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SUPPORT A SAFETY LEARNING CULTURE IN PORT STATE CONTROL REGIME

PENG LYU

A dissertation submitted to the World Maritime University in partial fulfilment
of the requirements for the award of the degree of Master of Science in
Maritime Affairs


2023

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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.

(Signature): 

(Date):September 24, 2023.....

Supervised by:

Supervisor's affiliation:

Acknowledgements

First and foremost, I would like to express my deepest gratitude to the Government of the People's Republic of China that gave me the valuable opportunity to study at World Maritime University (WMU). I would also like to express my sincere gratitude to WMU, the faculty and staff for making me feel the creativity and influence of such a center of excellence for postgraduate maritime education, which not only enriched my maritime expertise, but also broadened my view.

Also, I must deliver the deepest appreciation to my academic supervisor, Prof. Rafael Baumler, and my co-supervisor, Dr. Maria Carrera, for their guidance, valuable advice and continuous support throughout my research. Their professional knowledge and insights were of great help not only to this paper but also to my personal knowledge framework.

At the same time I earnestly extend my my deepest gratitude to all the participants, seafarers and Port State Control officers, who contributed their time and shared their experiences for this study. Their views and suggestions played a decisive supporting the depth and authenticity of this study.

The WMU Class of 2023, especially the 21 MSEA students, we have had an important and unforgettable experience during the year. We feel the charm of WMU, we feel the joy of being together from different cultures. I believe our friendship will keep going, and I believe that we still have the opportunity to meet again.

My sincere thanks to the library and administrative staff, World Bistro team and HSR staff for their assistance, and to all who indirectly contributed to facilitate us and make our study life comfortable and memorable in Malmö, Sweden.

I like to express my special thanks to Lecturer Anne Pazaver and Dale Smith for their helping me in the language review for this dissertation.

Lastly, I would like to acknowledge and express my gratitude to my parents, my wife Qiji and my lovely daughter Maisui, with their unwavering belief in my capabilities and their constant encouragement were my pillars of strength. Their love and support, especially during challenging times, have been nothing short of inspirational.

Abstract

Title of Dissertation: **Support a safety learning culture in Port State Control regime**

Degree: **Master of Science**

Since safety learning can effectively improve ship safety, achieving a safety learning culture should be pursued in the shipping industry. As one of the important safety nets in ensuring the safety of ships, the Port State Control (PSC) regime plays an important role in the industry. This dissertation is an exploratory study on supporting a safety learning culture in the PSC regime.

This paper starts from the basic role of the PSC regime, explores its means of ensuring the effectiveness of ship safety, and its limitations, and verifies whether it can provide unique support for the safety learning culture. Through qualitative research methodologies, and semi-structured interviews were conducted, involving 31 participants consisting of 11 seafarers and 20 Port State Control Officers (PSCOs). With extensive literature reviews, the data was collated and evaluated to elucidate how PSC targets substandard ships, acting as a reliable external oversight to improve ship safety. Nonetheless, while PSC plays an instrumental role in enhancing maritime safety, it isn't without constraints. These limitations range from scarce understanding and integration of human element aspects in daily work, inconsistencies in regional implementation to corruption challenges faced.

The research concludes that supporting a safe learning culture in PSC regimes has a unique meaning, it can promote ship safety by impacting on multiple levels, spanning individual crew members to fleet management, and sector stakeholders, then overarching industry standards governed bodies like the IMO, which has positive significance for establishing a culture in the entire industry.

KEYWORDS: Port State Control regime, Ship Safety, Safety Learning Culture, External Oversight, Effectiveness, Limitations, Multiple Levels.

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List of Abbreviations

UNCTAD	United Nations Conference on Trade and Development
SOLAS	International Convention for the Safety of Life at Sea
IAEA	International Atomic Energy Agency
PSC	Port State Control
IMO	International Maritime Organization
PSCO	Port State Control Officer
SMS	Safety Management System
NIR	New Inspection Regime
RO	Recognized Organization
NCSR	Navigation, Communications and Search and Rescue
MSC	Maritime Safety Committee
PTA	Pilot Transfer Arrangement
ISM	International Safety Management
DOC	Document of Compliance
SMC	Safety Management Certificate
MACN	Maritime Anti-Corruption Network
CIC	Concentrated Inspection Campaign

Chapter 1: Introduction

1.1 Background

The maritime industry plays a crucial role in the global economy, facilitating over 80% of the volume of international trade in goods is carried by sea (United Nations Conference on Trade and Development [UNCTAD], 2022). However, the industry also experiences numerous incidents and accidents, posing risks to human life, property, and the environment (Stoop, 2002). Ensuring maritime operations are both safe and efficient has hence emerged as a significant concern for stakeholders such as international regulatory bodies, member states, ship owners, and seafarers.

Despite advancements in regulations and technology, accidents persist in the maritime sector. Following maritime catastrophes like the capsizing of *Free Enterprise* in 1987, there has been a shift in the maritime safety paradigm. The focus transitioned from solely technical aspects to encompassing organization, system management, and human element (Ek & Akselsson, 2005; Qiao et al., 2020). This broader approach aligns with the principles of safety culture, which emphasizes shared values, beliefs, attitudes, and practices within organizations that bolster safety management (Reason, 1997). Studies indicate that a robust safety culture can lead to enhanced safety performance and operational efficiency across various sectors, including maritime industry (Berg, 2013; Macrae, 2014).

Researchers and industry practitioners increasingly recognize the significance of safety culture in elevating maritime operations' safety and efficiency (Oltedal & Wadsworth, 2010). Among the safety culture components, the learning culture stands

out for its proactive approach to safety, emphasizing the collection, monitoring, and analysis of relevant data to refine safety measures (Ek & Akselsson, 2005).

Since the Titanic sank in 1912, the first most important modern maritime safety legislation, the International Convention for the Safety of Life at Sea (SOLAS) was adopted. The shipping industry never stopped learning of the root causes of the problem. It was necessary to try to prevent the casualties from happening again (King, 1995, p. 470). Maritime accidents, whether they are serious or not, can always have tragic consequences, and it is imperative that we learn from them to prevent their recurrence, and to protect seafarers and passengers, and to safeguard the industry itself (The Nautical Institute, 2022). Learning from accidents, finding out what caused the accident, and taking effective measures to avoid similar accidents next time is indeed an effective way of safety learning. However, we should be aware that accidents do not always happen, and the frequency of major accidents is relatively low. Therefore, instead of being passive and just waiting to learn from accidents, it is necessary to explore some proactive safety learning.

The Port State Control (PSC) regime, aimed at maintaining maritime safety, inspects foreign ships in national ports to validate their adherence to international regulations and Conventions (International Maritime Organization [IMO], n.d.). This regime ensures that ships entering foreign ports are compliant with international safety, security, and environmental protection mandates, thereby preventing potential accidents and environmental hazards. Since its inception, PSC has served as the last line of defense against maritime accidents (Mejia, 2005). PSC has always remained a focal point for national stakeholders in the maritime industry due to its effectiveness in curbing maritime casualties and targeting substandard ships (Hare, 1996).

1.2 Problem Statement

As an internationally adopted program, PSC by enforcing safety standards, PSC identifies and rectifies deficiencies, promotes best practices, incentivize compliance, collects and analyzes safety data. All these elements provide a good support to promote safety learning culture in maritime industry. However key interested parties such as shipping companies, seafarers and even PSC itself, typically focus on individual ship inspection findings. For example, parties are much more concerned about the number of deficiencies found in each inspection, and only take corrective measures for a single defect, but there is a lack of systematic study and analysis of the problems, so that deficiencies may appear repeatedly or new risks are constantly exposed.

Moreover, the majority of existing research on safety culture in the maritime industry has focused more on the internal management of shipping companies, with limited exploration of external oversight. In this way, there may be some shortcomings that the company cannot see the existence of some problems by itself, lacks necessary external supervision, and improvement measures may play a limited role only.

This research aims to address these gaps, by examining the principal role of PSC regime, the limitations associated, and verify that the PSC regime is a good way to support a safety learning culture. By exploring these issues, the study seeks to contribute to the ongoing efforts to enhance maritime safety and performance through the promotion of a safety learning culture in the PSC regime.

1.3 Aims and objectives

The PSC regime is an important system that aims to ensure ships compliance with international maritime safety standards and prevent marine pollution. By analyzing the perspectives of seafarers and Port State Control Officers (PSCOs) on safety learning culture components including human elements, just culture, reporting, Safety Management System (SMS) implemented onboard and the practice of PSC inspection.

The aim of the study is to explore ways to improve the safety of ships through a safety learning culture supported by the PSC regime.

To achieve the aim, the research is guided by the following objectives:

- To understand the principle of PSC in improving the safety of the shipping industry.
- To examine the limitations of PSC in improving safety in the shipping industry.
- To explore the role of PSCOs, seafarers, in promoting a safety learning culture.
- To explore strategies for enhancing ship safety through a safety learning culture supported by the PSC regime.

1.4 Research questions

To meet the aims and objectives of the study, the researcher focuses on the following questions:

- How does PSC intend to improve the safety of the shipping industry?
- What are the limitations of PSC in improving the safety in the shipping industry?
- How to improve ship safety through a safety learning culture supported by the PSC regime?

1.5 Overview of the research

The research is organised into six chapters.

- Chapter 1 offers an introduction, which includes a description of the background, the problem statement, the aims and objectives, the research questions and finally an overview of the research.
- Chapter 2 provides a comprehensive literature review, examining existing theories and studies on PSC regime and safety learning culture.
- Chapter 3 explains the methodology of the study, detailing the data collection method, which includes semi-structured interviews with seafarers and PSCOs.
- Chapter 4 will present the results of the research, organized around the key themes that emerged from the interviews.
- Chapter 5 discusses the findings of the study, linking them to the research questions.
- Chapter 6 concludes the study, it also includes some limitations and recommendations for future research and practice.

1.6 Significance and limitations of the research

This research aims to contribute to the necessity of transitioning from a purely reactive approach in ship safety (addressing problems after they arise or after accidents have happened) to a proactive one (anticipating and preventing potential issues). By emphasizing the role of support for safety learning in PSC regimes, this study advocates for a system understanding of safety beyond individual inspection and immediate response. The findings of this study are expected to provide valuable insights to policy makers, maritime authorities and shipping stakeholders on the potential benefits of incorporating PSC regimes. Furthermore, by identifying key components of a safe learning culture, this study may contribute to the development

of a more systematic and comprehensive approach to achieve the culture in the shipping industry.

The study may be limited by not encompassing all factors affecting maritime safety. Other relevant parties like flag States, Recognized Organizations (ROs) might not be covered in detail. Additionally, while semi-structured interviews provide in-depth insights, they might also introduce subjective biases, both from the interviewer and interviewee. Furthermore, as the seafarers and PSCOs only come from one country, sampling constraints is another limitation of the research.

Chapter 2: Literature review

2.1 Introduction

Safety stands as a paramount concern in the shipping industry, with a rich tapestry of research and real-world observations underscoring its importance (Cong et al., 2022). Central to the evolving understanding of safety is the significance of learning in maritime operations. By fostering a continuous process of gathering, monitoring, and analyzing pertinent data, learning becomes a vanguard of proactive safety measures (Ek, 2006). Stemming from this, the concept of a safety learning culture emerges as a potent catalyst for enhancing maritime safety, promoting both preventive strategies and reactive measures (Kirwan et al., 2021). Meanwhile, the role of PSC is indisputable. Acting as the industry's safeguard against substandard ships, PSC facilitates the rigorous verification of ships' adherence to international regulations. This, in turn, cultivates a safer maritime environment, drastically reducing the risk of maritime accidents, incidents, and marine pollution (IMO, n.d.).

