regular basis.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

4. In an assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings, the company should provide adequate means for effective implementation.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

5. In an assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings, the reporting process should be carried out anonymously by electronic means.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

6. In an assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings, the company should analyze all assessments of senior officers by junior officers and ratings objectively.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

7. In an assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings, the company should reward senior officers for continual good performance.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

8. In an assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings, the company should offer feedback to senior officers on poor performance and give them opportunity to improve.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

9. In an assessment scheme designed to evaluate the leadership performance of senior officers by junior officers and ratings, senior officers should accept feedback from the company and adjust their leadership accordingly.

Strongly agree/ Agree/ Neutral/ Disagree/ Strongly disagree

10. Do you have any other remarks regarding the consideration of the assessment scheme of senior officers from junior officers and ratings?

THANK YOU FOR YOUR VALUABLE COOPERATION.

Appendix C: Personal interviews

Interview Consent Form

Research topic: A Bottom-up assessment approach to improve safety culture onboard ships

Date of interview:

Expected duration:

Name of participant:

Name of researcher:

Dear Ms/Mr.

Thank you for agreeing to participate in this interview, which is carried out in connection with a research project which will be conducted by the interviewer, in partial fulfilment of the requirements for the degree of Master of Science in Maritime affairs at the World Maritime University in Malmö, Sweden.

This consent form intends to ensure that you understand the purpose of your involvement and that you agree to the conditions of your participation.

- Your interview will be recorded and notes will be taken during the meeting.
- From the interview, there will be a transcript of main points retained by the researcher.
- The transcript will be sent to you to provide you with the opportunity to correct any factual errors.
- The transcript will be analyzed by the researcher to support the investigation.
- The access to the transcript will be limited to researchers and academics involved in the research.
- The information provided will be used for research purposes and will form part of a research reports or/and academic papers as well as eventually in presentations.
- Any extract or quotation of the interview used for publicly available publication will be anonymized.

Moreover, you have the right to stop the interview or withdraw from the research at any time, and your personal data will be immediately deleted on your request.

Anonymized research data will be archived on a secure drive linked to a World Maritime University email address. All the data will be deleted after completion of the research.

Your participation in the interview is highly appreciated.

Student's name Soe Htut
Specialization Maritime Safety and Environmental Administration
Email address w1802442@wmu.se

* * *

Quotation agreement

I consent to my interview, 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.

I also understand that my words may be quoted directly. With regards to being quoted, please initial next to any of the statements that you agree with:

	I wish to review the notes, transcripts, or other data collected during the research pertaining to my participation.
	I agree to be quoted directly.
	I agree to be quoted directly if my name is not published and a made-up name (pseudonym) is used.

	I agree that the researchers may publish documents that contain quotations by me.
--	---

By signing this agreement, I agree that;

1. I am voluntarily participating in this research project and I can stop the interview at any time;
2. The transcribed interview or extracts from it may be used as described above;
3. I have read the Information sheet;
4. I can request a copy of the transcript of my interview and may make edits;
5. I am free to ask any questions I wish to researchers and to contact them in the future.

Name:

Signature:

Date:

Contact Information

This research has been approved under WMU Ethics. For additional questions or concerns, please contact:

Student's name Soe Htut

Specialization Maritime Safety & Environmental Administration

Email address w1802442@wmu.se

You can also contact research supervisor

Supervisor's name Professor Dr. Jens-Uwe Schröder-Hinrichs

Position Vice-President Academic Affairs

Email address jus@wmu.se

INTERVIEW QUESTIONS (for seafarers)

Semi-structured interviews

Personal information

1. Name/ nationality/ age/ COC/ experience in years?
2. Latest Rank?
3. What is your sailing career? (company/management, ships/flag, crew/nationality)

Shipboard organization structure

4. Can you tell me the organizational structure on board ships which you have served?
5. The traditional organizational structure onboard ships is extremely hierarchic; do you think that it is necessary? Why?

Leadership

6. Do you think leadership is an important element for senior officers?

7. Based on your experience, can you say that all senior officers you have dealt with know how to effectively lead the junior officers and ratings? Why?
8. What characteristics have senior officers displayed that have made them effective leader and ineffective leader?
9. In your opinion, how could senior officers more effectively manage and lead their crew?

Teamwork

10. Ship operation is done by a certain amount of crew onboard ship. Do you think that teamwork is a crucial factor for seafarers?
11. Has teamwork been efficient in all ships you have sailed? why?
12. Do you think that senior officers usually seek advice and feedback from other crew members? why?
13. Do junior officers and crew members usually provide feedback and offer suggestions to senior officers? why?
14. Does the strict hierarchical organizational structure onboard ships limit the willingness of junior officers and ratings to offer feedback and suggestions to senior officers?
15. Do you think that suggestions and feedback provided by junior officers and ratings to senior officers are beneficial and important to improving shipboard efficiency and workplace climate?

Assessment scheme

16. Is there an assessment or evaluation scheme for junior officers and ratings? Is it done by senior officers? How?
17. Is there an assessment or evaluation scheme designed to evaluate senior officers from junior officers and ratings?
18. Do you think it will be beneficial for senior officers to get feedback from junior officers and ratings?

19. Do you think it will be beneficial for shipping companies?
20. Do you think these assessment schemes can be effectively implemented by shipping companies?

Process of assessment scheme

21. How do you think that such an assessment scheme be implemented and its findings utilized? (easy, simple, anonymous, direct reporting?)
22. How do you think the company should process and utilize this assessment scheme? (Reward, warning, time interval?)

THANK YOU FOR YOUR COOPERATION.

INTERVIEW QUESTIONS (institutional players)

Semi-structured interviews

Personal information

23. Name/ nationality/ age?
24. Company/ position?
25. Years of experience?

Assessment scheme

1. Is there an assessment scheme onboard ships where senior officers can assess the performance of junior officers and ratings?
 - Do you think it is an important process for the company?

2. Is there an assessment scheme onboard ships where junior officers and ratings can assess the performance of senior officers?
 - Do you think it is an important process for the company?

3. Do you think that an assessment scheme designed to evaluate the performance of senior officers would be easily implemented in a shipping company?

4. If an assessment scheme were to be implemented, which areas in particular are important to properly assess for the performance of senior officers?
 - Leadership?
 - Teamwork?
 - Others?

5. How do you think about the reporting system for the assessment scheme of senior officers needs to be?
 - Should it be anonymous?
 - Directly send to company?
 - Others?

6. The feedback from the company to senior officers is also very important. How should a company arrange the feedback process?
 - Reward for good performance?
 - Warning or fines for bad performance?
 - Time intervals?

THANK YOU FOR YOUR COOPERATION