2.2 Safety culture in maritime industry

The concept of “safety culture” first emerged in the 1987 OECD Nuclear Agency report, emphasizing safety as the top priority (Cooper, 2002). Since then, various industries, including aviation, nuclear, and maritime, have adopted this ethos to reduce risks and accidents (Cooper, 2000).

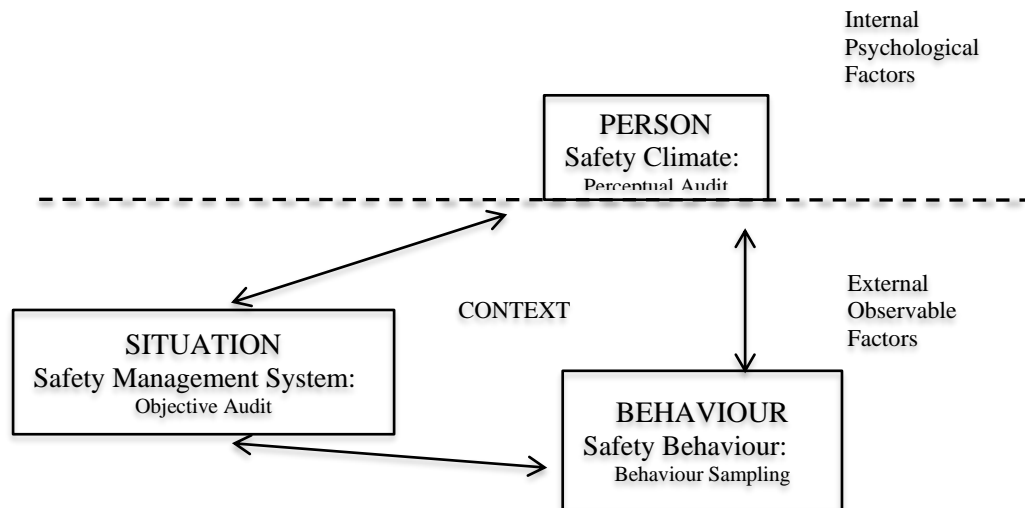
2.2.1 Definition of Safety culture

The term safety culture has multiple definitions across sectors and researchers. The International Atomic Energy Agency (IAEA) has traditionally applied the concept of safety culture, defined as the assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance (INSAG, 1991). Since then, safety culture has been extensively studied and applied to various industries, including the maritime sector. Similarly, the IMO (2012) defines an organization with a safety culture as one that gives appropriate priority to safety and realizes that safety has to be managed like other areas of the business.

Safety culture encompasses both the organizational and individual aspects that contribute to safe operations, with the ultimate goal of minimizing accidents and incidents. It is generally defined as the shared values, beliefs, attitudes, and practices among employees that influence their behavior and decision-making processes regarding safety (Reason, 1997; Cox & Flin, 1998). In Guldenmund's (2000) study, he mentioned that the concept of safety culture is that a wide range of characteristics are assessed. Flin et al. (2000) found that the general themes of safety culture include management, safety systems and risk. Meanwhile management commitment is always considered as the major factor and approach to safety (Thompson et al., 1998; O' Toole, 2002; Flin, 2003). Cooper (2000) pointed out that in order to establish an effective safety culture, it is necessary to consider the relationship between psychological, behavioral and situational factors. Similarly, Bandura (1986) created a reciprocal model of safety culture that has been adapted widely (Figure 1), which provides both a theoretical and practical framework with which to measure and analyze safety culture (Cooper, 2000).

Figure 1

Reciprocal safety culture model



Note. From “Social foundations of thought and action: A social cognitive theory” by Bandura, A. 1986. Englewood, NJ: Prentice II. all.

2.2.2 Safety Culture in the Maritime Industry

The maritime industry is inherently hazardous, with seafarers facing numerous risks, such as extreme weather conditions, ship collisions, and human error (Celik & Cebi, 2009). It is agreed that a significant shift in maritime safety administration at the international level occurred starting from around the late 1980s to the early 1990s, which was caused by the reason of dramatic accidents happened at sea during the time (Mejia, 2005). IMO has recognized the critical role of safety culture in reducing accidents and improving safety performance, and has incorporated it into key regulations, such as the International Safety Management (ISM) Code. IMO (2005) made a report on “Assessment of the impact and effectiveness of implementation of the ISM Code”, and confirmed that the ISM Code is moving toward a positive direction through safety culture.

A positive safety culture can contribute to reducing the occurrence of negative safety related events, such as near-misses and accidents, by fostering a proactive approach to

safety management and encouraging continuous improvement in safety practices (Mearns et al., 2001). Lu and Yang (2011) found that effective safety leadership and a strong safety climate positively influence both safety compliance and safety participation among employees in container terminal operations, ultimately reducing accidents. A strong safety culture in the maritime industry has been linked to several benefits, including reduced accident rates, improved safety performance, and enhanced organizational resilience (Ek et al., 2014; Macrae, 2014). Furthermore Lappalainen and Salmi (2009) mentioned that safety culture is considered crucial for ensuring the safety and efficiency of maritime operations, as it influences seafarers' behavior, decision-making processes, and adherence to safety procedures.

The ISM Code was adopted by IMO in 1993 as Resolution A.741(18), with the SOLAS as amended in 1994 to include a new Chapter IX “Management for the Safe Operation of Ships” entering into force in 1998, after that the ISM Code became mandatory for the shipping industry. Developing and sustaining a positive safety culture is a continuous process that requires ongoing efforts from all members of an organization (Reason, 1997). One of the ISM Code’s main features is through reporting and learning to improve the ship safety mechanism. Shipping companies always want a strong safety culture to achieve fewer accidents, injuries, and fatalities, while also experiencing better operational efficiency and employee satisfaction (Teperi et al., 2019). Through establishing the Safety Management System (SMS), a shipping company can provide standard requirements and operation procedures to improve the safety on board the ship, involving the people not only from ship, but also from those shore side.

With SMS for shore-side organization and on-board ships helps to reduce incidents, personal injuries and casualties, but a certain number of high-profile incidents suggest that the absence of a fully implemented safety culture on board ships is still an issue (Maaswinkel, 2016). As Oltedal and McArthur (2011) stated, the negative relationship between seafarers and shipping companies caused poor reporting practices and led to

the result of low participation in SMS. A just culture is established based on trust and learning, which creates open communication and reporting without blame, however due to not trust and poor quality feedback taken by the company, it is necessary to enhance its development between shore and ships. Seafarers fear being blamed and losing jobs for incidents and near-misses which led to poor communication and under-reporting (EK et al., 2014; Bhattacharya, 2011). The truth is you can either blame or learn - you can't do both (Kirwan et al., 2019). Meanwhile seafarers were not particularly happy with the additional administrative responsibilities such as paperwork brought about by the ISM Code (Mejia, 2005).

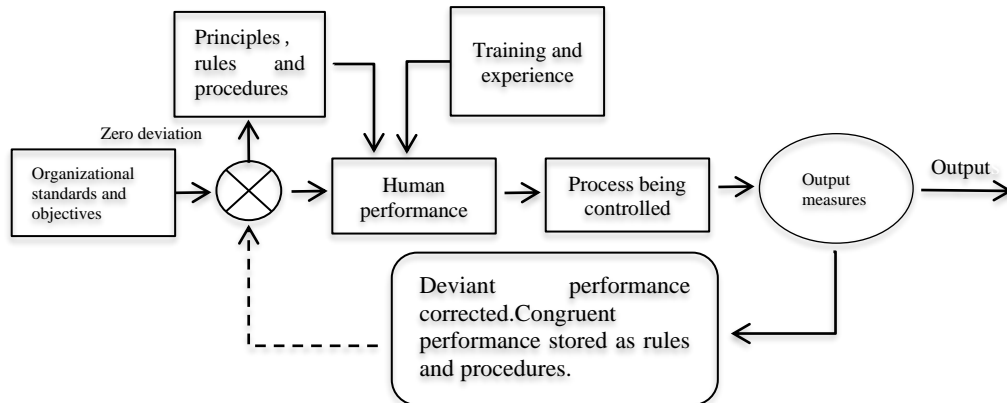
2.2.3 Learning - a proactive approach to Safety culture

According to Reason (1997), safety culture can be engineered by identifying its essential elements and then assembling them into a working whole, which may be defined by four key elements: reporting culture, just culture, flexible culture and learning culture. Learning is always a proactive way to achieve the continuous improvement of safety. Learning culture is described as an organization's or individual's willingness and ability to draw correct conclusions from their safety information systems and to implement significant reforms where necessary (Dekker, 2014). By promoting a learning culture, organizations can identify and address potential safety issues before they become serious problems. In the context of safety, a learning culture involves the systematic identification, analysis, and dissemination of safety-related knowledge and experiences, such as accidents, near-misses, and best practices, to improve safety performance and reduce the risk of accidents (Dekker, 2018). Employees are empowered to identify hazards and suggest improvements to existing processes, which can lead to better safety outcomes. A learning culture can lead to better safety outcomes and a safer work environment (Cox & Cheyne, 2000). Reason (1997) pointed out that acquiring a safety culture is just a process of collective learning, he created a mixture of control modes shown in Figure 2. Mejia (2005) stated that the mode was typical of organizations where human performance in the

management of maritime safety is first by the experience and discretion of individuals tasked to draft and develop rules and procedures.

Figure 2

Mixed feedback and feed-forward controls



Note. From “Managing the risks of organizational accidents” by Reason, J. 1997. Ashgate.

In the maritime industry, a learning culture is considered essential for enhancing safety performance and reducing the risk of accidents and incidents, as it encourages the continuous improvement of safety practices and fosters a proactive approach to safety management (Dekker, 2018; Oltedal & Wadsworth, 2010). A learning culture can contribute to the identification and dissemination of effective safety practices, create an open environment where safety concerns are freely communicated, thoroughly investigated, and effectively learned from (Dekker, 2018; Reason, 1997).

Several factors can influence the development and maintenance of a learning culture in the maritime industry, such as leadership commitment, effective communication, trust and psychological safety, and the availability of resources and support for learning and improvement activities (Edmondson, 1999; Oltedal & Wadsworth, 2010). Furthermore, a learning culture requires a just culture that encourages the reporting of safety concerns, incidents, and near-misses without fear of retribution, as well as a

systems approach that focuses on identifying the underlying causes of accidents rather than attributing blame to individual errors (Reason, 1997; Dekker, 2018).

Safety always improves effectively soon after learning from serious accidents which just happened, but it will diminish with the passage of time (EK, 2006). Meanwhile before the accident, many risk points are often ignored, which will directly increase the probability of accidents. The effective way is to change from passive to active, and enhance safety behavior by learning about risk points before an accident occurs. As the focus on safety increases, both due to external examination and internal drive, it's an opportune moment to consider how the maritime industry can make widespread enhancements, one possible strategy involves strengthening the overall Safety Culture by transitioning towards a model called a Safety Learning Culture (Kirwan et al., 2021).

2.3 Port State Control

The United Nations Convention on the Law of the Sea 1982 (UNCLOS) forms the cornerstone of maritime law, offering a detailed framework governing global oceans. Its provisions ensure countries abide by internationally agreed standards when engaging in international affairs related to oceanic issues (Churchill and Lowe, 1999). Notably, UNCLOS Article 25 grants States the authority to prevent any breaches related to conditions that vessels must uphold when docking at its ports. This establishes a fundamental basis for PSC in the maritime industry (Hare, 1996).

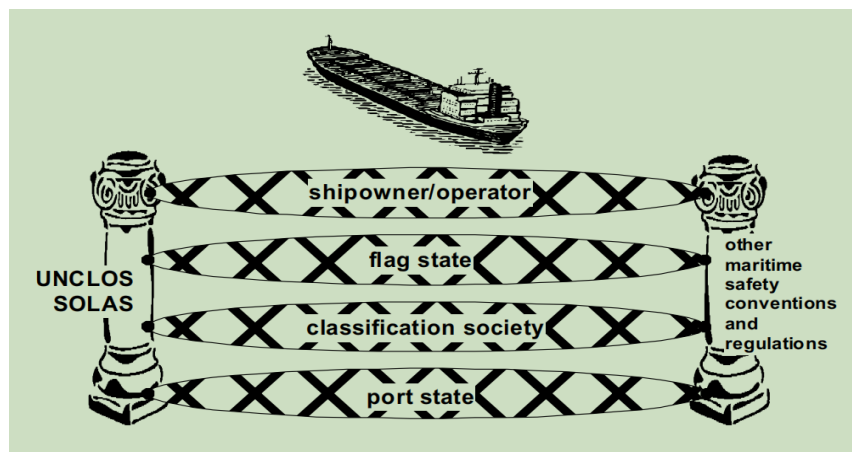
PSC inspections fall under the jurisdiction of Port State Control Officers (PSCOs). Their primary role is to ascertain that ships adhere to international standards, verify the authenticity of their documentation, and evaluate the seaworthiness of the ship and the competency of its crew (Knapp et al., 2011).

2.3.1 Port State Control Regime and its objective

PSC is a key mechanism for ensuring maritime safety and environmental protection by inspecting foreign ships in national ports and verifying their compliance with international regulations and Conventions (Cariou et al., 2008). Kasoulides (1993) highlighted that relying solely on a ship's flag State to ensure compliance with maritime standards was proving to be insufficient. This shortfall paved the way for the conceptualization of PSC. Mejia (2005) mentioned that today there are four actors that are generally considered as different layers for shipping safety, PSC is generally considered as a last line of safety nets in maritime safety administration (Fig. 3).

Figure 3

Safety nets in maritime safety administration



Note. From “Evaluating the ISM Code using port state control statistics” by Mejia, M. Q. 2005. Lund University.

The Amoco Cadiz oil spill and other significant maritime accidents prompted the creation of the Paris MOU in 1982, this new agreement broadened both the range of issues covered and the number of participating members (Ozcayr, 2008). Since then, with the creation and development of several other PSC regimes, this now covers almost all regions of the world with the United States implementing its own PSC mechanism. These regional organizations establish inspection criteria, procedures, and targets, and share information on inspection results and substandard ships to promote

consistency and effectiveness in PSC activities (Paris MOU, 2021). One of the first contributions on the effectiveness of PSC demonstrated that the growth of regional MOU has substantially reduced the opportunities for substandard ships to engage in global trade (Hare, 1996). To achieve coordination and unification in different regions, IMO has also been constantly standardizing the operating procedures of PSC, so as to maintain the common standards of the convention and provide convenient services to ships (IMO, 2021). However, in the actual process, there also shows some limitations of the PSC regime in regional coordination and effective supervision of inspections. Unlike an international convention, the MOU are signed and approved by the port State authorities and they are not legally binding on the Member States like treaties. The performance level of individual regional arrangements and inter-regional uniformity need to be adequate (Molenaar, 2007).

2.3.2 Port State Control inspection efficiency

Noticed PSC inspections play an increasingly important role in maritime safety. Consequently, a multitude of research has zeroed on improving PSC inspection efficiency to promote shipping safety, which mainly include the ship inspection regime and individual ship onboard inspection efficiency.

Since the New Inspection Regime (NIR) was developed and put into practice by Paris MOU in 2011, it marked a transformative phase in PSC inspection dynamics and also developed a better-balanced method of the targeting and the inspection of ships (Yang et al., 2020). The NIR comes with one key strategy, the use of a risk-based targeting mechanism, whereby ships perceived as high-risk are prioritized for inspections. High-risk ships are identified based on factors such as ship type, age, flag State performance, and company performance. Another important strategy is the use of a 'White, Grey, and Black list' to categorize flag States based on their performance. Flag States with a higher detention rate are placed on the Black list, while those with a low detention rate are on the White list. This strategy promotes a 'name and shame' approach,

encouraging flag States to improve their performance (Ozcayr, 2008). This not only incentive compliance but also fostered a culture of accountability. Xiao et al. (2021) conducted a super-Slacks Based Measure to evaluate and compare the inspection efficiency of the three inspection regimes implemented by the world wide MOUs, and confirm that the NIR is more stable than other inspection regimes. Despite the positive effects of the NIR, several drawbacks also exist in its ship risk profile factor, and some more advanced and accurate ship selection models have been proposed (Yan et al., 2022). According to Tian and Zhu (2023) seven features selected by NIR to calculate the ship value are coupled with each other, the risk-assessment model of NIR has been criticized for its oversimplified weighted-sum methodology. To address these challenges, several researchers have proposed more sophisticated models. For instance, Yang et al. (2018) proposed a data-driven Bayesian Network (BN) approach to analyze risk factors that impact PSC inspections and predict the likelihood of vessel detentions. This method offers a means to estimate detention probabilities under various circumstances and effectively assists port authorities in optimizing their inspection regulations and resource allocation. Meanwhile, Fan et al. (2022) learned from the Bayesian Network (BN) model and found that select vessels with a medium inspection time interval for inspection can better improve ship safety quality effectively. Yan et al. (2022) developed a combined model for ship risk prediction, giving suggestions to improve the efficiency of ship selection in MOUs.

On the other hand, focusing on the onboard inspection process, Sampson and Bloor (2007) conducted a study on improving the skills and knowledge of PSCOs, like receiving training programs that focus on practical skills, regulatory knowledge, and emerging technologies that can enable inspectors to perform their duties more effectively and efficiently. Knapp et al. (2011) provided a monetary quantification of the cost savings that can be attributed to PSC inspection. Knapp and Franses (2008) developed a risk-based targeting system to improve onboard inspection efficiency by prioritizing vessels with higher risks of non-compliance. Meanwhile, by sharing inspection data, best practices, and lessons learned, PSC authorities can learn from

each other's experiences and develop more efficient inspection processes (Cariou et al., 2008).

2.3.3 Limitations and Challenges of Port State Control

Despite the critical role PSC plays in ensuring maritime safety, several inherent limitations and challenges hinder its full effectiveness. For instance, while PSC inspections are stringent about tangible aspects such as ship conditions and certificate validations, they often neglect intangible yet significant factors like crew fatigue, inter-crew communication, and a ship company's overall safety culture (Fan et al., 2022). On the other hand, PSC also faces a multitude of challenges in its endeavor to regulate and enhance safety in the shipping industry. Resource constraints just pose another formidable challenge, given the vast number of ships docking at ports daily, a comprehensive inspection of each vessel is practically infeasible due to manpower and financial limitations (Gan et al., 2010). Moreover, commercial pressures sometimes overshadow the inspection's primary goal, leading to potential conflicts of interest and even jeopardizing inspection integrity (Knapp et al., 2011). In certain regions, there have been allegations of bribery and corruption influencing the outcomes of PSC inspections, also undermining the credibility of the regime (Knapp et al., 2021).

2.4 Safety Learning Culture in the PSC Regime

While extensive research exists on PSC inspection efficiency, there's a notable shortage of literature addressing the broader PSC framework's continuous evolution, especially concerning safety learning culture, but PSC has the capacity to fulfill its potential in this area. Mejia (2005) stated that PSC statistics are an appropriate indicator of the ISM Code's performance. According to Lee (2016) PSC inspections have an effective impact on the overall shipboard safety management system by means of the improvement mechanism, and promotes the cultivation of a safety culture. PSC's pivotal role in shipboard safety is irrefutable, yet its intersection with safety learning culture remains relatively unexplored. Similarly, Oltedal and Wadsworth

(2010) mentioned that the importance of safety culture in shipboard operations is widely acknowledged, and that it is necessary to carry out research on the role of safety learning culture in the regulatory and inspection processes.

The concept of a safety learning culture has received limited attention within the context of the PSC regime. Indeed, supporting a safety learning culture in the PSC framework demands a holistic approach. It would involve not only rigorous data collection and analysis but also fostering open communication channels among stakeholders, leveraging technological innovations, and maintaining a database of best practices (Oltedal & Wadsworth, 2010). Furthermore, a safety learning culture in the PSC regime may require a shift in the focus of inspections from merely identifying and rectifying deficiencies to understanding the underlying causes of substandard shipping practices, as well as the identification of trends and patterns that can inform improvements in inspection processes and safety management practices. This could involve the adoption of a systems approach to inspections that considers the complex interactions between human, organizational, and technical factors in the causation of accidents and incidents, as well as the development of risk-based inspection strategies that prioritize resources and efforts towards the most significant safety risks (Cariou et al., 2008).

2.5 Summary

The literature review has provided an overview of the concepts of safety culture, learning culture, and their significance in the maritime industry, and found a safety learning culture approach has the potential to enhance the overall safety culture. While the PSC regime's foundational importance is universally acknowledged, integrating a safety learning culture within its framework remains relatively uncharted territory.

This study aims to address the gap by examining the PSC mechanism itself, and emphasizing the importance of embedding a safety learning culture within it. Through

this exploration, the study seeks to serve as a beacon to guide ongoing efforts to enhance maritime safety.

Chapter 3: Methodology

3.1 Introduction

This chapter presents the methodological framework employed to explore the support for safety learning culture in the PSC regime. Given the nature of the research inquiry, a qualitative approach using semi-structured interviews was adopted, targeting two distinct respondent groups: PSCOs and seafarers.

3.2 Research Methodology

Qualitative research allows for a comprehensive understanding of human experiences, behaviors, and interactions within their context, which is pertinent to this study (Gray, 2021). The purpose of this study is to explore the key components, benefits, and challenges to support fostering a safety learning culture in the PSC regime. To achieve this objective, the research employs a qualitative research design, which is particularly useful for exploring complex social phenomena. Given the intricate nature of safety culture, a qualitative paradigm was employed, transcending the potential constraints of quantitative assessments (Creswell & Poth, 2016).

3.3 Data collection method: Semi-structured interview

The essence of organizational learning from incidents stems from individual learning dynamics – this involves grasping personal beliefs and motivations regarding learning (Drupsteen-Sint, 2014). The pivotal data collection tool was semi-structured interviews, which offered an adaptable framework that delved deep into topics,

maintaining structure without stifling spontaneity (Bryman, 2016). Regarding this study's need to explore the more detailed exploration of participants' experiences, perceptions, and attitudes of the safety learning culture, the semi-structured interview approach was chosen in this paper.

3.4 Participant Selection and Sampling

The sampling strategy for this study was purposive sampling, which involves selecting participants based on their relevance to the research question and their ability to provide rich and diverse data (Creswell & Poth, 2016). In this study, PSCOs and seafarers were selected as the key stakeholder groups because of being directly related to the research topic. The sample size was determined based on the principle of data saturation, which means that data collection continued until no new themes or insights emerged from the interviews (Guest et al., 2006).

For the PSCOs, the researcher tried to select diverse experience levels, jurisdictions, and backgrounds. This approach ensured a comprehensive understanding of the PSC regime and its interactions with safety learning culture. After approximately 15-18 interviews, common themes and insights are likely to repeatedly emerge, indicating that new interviews might not add significant new data. In the end, the researcher interviewed 20 PSCOs.

For the selection of the seafarers, the researcher hoped to choose those who had more experience with PSC inspections and with deeper knowledge of ship safety management. Lastly, management level seafarers were targeted, mainly including the captains, chief mates, chief engineers and second engineers. Similar to the PSCOs, recurring themes emerged after approximately 8-10 interviews, signaling the attainment of the saturation point. Finally 11 seafarers were selected and joined the interviews.

The inclusion of female perspectives proved challenging due to the male dominance within PSCOs and seafaring roles. Still, through persistent efforts, a female PSCO and a female engineer from a renowned oversea container shipping company participated.

3.5 Pilot test

The researchers first conducted the pilot tests with two participants, one of whom was a WMU classmate who conducted the test face-to-face, and the other who was a colleague of the researcher, conducted online. The purpose was to verify the feasibility of the semi-structured interview and the rationality of the question design, and make necessary adjustments to the interview content according to the actual situation of the experiment and the feedback from the two participants.

3.6 Data collection

3.6.1 Semi-structured interviews

Semi-structured interviews were started on July 9th 2023, and finalized by early August 2023. Before starting the interview with each participant, the researcher spent a lot of time negotiating the content of the interviews. That mainly included introducing the research background, interview form, anonymous participation and privacy protection policy to the participants. Adapting to global time zones and individual schedules, the interview time was also confirmed through multiple communications. Some participants were still working on the ship. For this part of the participants, the interview could during the ship in the port, and the work/rest hour also considered.

All the interviews were conducted one-on-one with no other people involved by Wechat APP, were either video or audio-based, dependent on the connectivity quality available to the participant. The interviews ranged from 30 minutes to an hour and were audio-recorded with the participants' consent.

The interviews were guided by a set of open-ended questions that covered topics, which including:

For PSCOs:

- regulatory frameworks,
- inspection processes,
- training,
- key components of safety learning culture.

For seafarers:

- working experience,
- views about PSC regime,
- key components of safety learning culture.

The researchers prepared two different lists of interview questions for the PSCO and seafarer. However, during the actual interview process, the researcher did not strictly follow the order of the interview questions, but wanted to combine them according to the participants, so as to create a relaxed atmosphere as much as possible, increasing the trust of both parties, and fully allowing participants to express their views.

3.6.2 Specific Case Study: Seafarers' Work/Rest Hour record

In order to make the content of the interview more objective and specific, the researcher asked the respondents about the seafarers' work/rest hour record as a case study. This captured the essence of the tension between theoretical regulatory frameworks (as stipulated by conventions) and the practical realities on board ships, and also highlighted PSC's regulatory challenges or limitations.

3.7 Data Synthesis

Following the research question, the researcher uses the method of thematic analysis to analyze the interview data in this study. According to Braun and Clarke (2006), thematic analysis is a widely used method for identifying patterns and themes in qualitative data. It mainly involved six steps, which included familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining themes, and producing the final report (Braun & Clarke, 2006).

Delamont (2016) points out that there are no shortcuts for the task, you have to do it step by step. After the interview work is completed, the researcher puts himself into the work of data coding and analysis in a timely manner. Data coding or categorization plays a crucial role in the analysis process, which includes subdividing and grouping the data (Dey, 2003). When considering whether to use manual or electronic software to assist in coding processing, considering that the manual method can provide researchers with a better opportunity for in-depth learning, it allows researchers to communicate and connect more deeply with data to advance understanding of emerging phenomena (Basit, 2003).

Meanwhile due to the time limit to master the use of electronic software, manual coding was preferred over electronic alternatives in this study (See Appendix 1 Data Coding list).

3.8 Ethical Considerations

The study was conducted in accordance with ethical principles and guidelines for conducting research involving human participants, including informed consent, confidentiality, and the protection of participants' rights and welfare (Creswell & Poth, 2016). The researcher sent a research proposal, World Maritime University (WMU) protocol form, sample consent form, and semi-structured interview questionnaire to the WMU Research Ethics Committee (REC) for approval. Interviews started only

after approval had been obtained. The WMU REC approved the research on June 26th 2023 (REC-23-042(M)) (See Appendix 2 related to the protocol of WMU REC). Prior to the interviews, participants were provided with an information sheet that explained the purpose and procedures of the study, the voluntary nature of their participation, and the measures taken to ensure confidentiality and anonymity. Participants were asked to sign a consent form indicating their agreement to participate in the study and the use of their data for research purposes.

All data, including interview recordings and transcripts, were stored securely and treated confidentially to protect participants' privacy and ensure compliance with data protection regulations. All electronic recording materials are stored in the researcher's personal computer, and are encrypted and hidden. Participants are also promised that all related materials will be deleted upon completion of degree acquisition.

Chapter 4: Data Presentation

4.1 Introduction

The data presented in this chapter is drawn from in-depth interviews with 20 PSCOs and 11 seafarers. The objective is to understand their perspectives on various maritime safety aspects. While PSCOs bring an external regulatory perspective, seafarers provide an internal operational viewpoint.

4.2 Demographics of participants

In the end, 31 respondents participated in the interviews, which included 20 PSCOs and 11 seafarers. They all come from China, with two female and 29 male. The PSCOs work in different port areas, 75% of them have various seafarer's working experience ranging from one to fifteen years. For the seafarers, they work in different companies and serve different types of ships, including container ships, bulk carriers and tankers. The age range of the participants is between 25 and 55 years old (mean age = 40.4 years), and they have varied maritime industry working experience from 3 to 31 years. Table 1 and table 2 provide detailed information about the participants.

Table 1*Participants information : PSCOs*

No.	Gender	Age	Seagoing experience		PSCO experience (years)
			Years	Rank	
P1	Female	41	0	/	12
P2	Male	38	0	/	8
P3	Male	36	4	3/E	8
P4	Male	43	5	3/E	8
P5	Male	41	7	2/E	10
P6	Male	53	15	Captain	12
P7	Male	45	1	3/O	5
P8	Male	41	9	C/O	6
P9	Male	43	11	C/E	4
P10	Male	32	0	/	4
P11	Male	34	3	3/E	4
P12	Male	42	0	/	15
P13	Male	47	0	/	12
P14	Male	38	3	3/O	9
P15	Male	38	5	2/E	8
P16	Male	36	2	3/E	9
P17	Male	43	4	2/O	7
P18	Male	45	3	3/E	11
P19	Male	37	1	3/E	7
P20	Male	40	5	C/O	8

Table 2*Participants information : seafarers*

No.	Gender	Age	Seagoing experience (years)	Rank	Vessel type	Company
S1	Female	27	3	3/E	Container	Oversea private
S2	Male	53	31	Captain	Container	Oversea private
S3	Male	42	15	Captain	Bulk	Local private
S4	Male	39	15	2/E	Container	Oversea private
S5	Male	42	15	C/O	Tanker	State-owned
S6	Male	33	7	2/O	Container	Oversea private
S7	Male	37	11	2/E	Tanker	State-owned
S8	Male	38	15	C/E	Container	Oversea private
S9	Male	43	17	Captain	Bulk	Local private
S10	Male	47	22	Captain	Container	Oversea private
S11	Male	39	15	C/E	Container	Oversea private

4.3 Themes

4.3.1 Ship safety elements

One question was asked of all interviewees: “What are the essential elements to keep ship safety at sea?” This is a very common and broad question, and the participants gave different answers. Nonetheless, a clear pattern emerged from their collective feedback, demonstrating that despite the vast expanse of the maritime realm and its associated challenges, there are certain foundational pillars that hold consistent significance. The majority of respondents emphasized three primary facets including the competence of the crew, the SMS and third-party supervision.

Competence of the crew was seen as playing a key role in ship safety. Nearly all the participants (n=29), both PSCOs and seafarers, mentioned that. The ship sails in the sea most of the time, away from the effective support of the outside world, and faces many uncertain factors. Only the crew has sufficient professional skills and knowledge, can they better cope with such a complex and changeable environment and make right decisions.

One PSCO offered, *“In all our years of inspecting ships, we found that the two important foundations to ensure the safety of the ship are equipment and operation. Usually, the ship can be equipped with the required equipment according to the requirements, but how to ensure that the equipment is always available and used correctly, how to make a right decision according to the circumstance, all depend on the crew's competence”*. (P12)

A Captain expressed, *“Every day, we navigate the vast and often unpredictable expanse of the ocean, which demands nothing short of excellence in our skills and knowledge. If my officer don't feel competence to keep the navigation watch, I have a hard time trusting them to hand over the whole ship under their control”*. (S10)

Safety Management System (SMS). Majority of the the participants (n=25) explained that SMS is about creating an environment where safety becomes a core value, deeply ingrained in every crew member's behavior, decisions, and daily routines. It set the tone from the top. When ship management prioritizes safety, it sends a clear message to all crew members that safety isn't optional - it's integral to the ship's operations. This affects every crew member, making them understand that safety is a shared responsibility and requires everyone to participate. P9 and S5 expressed,

As a PSCO, every time I board a ship for inspection, I can clearly feel that the safety conditions of ships managed by different companies are quite different, and these mainly depend on the what the SMS is and how its implementation on board. (P9)

Work on board, every decision we make, every task we perform, we have to think about the ship safety. This isn't just because of rules, it's because of the culture set by our management. When we have a deep understanding about our SMS, it making us not just follow protocols but internalize them. (S5)

Third-party supervision. Majority of the respondents (n=23) highlighted the external bodies play a vital role in monitoring and ensuring adherence to safety standards. P11 expressed,

Our regular inspections act as a reminder to all vessels about the critical importance of safety. In doing so, we aim to foster a culture where safety isn't just seen as compliance but as a responsibility. (P11)

Then they especially mentioned PSC, from its regular inspections, acting as a check and balance system, reinforcing the necessity for ships to maintain stringent the safety standards. S3 stated,

For us seafarers, PSC inspections are more than just regulatory procedures. They are affirmations of our dedication to safety. During the COVID-19 epidemic, because most PSCOs will not board the ship for inspection, I can

clearly felt that the crew's attention to safety has declined. Now everything is back to normal, and my crew has also lifted their concern in terms of safety. I think this is very good for our ship. (S3)

4.3.2 Understanding the Human Element

Human element has always been a key research issue, as it has both a potential vulnerability and a significant strength in the shipping industry. To delve deeper into this nuanced topic, participants were asked questions on a number of topics related to human element, such as their understanding and training.

Almost all participants (n=29) said that human element is the most important factor in maritime safety, but at the same time they also indicated that they had not participated in the training specifically for human element. P15 viewed that,

I have not participated in any training on human element. Of course, I know that this is a very broad concept. Although we often mention it in the field of maritime security, most of it is only for human operations. (P15).

Most of their understanding was that the operation of ships, and the decisions are made by the crew, so almost all the accidents are related to the crew themselves, because they have not followed the standard procedure. Notably, approximately forty percent of PSCOs mentioned that they had attended SMS training and worked as auditors also, which they said gave them a deeper understanding of human element, not only simply thinking that some incidents were merely caused by crew mistakes. Meanwhile, three out of eleven seafarers also reported that one should consider more factors when talking about human element, not only focused on the crew's operation. As S11 emphasized,

We often say that more than 80% of maritime safety accidents are caused by human errors. Of course, most of the people involved here are the crew, because we are operating the ship, but I think we should look at human

element in a broader sense. After all, the crew is only one part of ensuring the safety of ships. (S11)

4.3.3 Safety management system (SMS)

Earlier, some participants highlighted SMS as an essential element to keep ship safety at sea, and that it can create a culture related to safety on board. So we wanted to find some deeper insights about this. During the interviews, the participants were asked about the effectiveness of the SMS in relation to the shipping safety and the role of PSC in improving the safety management of ships.

Nearly all the interviewees (n=28) praised the SMS as playing a quite important role and offering a structured and systematic approach to maritime safety. In detail, SMS offers a well-defined structure that outlines how to identify, evaluate, and manage risks associated with ship operations. Meanwhile, an effective SMS is based on continuous improvement with its feedback, like when some accidents happen, lessons are learned, and the system is adjusted accordingly, ensuring that the same mistakes aren't repeated. S3 expressed,

The SMS always containing the detail information about the ship safety, with providing the standardized procedures of various shipboard operations, ensuring that all crew members are on the same page and reducing the scope for errors. (S3)

When talking about the relationship between PSC and SMS. Majority of the respondents (n=20) said that PSC is an effective way to improve the level of ship safety management, which continuously improves it. Almost every deficiency can be related to the SMS onboard. Through rectifying the related deficiency, PSC plays a positive role that SMS is running and updated in a timely manner. P4 stated,

According to the deficiency found in the inspection, PSCO compares it with the requirements of the ISM code, and if there is objective evidence that the

SMS failure or lack of effectiveness, it will issue ISM-related deficiency and take corrective measures, such as a SMS audit. (P4)

However, some participants also said that the role of the PSC is limited to improve SMS. S5 and P9 commented,

PSCOs only do spot check of ships for a few hours, most of the time they check some documents to assess the effectiveness of SMS operation, but you know sometimes the records don't reflect the actual condition of the ship. (S5)
For the effective operation of SMS, more subject responsibilities should lie in the daily management of the shipping company itself. (P9)

On the other hand, some seafarers (n=4) pointed out that although SMS was designed to standardize management and improve ship safety, the large amount of document content brought them a lot of extra paperwork, and it also lacked certain company support because all safety operations and management required finish by themselves. These have even had an impact on their careers. S7 stated,

The reason why I chose to work on a ship was that I thought it would be enough to do a good job of safety operation. But now I need to complete a lot of paperwork, just like working in an office, which is not what I want. (S7)

4.3.4 Reporting

Reports are usually relative to the seafarers, and they have to report to different parties. This paper mainly focuses on the various reports that the crew makes to the company in accordance with the requirements of the SMS and the relevant reports to the port State authority.

4.3.4.1 Report to the shipping company

All the seafarers mentioned that they are required to report near-misses, non-conformities, and accidents to the company as part of the SMS requirement. They also stated that not every crew member can submit the report, usually, the chief mate and the second engineer are responsible for the reports of the two departments from the deck and engine room, then the captain and the chief engineer confirm and submit the reports.

For the near-miss report, majority of the seafarers (n=9) pointed out that they only report one near-miss every month as per the company mandatory requirement. As illustrated by S2:

Usually, we will report accidents truthfully, but we will not send many reports on near-miss and non-conformities, otherwise it will be considered that our ship safety management is not doing well”.(S2)

4.3.4.2 Report to the port State authority

Majority the seafarers (n=8) indicated that they would report to the port State what they are compelled to do, but they would decide whether to declare, according to the situation when it comes to voluntary declarations, incidences such as ship equipment failures, because they would be worried about to get into more trouble if the declare the issues. S3 stated,

Usually we will only report to port State those equipment failures that have a dispensation from the flag State. Otherwise, we may not take the initiative to report, because it may be more troublesome. Once, my ship reported to the port State that there was a spare pump failure in XX country, and they asked us to repair it before entering the port, but if we didn't report it because the ship was out of the window inspection, they would not find anything. (S3)

On the other hand, all PSCOs pointed out that according to the inspection procedure, they will confirm with the captain whether any defects need be declared in advance before carrying out the inspection. P8 expressed,

We hope that the ship can actively report some non-conformities to us, including before the ship enters the port or before we start the inspection, which can increase the trust of both parties, and at the same time help us evaluate the safety of the ship, and take certain support measures if necessary.
(P8)

4.3.5 Just culture

The concept of a ‘Just Culture’ within maritime operations has gained attention in recent years, especially within SMS. It refers to an atmosphere where individuals feel encouraged to report mistakes and issues without the fear of punishment. Participants were not queried about just culture directly, instead were asked questions about “Whether you trust the company's safety management, whether you will be regarded as a troublemaker if you report a safety incident, and whether the results of the PSC inspection will have a certain impact on the crew themselves.”

Nearly all the seafarer participants (n=10), emphasized that they were concerned that these safety reports implicated them, as they could lead to blame from the company, wage deductions or even affecting their contracts. As S10 provided,

The crew needs to believe that they won't face repercussions if they report an incident. But this trust is not easy to build and need through consistent actions from the top. (S10)

On the other hand, all PSCOs responded that they would check with the ship’s master if there were any non-conformities that needed to be declared before they started inspections. They also said that they understand that in most cases the crew are trying to hide the problems. As P17 quoted,

The crew are almost afraid of the PSC inspection, especially the deficiencies found are related to themselves. The main reason may be that these will have a direct impact on their own interests. (P17)

After being explained the definition of ‘Just Culture’, all the participants recognized the importance of just culture in ensuring that mistakes are reported, analyzed, and learned from. P20 noted,

In an environment without blame, more safety risks can be found and certain measures can be taken instead of gone unnoticed. (P20)

4.3.6 Interaction between PSCO and Seafarer

Interaction between PSCOs and seafarers is a critical part of the inspection process. This interaction not only determines the outcome of the inspection but also influences the relationship between the port State authority and the crew. This also has long-term implications for trust building between the two parties.

During the interviews, the interviewees were asked about the communication between the two parties during the inspection process and how to evaluate the relationship between them.

From the responses, nearly all the PSCOs (n=18) highlighted that they maintained a professional and neutral stance during their inspections, emphasizing that their primary aim is to ensure the safety of the vessel. P9 stated,

I usually carry out inspections according to standard procedures , including showing my ID card, meeting with the captain, and then carrying out relevant inspections. When I find the deficiency, I will take photo and record, and then confirm with the crew on site. (P9)

Majority of seafarers (n=8) felt that while PSCOs were generally professional, yet sometimes certain PSCOs made them feel pressured or even intimidated. S5 pointed out that,

I hope that both parties can have more communication. For example, PSCOs can give a more detailed explanation of each deficiency, so that we can learn more about the relevant convention requirements, and I also hope that PSCOs can listen to our expressions more. (S5)

When the respondents were asked to rate the degree of the relationship between the two parties (5 degrees including: very bad, bad, neutral, good and very good.). Feedback from PSCOs was more positive than from the seafarers, about half of the PSCOs responded ‘good’ or ‘very good’ relationship between the two parties, but only a few seafarers rated these degrees (Figure 4). S4 expressed,

Some PSCOs always behave very forcefully during the inspection process and do not give the crew a chance to speak or explain at all.

Figure 4

Degree of the relationship between PSCOs and Seafarers



4.3.7 Port State Control Effectiveness

The effectiveness of PSC inspection is pivotal in ensuring maritime safety, environmental protection, and the welfare of seafarers. An essential query posed to participants was, “How do you think the PSC regime as an effective way to promote shipping safety?”

Nearly all of the participants (n=27) acknowledged the pivotal role PSC inspections play in enhancing maritime safety. S10 commented,

There is no doubt that PSC plays an important role in ensuring the safety of ships, especially for old and sub-standard ships. It is hard to imagine what the situation of maritime safety would be without PSC. (S10)

PSCOs also pointed out that as an external supervision method, PSC has its own unique features in ensuring ship safety. Like an additional layer of oversight, PSC ensures that ships should always meet the required standards. P11 provided his view to support that,

I think PSC inspections can play a certain deterrent role for some relevant parties, including ships, shipping companies, ROs and flag States, because ships may face inspections at any time, which may lead to detention or even fines, and these will have a negative impact on certain relevant parties. (P11)

4.3.8 Port State Control limitations

While PSC inspections are critical for maritime safety and environmental protection, it's essential to understand its limitations. Participants were asked, "Based on your experience, what are the perceived limitations of the current PSC regime?"

Nearly all the interviewees (n=29) said that since the PSC regime has been established for quite a long time, the design of the mechanism itself is very good, meanwhile most of them also expressed some problems in the actual implementation process.

Majority of PSCOs (n=16) pointed out that they believe that the main limitation of PSC is the competence of PSCOs themselves, especially the continuous updating of new technologies and the continuous improvement of convention knowledge, which pose higher challenges to PSCOs. P15 highlighted,

New technologies, new convention regulations – PSCOs need to be abreast with all these to be effective. (P15)

The seafarers mentioned more about the inconsistency of standards and corruption. As S2 and S11 expressed that,

The PSC inspection in one port might be completely different from another, leading to unpredictability and potential oversight. (S2)

PSC inspections in some areas, they are not for the safety of the ship, PSCO boarding is just for money, we can get the clear report after give the money. (S11)

4.3.9 Work/rest hour record implementation

In order to make the research more practical, the researcher introduced an actual case of crew work/rest hour record implementation during the interview. The researcher asked about the seafarers' actual working hours on board and related records, and also checked about the practices in the actual inspection process of this issue from PSCOs.

All the seafarers pointed out that it is difficult to ensure that the rest time always complies with the requirements of the Convention in actual work on board, especially when the ship is in port or has some other special operations. According to their responses, their daily working hours on the ship can be summarized as,

At sea, they working about 8-10 hours every day, but sometimes may more than 10 hours also;

In port, about 90% of the seafarers highlighted working about 10 to 15 hours a day.

Regarding records, all the seafarers responded that they do make adjustments for those that do not meet the requirements. When asked why, they explained that it was mainly to cope with third-party inspections, especially PSC. The following participants quoted,

There's an unspoken pressure to 'adjust' the records to ensure they always comply. We don't want the PSCO find this non-compliance because of our own records. (S6)

We now use software to record. If the requirements are not met, the system will automatically mark it. We don't want such a simple record to cause problems because of ourselves. (S11)

Almost all PSCOs (n=18) responded that they are very concerned about this issue because it is directly related to the crew fatigue, which in turn affects the safety of the ship. However, they also said that despite taking the time to check, it was difficult to find problems through records. As following participants expressed ,

The reason why we pay attention to this record is because if the crew members have insufficient rest, or fatigue, it will have a greater impact on the safety of the ship. (P2)

In fact, I know that their records are not a true reflection of the situation, which means that it is difficult for us to find obvious evidence and take measures to solve this problem. (P8)

It is quite difficult to find problems by checking the records only. We need to cross-check with other official records, which usually takes a lot of time. (P12)

As for a PSCO who seldom checks the matter, he explained that the reason for not checking is not because there is no problem, but that it is meaningless to check the adjusted records. He mentioned,

Unless the crew is being honest about all the records, then if there is indeed a general problem of insufficient rest time, I believe PSCO can take some measures to rectify the problem. (P19)

4.3.10 Key insights on safety learning culture in maritime industry

The maritime industry, with a culture that emphasizes learning from incidents, near misses, and even routine operations is fundamental to the continual improvement of safety standards. During the interview, the researcher asked the crew members whether there are some good safety learning practices on board, and asked the PSCOs about their understanding of the safety learning culture in general.

Firstly, all respondents highlighted that learning is important in the maritime industry, mainly in ensuring ship safety and improving personal knowledge and skills. S4 and P12 expressed,

Safety through knowledge, knowledge acquired through learning, this is a philosophy I always emphasize to my crew. (S4)

Through learning, I can improve my professional knowledge, so that I can be competent for such a challenging job as PSCO. (P12)

It was found that some good safety learning practice already exist. Majority of the seafarers (n=7) mentioned that the company provides safety information reports to the ship every week, including fleet PSC inspection results, accident investigation reports, new Convention requirements, etc., which provides them with a good learning opportunity. Similarly, PSCOs also give some good practices, some of them mentioned NIR, based on the learning of past inspection results, in order to optimize the ship selection mechanism and improve inspection efficiency.

The researcher mentioned the concept of safe learning culture, and some interviewees also made certain responses based on their understanding. S6 and P3 commented,

The formation of a culture requires engagement of all hierarchies, from the deck cadet to the captain, has a role in fostering a learning environment. (S6)

We are always used to learning from accidents. This is of course a good way to learn, but accident losses are always painful. We also need to establish a approach to transform from reactive learning to proactive learning. (P3)

4.3.11 Support a safety learning culture in PSC regime

The researcher tried to find out the views of support a safety learning culture in PSC regime. The majority of the participants (n=24) generally believe that support a safe learning culture in PSC regime has a quite positive meaning, which can promote ship safety through various sectors.

4.3.11.1 For seafarer

Nearly all seafarers interviewed (n=10) stated that although they do participate in a lot of training, most of the training was aimed at improving skills and satisfying equipment operations. S6 expressed,

Almost all the trainings I have participated in are aimed at ship management and equipment operation. (S6)

While working on the ship, it is difficult to have time to learn theoretical knowledge due to busy with various shipboard operations. As one captain S3 stated,

When crew working on board, we have a lot of daily operations and SMS document work every day, and it is difficult to have time to learn about Convention knowledge. (S3)

PSCOs generally have relatively comprehensive knowledge of Conventions, and they carry out the inspections based on the requirements of specific provisions. Every PSC

inspection provides good learning opportunities for individual crew members to understand the requirements of the Conventions. S4 illustrated,

I know that every deficiency issued by PSCO has specific convention requirements. This is a good opportunity for me to learn theoretical knowledge, because it is difficult for me to have time to read those Conventions. (S4)

4.3.11.2 For company

When one ship in a fleet undergoes a PSC inspection, noticed by the company and lessons learned from it, these insights are often shared across the fleet. Meanwhile, the company also gets an opportunity to refine the SMS. This ensures that all vessels benefit from information sharing. S10 stated that,

Our company attaches great concern of every PSC inspection, and will study and analyze each report carefully, giving the 'root cause, correct action and prevent action', and then issue the circular to the entire fleet. For the common problems, the SMS will be revised if necessary. (S10)

4.3.11.3 For other parties

Majority of PSCOs (n=15) reported that they frequently coordinate joint inspections and seminars, involving various relevant entities in these initiatives, which include seafarers, shipping companies, ROs, flag States. This platform where diverse maritime stakeholders converge to exchange knowledge, propagate best practices, and collaboratively tackle prevalent challenges. This kind of brainstorming-like activity can often lead to unexpected gains, such as result in innovative solutions to long-standing industry problems. P11 stated,

We organize PSC-themed seminar every year, which provides the relative parties with a good opportunity to communicate and learn. More

*importantly, it creates a adaptive and collaborative maritime ecosystem.
(P11)*

4.3.11.4 For legislation

PSC inspections not only check whether the Conventions are effectively being implemented, but also evaluate the weakness of the Conventions themselves. Majority of PSCOs (n=12) mentioned that the PSC regime has made a great contribution to maritime legislation under the IMO's framework, which in turn has had an impact on the entire industry. It be consider that PSC has been one learning mechanism to update instruments. Since IMO Conventions are adhered to by member countries globally, any change or update has a ripple effect across the maritime industry. Any enhancement of a Convention doesn't just improve the operations for one ship, company or a country - it lifts the standards for the entire maritime ecosystem. P5 mentioned a practical example,

A few years ago, during the inspection process, we found that there were many deficiencies with the Pilot Transfer Arrangements (PTAs), and many accidents occurred related with the equipment. After the study, we submitted several proposals to the Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) and Maritime Safety Committee (MSC) of IMO, finally IMO approved a new output to amend SOLAS regulation V/23 and associated instruments to improve the safety of PTAs. We are still working on this now. (P5)

4.4 Summary

Based on the findings from the interviews and the above statements, it can be seen that the PSC mechanism, with its own advantages, can play a positive role in supporting a safety learning culture. It can play a role in multiple areas, which is

conducive to establishing common goals within the industry, thus promoting the formation of a culture.

Chapter 5: Discussion

5.1 Introduction

In this chapter, the focus is on the research questions, weaving together the views of participants with support from various literature sources, and finally giving the answer to the research questions.

5.2 How does PSC intend to improve the safety of the shipping industry?

As a reliable external oversight, PSC plays an important role in implementing and enforcing international regulations, intending to eliminate the substandard ships.

5.2.1 A important external oversight

Majority of the participants mentioned that the external oversight provided by PSC plays a pivotal role in the shipping industry.

External oversight can has power over shipping companies, with crew paying more attention to such inspections and strategically adapting their practices to achieve these external demands (Xue et al., 2021).

PSC, via its regional MOU agreements, ensures that a consistently high standard of safety and operational procedures is upheld. The integrity of the PSC regime was highlighted by the PSCOs as the top priority. PSCOs do not have any vested interest in the inspected vessel, regardless of its flag State or ownership. This independence

from ships and ship operators imply that all ships are held to the same standard, irrespective of their origin or the affiliations.

The PSC inspection, often as an unannounced visit, is different from the flag State inspection or the company safety inspections, as it ensures crew members maintain their vessels in adherence to the safety standards at all times (Mejia, 2005). This external monitoring can effectively building a positive pressure and help promote the establishment of good safety practice or culture on ships.

5.2.2 Intention to eliminate substandard ships

Substandard ships pose significant risks not only to the marine ecosystem but also to the crew, cargo, other ships, and port facilities (Chung et al., 2020). The main reason for the existence of such ships is the pursuit of profits and cost savings, and PSC can use its effective measures such as detention, fines, prohibition of entry, etc.

In order to effectively identify high-risk ships, certain MOUs have established the NIR, which has greatly improved the efficiency of the PSC inspection and stimulated shipowners to invest more in ship maintenance (Yang et al., 2020). Based on factors like ship age, flag, type, and inspection history, those vessels deemed to be of a higher risk, are subjected to more frequent and in-depth inspections. Once the vessels are found to have serious deficiencies they will be detained until those deficiencies are rectified.

The establishment of the NIR can be said to be a good application of safety learning culture. PSC has formulated a more scientific and effective inspection regime through the analysis of past inspection results and other risk factors. Meanwhile, as the risk of ships being identified as substandard ships or even being detained is high, the PSC regime fosters a culture where ship owners, operators, and crews prioritize compliance with international standards.

5.2.3 Improve the SMS

Interviewees unanimously agreed on PSC's pivotal role in refining the SMS. Mejia (2005) explained that as a random inspection regime, PSC works as a candid snapshot of the actual status of operational safety of vessels and, by extension, can reflect the effectiveness of SMS.

During the inspection, PSCOs will check ships' Document of Compliance (DOC) and the Safety Management Certificate (SMC) to ensure they are valid and up-to-date, together with logs, maintenance records, drills, training records, and also the crew's professional competence. By assessing the ship's safety operations, PSCOs offer an objective perspective of some elements related to SMS implementation. Once the ISM-related deficiency issued, corrective actions are mandated, which makes the SMS maintain continuous improvement. Meanwhile, a certain number of PSCOs had SMS training and an ISM auditor qualification, noting that it equipped them with a structured approach during inspections, and they had a more scientific understanding and judgment of SMS.

5.3 What are the limitations of PSC in improving the safety in the shipping industry?

While PSC evidently has strengths, participants also pinpointed some limitations from their perspectives.

5.3.1 Human element

The human element is a wide-ranging scope and treated as a key element of safety in the shipping industry. But mostly it is mentioned related to shipboard operations and marine casualties (Shi, 2015). In the maritime industry, this human element involves

the entire spectrum of human activities related with ship safety (IMO, 1997), PSC is also no exception and should address the issue effectively.

(1) PSCO insufficient of knowledge about the human element

None of the PSCO participants indicated that they had participated in relevant training on human elements. So when discussing this topic, they only talked about the human behavior, like the shipboard operations. The human element plays a nuanced and multifaceted role in influencing maritime safety. This encompasses activities undertaken by ship crews, companies, regulatory agencies, and other stakeholders. Collaboration among all Parties is crucial to effectively tackle challenges posed by the human element. PSCOs lack of knowledge about human elements will lead to a lack of systematic consideration in the process of carrying out inspections, which will affect the effectiveness of the inspection.

(2) Competency of PSCO

PSCOs should demonstrate professional knowledge with enough skills to ensure that they are competent for ship safety inspections. In addition to the ever-updating provisions of the Conventions that put forward higher requirements for PSCOs, majority of PSCOs pointed out that technology development is a greater challenge for them also. Modern vessels, replete with high technologies, present challenges in inspections. The expertise of PSCOs includes theoretical knowledge of conventions and technical knowledge of modern equipment, which will have a direct impact on the effectiveness of inspections (Yan et al., 2020). As technologies evolve, there's an increasing need for PSCOs to keep abreast, ensuring evaluations remain thorough and relevant.

(3) Bias of PSCO

Every human-involved system is susceptible to inherent biases, and PSC is no exception. PSCOs' decisions could occasionally reflect personal prejudices, potentially leading to unfair or inappropriate inspections. A PSC inspection is carried out based on the PSCOs' professional judgment, which will vary depending on each person's individual differences. The professional judgment may be affected by certain factors, like being under pressure or the limited timing (Akyurek & Bolat, 2020). This situation is also common in the use of action codes, such as different PSCOs may use different action codes for the same deficiency.

5.3.2 Inconsistency Across Regions

PSC operates under an internationally recognized framework, variations arise in its actual execution across nations and regions. Due to uneven development, different countries or regions have different levels of implementation of international Conventions, which has led to the emergence of inspection standards in different regions (Fei & Bao, 2006). For example, Paris MOU has quite a high standard of inspection requirement and stricter actions are taken, some ships may be banned from the region, but these ships still can operate in some other region or MOUs (Shi, 2015).

The situation of different standards in different regions may have a certain negative impact on the global mechanism of PSC, especially making seafarers feel that they have been treated unfairly. Although IMO has adopted the procedures for PSC, it is still necessary to strengthen regional cooperation and establish a communication mechanism for PSCO to learn from each other and achieve unified standards.

5.3.3 Limited Resources and Time

It was found that every single PSC inspection usually needs 2 PSCOs, and takes about 3 to 4 hours. The shipping industry has been constantly pursuing higher efficiency, and the time that ships stay in ports is also constantly shortened. In the actual PSC inspection process, PSCOs are under the pressure of conflicts with the ship's berth and

departure and the crew's rest time, which may have a certain impact on their inspection results. With numbers inspection items, taking into account the avoidance of unduly delay to the ship, PSCOs are extremely difficult to inspect all the items in one inspection (Chung, 2020).

5.3.4 Corruption

Corruption in the PSC regime was mentioned by most respondents, and they also pointed out that the situation mostly exists in some specific regions or countries. Corruption in the maritime industry is an issue of concern, affecting various operations and facets of the sector. IMO calls on all Member States and relevant parties should to adopt, maintain, and strengthen systems that promote transparency, fight acts of corruption and prevent conflicts of interest (IMO, 2022). At the same time, it should be noted that PSC has always been a high-risk point for corruption. In 2019, the Republic of the Marshall Islands Maritime Administrator joined the Maritime Anti-Corruption Network (MACN) and produced a report to work towards eliminating maritime corruption, and found that 55% of the reports received implicated the PSC (MACN, 2020).

Corruption is a serious challenge to maritime safety, which not only affects the effectiveness of PSC, but also has a great impact on maintaining fair competition in the shipping market. The effect of corruption not only has the negative influence on the fundamental principles of PSC, which include integrity, professionalism and transparency, but also potentially increases the safety risk of the ship and creates a burden to shipping companies (Knapp, 2021).

5.3.5 Reliance On Crew's Honesty

As a random character inspection, PSCO boarding is not usually announced in advance. Some PSCOs explained that the main reason for this is that they do not want the crew to make temporary preparations in advance, and they prefer to see the real daily

conditions of the ship within a limited time, so as to discover more risks or deficiencies. But the fact that the crew is always trying to hide some problems, becomes like a game of “cat and mouse”. It is the greatest irresponsibility for patients to conceal their condition from doctors. PSCO working as a ‘doctor’ for the ship, when the crew conceals the true condition of the ship from them, the true safety status of the ship will not be accurately assessed during the limited inspection time.

In many cases, PSCO evaluates the daily operation of the ship by checking the documents and records on board, but if the records cannot correctly reflect the actual situation, then PSCO cannot make correct judgments and take corresponding measures. The research found that a “culture of adjustment” spreads among seafarers, so that the records are adjusted only to comply with the regulation requirements, which may lead to a failure to address the issues during the PSC inspection (Baumler et al., 2020). During the interviews, the researcher discussed the issue of crew work/rest hour records. On the one hand, seafarers said that they faced the problems of insufficient rest time and fatigue, but they almost always adjusted reports to meet the requirements of relevant Conventions when recording. On the other hand, PSCOs stated that if the records are adjusted, the actual situation can not be reflected. In this case, even if the crew members are obviously fatigued, PSCOs cannot take corresponding measures because they lack objective evidence.

5.4 How to improve ship safety through a safety learning culture supported by the Port State Control regime?

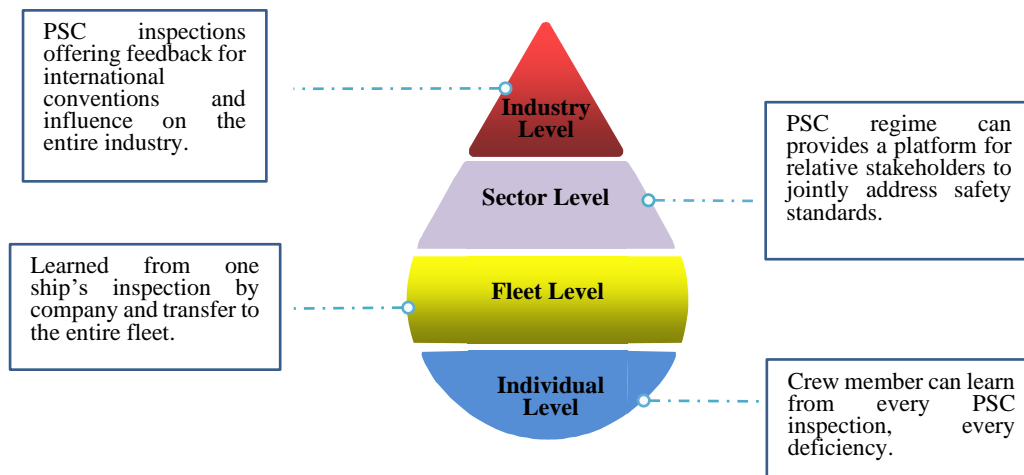
Some good practices of safety learning already exist in the maritime sector, but due to the diversity of individuals and different systems, which may lead to some inconsistencies in actual practice, they have a negative effect on the establishment of a safety learning culture across the industry. The PSC, with its extensive influence, can play a crucial role in cultivating a consistent safety learning culture in maritime industry.

5.4.1 Ways to improve ship safety

PSC with its extensive influence in the field of maritime safety, provides convenient conditions for its application to be better utilized (Yuan et al., 2020). A safety learning culture, supported by the PSC regime, can improve ship safety on multiple levels (Figure 5).

Figure 5

Support a safety learning culture in PSC regime to improve ship safety on multiple levels



5.4.1.1 Individual level.

All the seafarers responded that each PSC inspection was a good learning opportunity for them. Although the crew do participate in a lot of training, most of the training is more aimed at practical skills. At the same time, due to the busy work on the ship, it is difficult for them to have time to study the relevant Conventions. On the other hand, PSCOs have relatively good theoretical knowledge of the Conventions, and every single deficiency they issued should be based on the specific requirements of the Convention, which provides a good opportunity for seafarers to learn the knowledge of the Conventions. Especially when the deficiency is directly related to the crew

member responsible, this usually has a more significant impact on them, so that the same problem can be avoided from happening again.

5.4.1.2 Fleet level.

Learned by every ship's PSC inspection, shipping companies publish information sheets of the deficiencies to the fleet, urging them to draw comparisons with their ships and provide feedback. This is a best practice to establish a safety learning culture in a company, right from top management to frontline operators. As the seafarers emphasized, it always attracts their attention because they feel that the same thing may happen on their own ship. Meanwhile, when some deficiencies are prevalent across the fleet, they can be addressed by updating SMS, which prompts companies to continually refine their SMS, ensuring its ongoing improvement.

5.4.1.3 Sector level.

Ship safety involves many stakeholders, such as crew, company, recognized organization and flag States. As PSC inspections mirror a ship's safety status, stakeholders leverage this data to assess their safety management. So, the PSC has the ability to act as a powerful catalyst to spread best practices throughout entire sectors. Different stakeholders, with their unique cultures, operational methodologies, and management strategies, often face the challenge of inconsistent safety standards. The PSC regime, by setting a minimum safety benchmark, ensures that all players in a sector adhere to a common standard. This not only levels the playing field but also ensures that companies are competing on the basis of quality and efficiency, rather than compromising safety.

The PSC regime can provide a platform for all stakeholders to collaborate, share insights, and jointly address safety standards. For instance, an RO, after analyzing a specific deficiency issued by PSC, can collaborate with flag States to roll out interventions at a sector-wide level. As some PSCOs indicated that they regularly

organize joint PSC inspections and seminars, during which different relevant parties will participate, from such activities they can communicate and learn from each other, and conduct research and studies on issues of common concern.

5.4.1.4 Industry level.

Based on the standard requirement of the international Conventions, PSC carries out the inspection of the ships to verify the them comply with the regulations. With its vast array of safety data analyzed, and insights gathered from inspections, PSC inspections often bring to light discrepancies between on-paper regulations and their on-ground implementations, and provide invaluable feedback related to international Conventions. Such findings can be channeled to top-tier organizations like IMO, enabling the organization to continually refine the regulations.

As a Safety learning culture at this level may with its long period and low speed, but it has the most potential for widespread and more potent influences on the whole industry. This is a good example of safety learning with a loop for regulatory enhancement, which contains feedback, collaboration, and forward-thinking. This has also been verified by the interviewees. Some PSCOs indicated that they would submit some proposals to IMO based on the problems found in the inspection, including suggestions on the revision of existing international instruments and the legislation of new regulations, and all of them have achieved good results and responses. On the other hand, seafarers also said that usually the company and the crew will pay more attention to the requirements of the new Convention and take active measures to respond.

5.4.2 Recommendations

Based on the findings and related discussions, this paper also provides recommendations for a safety learning culture supported within the PSC regime to have better application and effectiveness in the maritime industry.

5.4.2.1 Elevating Data Collection Quality

Data quality plays a fundamental role in the effectiveness of learning (Jacobsson et al., 2012). Regarding the limitations of the PSC regime, certain measures should be taken to ensure that more high-quality information can be obtained in its inspections.

Comprehensive training of PSCOs: Investing in comprehensive training programs to increase the knowledge and soft skills of PSCOs is crucial. The PSC inspection relies on the decisions of PSCOs' personal judgment (Akyurek & Bolat, 2020). In addition to ensuring that PSCOs should have qualified professional knowledge, relevant training should also be provided on other comprehensive abilities, such as knowledge training on human factors, communication skills with crew, because these abilities can further improve the effectiveness of inspection.

Establishing just culture with crew members: Bhattacharya (2015) emphasized that blame is a great barrier in learning and has a negative effect on safety culture. Building a trust relationship with the crew and encourages them to report existing problems proactively. Engaging in open dialogue, demonstrating respect for their expertise, and understanding their perspective can lead to richer, more truthful information sharing.

Taking anti-corruption measures: Corruption can hamper the fundamental principles of the PSC regime (Knapp, 2021). It is necessary to establish an effective whistle-blowing system at various levels, including IMO, MOU, port State authorities down to port authorities. At the same time, some good practices are worth sharing and learning from. For example, PSCO wears a portable recorder during the inspection and records the entire inspection process. This has been proven by some port State authorities to be an effective way to eliminate corruption.

5.4.2.2 Instituting a Scientific Data Analysis

At present, most of the analysis of PSC inspection data is still relatively simple, such as the type, quantity and cause of deficiencies. Advanced data analysis techniques such as big data analysis and machine learning, are methods that can decipher patterns and insights from inspection data, which might be otherwise overlooked.

In addition, when conducting data analysis, more systematic thinking should be considered, such as the emphasis on human factors. Focusing only on seafarers who make mistakes will be a hindrance to an effective safety learning culture (Kiwani et al., 2021). Rather than solely focusing on crew members, understanding the broader context and systemic issues leading to these mistakes is essential. This holistic view can ensure that solutions address root causes.

5.4.2.3 Broadening Application

PSC should give full play to its important role in maritime safety, guide and promote the entire industry to establish a safety learning culture atmosphere by establishing forums, webinars, and safety training where stakeholders like seafarers, shipping companies, Recognized Organizations, and flag States can share experiences and best practices. Although these activities can usually achieve good results, they sometimes have limited reach due to various constraints, such as the limited number of participants due to location or limited resources, and some seafarers may not be able to participate because they are working.

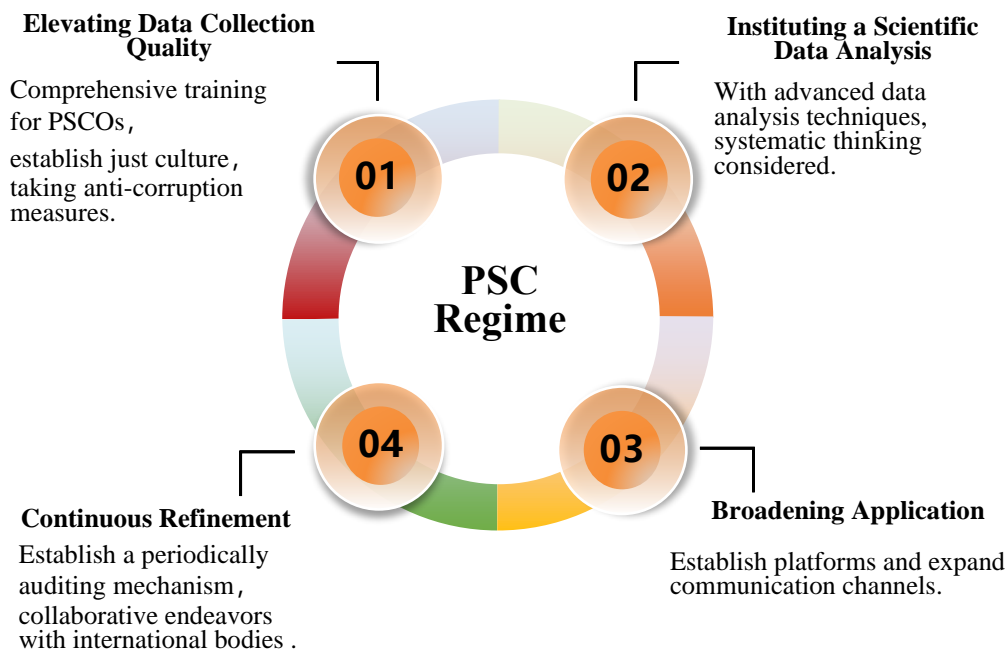
In order to expand its scope of influence, it is necessary to explore multiple communication methods. Such as introducing e-learning platforms where crew members, irrespective of their location, can access those activities. Establish a system where participants can provide feedback after the activity. This feedback can help refine future programs.

5.4.2.4 Continuous Refinement

In order to better achieve its effectiveness, the PSC regime should continue to improve itself. Internally, the PSC should establish a periodic auditing mechanism, including assessing the professional competence of the PSCO and a post-evaluation of each inspection report. Externally, it should actively collaborate with international bodies like the IMO, by taking measures to harmonize PSC activities and procedures worldwide. This harmonization also aids in achieving a more consistent and high-quality inspection regime across regions.

Figure 6

Recommendations to amplify the impact of a PSC-supported safety learning culture



In essence, this is a symbiotic cycle (Figure 6). It will benefit the PSC regime itself and improve its inspection effectiveness. Meanwhile, it also better amplifies the impact

of a PSC-supported safety learning culture in the industry, and continuously improves shipping safety.

Chapter 6: Conclusion

6.1 Research Conclusion

This research is an exploratory study on the concept of supporting a safety learning culture in the PSC regime. Through a qualitative approach using semi-structured interviews was adopted, targeting two distinct groups of respondents, including PSCOs and seafarers. Combined with the literature review, this study provides a more scientific and in-depth understanding of the topic.

As an external supervision mechanism, PSC has established a safety net globally. By defending against substandard ships, and ensuring that ships comply with international safety standards and Conventions. PSC plays an effective role in ensuring the safety of ships.

Despite its critical role, PSC regime still have certain limitations and face challenges, including human elements related with PSCOs, inconsistencies across regions, limited resources and time, corruption, and reliance on crew's honesty.

A safety learning culture can significantly improve ship safety in the maritime industry. Safety learning can exist in various bodies with the maritime industry, but because of their individual nature and management, this may not be conducive to establishing a safety learning culture across the industry. Through the research, it is evident that a safety learning culture supported by a PSC regime can play a role in improving ship

safety at multiple levels, which has positive significance for establishing a culture in the entire industry.

- Individual level. Crew members can learn from every PSC inspection, and every deficiency to improve their knowledge.
- Fleet level. Shipping companies issue PSC inspection bulletins to the ships in the fleet.
- Sector Level. PSC engages with different stakeholders to collaborate, share insights, and jointly address safety standards.
- Industry level. PSC works in conjunction with international bodies like IMO to address broader industry concerns, promote global safety standards, and push for legislative practices.

6.2 Limitations and Future Research

This study has several limitations that should be acknowledged. First, the sample for the quantitative data was from one country only, which may limit the applicability of the findings. Meanwhile insights from interviews hinge on the honesty and openness of participants, which might introduce biases. Future research could employ more diverse populations to further validate and extend the findings of this study. Second, the study focused primarily on the PSC regime, and the findings may not be directly applicable to other maritime safety management contexts or stakeholders. Future research could span across multiple regions, offering a more global perspective on PSC operations, also it could explore the applicability and transferability of the safety learning culture concept and framework to other parties and sectors.

6.3 Concluding Remarks

In conclusion, this dissertation has contributed to the understanding of the importance of supporting a safety learning culture in the PSC regime. By identifying the

effectiveness and the limitations of the PSC, it was found that support for a safety learning culture in the PSC regime played an important and influential role in promoting ship safety. It is hoped that the findings of this study will inspire further research, debate, action on this critical topic, and ultimately, help to enhance the safety and sustainability of the global maritime industry for the benefit of all stakeholders.

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Appendix 1: Data coding list

No.	Coding	Samples of answers
1	Ship safety elements	<p>PSCO: I think the crew's own safety awareness and professional skills, the company's safety management, and third-party supervision are the three most important aspects to ensure the safe navigation of the ship.</p> <p>Seafarer: As an engineer, I think the serious and responsible attitude of the crew and the effective support of the company are important conditions to ensure the safety of the ship.</p>
2	Understanding the human element	<p>PSCO: We always talking about the human factors, but I think we have not enough knowledge about it, we may need some specific training on it.</p> <p>Seafarer: Human element have always been one of the most important factors affecting maritime safety, especially the crew's own safety awareness and professional skills, which directly affect the navigation safety of ships.</p>
3	Safety management system (SMS)	<p>PSCO : We know that PSC does not review the ship system documents during the inspection process, but judges the ship safety management system based on the inspection results and the actual situation of defects, such as equipment maintenance, personnel training, company support, etc.</p> <p>Seafarer : (1)I think our SMS is running well in general. Crew can try their best to carry out daily work according to the requirements of the documents. However, in order to do a good job in related paper work, our workload has also increased a lot.</p> <p>(2) Port state control can indeed effectively improve our safety management level, because the company pays close attention to the results of each PSC inspection. If it finds that it is indeed a common phenomenon, the company will make changes in the SMS documents to solve related problems.</p>
4	Reporting	<p>PSCO: Usually we only receive some report contents required by the ship entering the port, and rarely receive other reports from the ship.</p> <p>Seafarer: We will regularly report some potential safety hazards to the company, but we will not report too many, otherwise it will be considered that poor safety management of our ship.</p>

5	Just culture	PSCO: If the ship voluntarily declares its own problems before entering the port or before our PSC inspection, we will deal with them reasonably according to the actual problem and the measures taken by the ship, and usually will not treat it as a defect.
		Seafarer : I think in the maritime field, the culture of blame is quite obvious, especially the crew will be very worried about making mistakes, because this may cause substantial damage to our own interests, such as fines, or even loss of jobs.
6	Interaction between PSCO and Seafarer	PSCO: I think the relationship between the two groups is just average. From my personal point of view, because I have worked on ships for many years, I often look at some issues from the perspective of the crew.
		Seafarer: In many cases, I feel that the crew and the PSCO cannot communicate equally, and some PSCOs are not willing to listen to what we want to say.
7	PSC effectiveness	PSCO: I think PSC is the most effective way of external supervision of ship safety.
		Seafarer: The role of PSC in ensuring the safety of ships is undoubted, especially for old ships and substandard ships.
8	PSC limitations	PSCO: Because English is the main language of our daily work at PSC, as people from non-native-speaking countries, language has always been a big challenge for us, including the understanding of the convention.
		Seafarer: PSCOs only inspect the certain areas of the ship for a few hours, they cannot really know our situation and the safety management.
9	Work/rest hour record implementation	PSCO: I personally seldom pay attention to it, because I know that firstly, the crew will work overtime in the actual work of the ship, and secondly, we only check their record sheets during the inspection process, which is not the actual work situation, and then even if the problem is found, the defects issued cannot be solved this problem.
		Seafarer: As engineers, we can meet the requirements of the rest time in most cases, but sometimes it is difficult to comply with it due to special activities such as port and cargo operations, so we will make slight adjustments to meet the requirements of the convention when recording.
10	Key insights on safety learning	PSCO: Case study has always been an effective way to improve the safety level in the maritime field, because

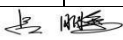
	culture in maritime industry	<p>it can directly reflect some problems and leave a deep impression on everyone.</p> <p>Seafarer: Every week we can receive our fleet weekly safety report, which contains some near-miss and accidents report, I think is really a good way to learning and improve our safety on board.</p>
11	Support a safety learning culture in PSC regime	<p>PSCO: During the inspection, when deficiencies are found, I will confirm with the crew and tell them the specific requirements of the convention.</p> <p>Seafarer : First of all, we certainly do not want PSC to find many problems with our ship during the inspection process, but we will take seriously and analyze each deficiency found in the actual inspection to avoid similar situations from happening again</p>

Appendix 2: WMU Research Ethics Committee Protocol



WMU Research Ethics Committee Protocol

Name of principal researcher:	Peng Lyu
Name(s) of any co-researcher(s):	N.A
If applicable, for which degree is each researcher registered?	MSc in Maritime Affairs under the specialization of Maritime Safety and Environmental Administration (MSEA)
Name of supervisor, if any:	Professor RAPHAEL BAUMLER, Doctor MARIA CARRERA ARCE (co-supervisor)
Title of project:	Support a safety learning culture in Port State Control regime
Is the research funded externally?	No
If so, by which agency?	N.A
Where will the research be carried out?	WMU, Malmö.
How will the participants be recruited?	Working in collaboration with Chinese PSCOs, and random selection of Chinese seafarers calling China ports or sign off at home.
How many participants will take part?	About 10 Chinese seafarers and 20 Chinese PSCOs
Will they be paid?	No
If so, please supply details:	N.A
How will the research data be collected (by interview, by questionnaires, etc.)?	By Semi-structured interview
How will the research data be stored?	In the personal laptop with strong password
How and when will the research data be disposed of?	After completion of my Master's degree (October 2023)
Is a risk assessment necessary? If so, please attach	No necessary

Signature(s) of Researcher(s): 

Date: 19.06.2023

Signature of Supervisor: 

Date: 20 June 2023

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

WMU Research Ethics Committee Approval

REC DECISION # REC-23-042(M) Inbox x



Email, PhD <PhD@wmu.se> (sent by cef@wmu.se)
to me, Raphael, Maria ▾

Mon, Jun 26, 11:27 PM (13 days ago)



Dear Peng Lyu,

I am pleased to let you know that the members of the WMU Research Ethics Committee (REC) have now unanimously **approved** the research related documents that you submitted to this office on 20 June 2023 concerning your research study involving human participation.

You are now free to start your data collection work in consultation with your supervisors.

With kind regards,

Carla Fischer
REC Secretary
Faculty Support Officer
Research Projects and Doctoral Programs