Ship Detention Factors Under Port State Control in Malaysia

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ABSTRACT

Port State Control (PSC) is the process of inspecting foreign ships in national ports to make sure that they adhere to international conventions and rules for safe shipping and the reduction of marine pollution. A ship is subject to detention when it is found unsafe to the crew, ship, and environment and is released once the deficiencies are rectified. Based on previous studies and information, this research selects ten factors of ship detention and identifies the main factors leading to ship detainment in Malaysia. Thus, a statistical analysis is conducted with the data provided by the Malaysian Marine Department and the Tokyo MoU PSC database. The factors that recorded the highest detainment are then considered the critical factors of ship detention in Malaysia. According to this research, the main factors that led to ship detention are certificates and documentation, life-saving appliances and fire safety measures, and countermeasures. Since there is limited research done in Malaysia, this study looks into various factors of ship detention, specifically in ports of Malaysia. Furthermore, this research proposes a proper decision-making method to ensure the ship's safety and pass over future inspections.

Keywords: Port State Control (PSC); ship detention; ship inspection

1. INTRODUCTION

In early 1970, frequent marine accidents significantly endangered life at sea and property due to increased marine traffic density. At that time, ship safety and inspection of ships were placed under Flag State Control (FSC); however, flag states could not maintain full control of the ships due to increased restraint and high demand. Due to the inadequacy of FSC, a few significant accidents were found to be involved sub-standard ships. Therefore, it is when the enforcement of Port State Control (PSC) becomes necessary to take preventive actions against substandard vessels.

To improve maritime safety and safeguard marine resources, life, and the environment to provide liveable and workable circumstances, each PSC authority examines the ships of various nations upon port arrival. Since PSC's inception, it has functioned as an international shipping regulatory model to remedy the flaw in the flag state regulation model by enhancing the defense of the maritime environment and shipping safety by ensuring the seaworthiness of the examined ship (Chen et al., 2019).

PSC is a mechanism that is adopted worldwide. It concentrates on safeguarding, maintaining shipping standards, reducing marine-based pollution, and ensuring life and marine property safety at sea (Li, 2002). This is one of the defence mechanisms (more specifically, second line) against substandard shipping strategies. The regional maritime authorities have signed a Memorandum of Understanding (MoU) on PSC to build standardized PSC systems and end substandard shipping throughout the region. Using the Paris MoU, Tokyo MoU, United States Coast Guard (USCG), Latin American Agreement, Indian Ocean MoU, and Black Sea MoU as a foundation, local PSC systems have been built by international maritime companies. Based on a Memorandum of Understanding, ten PSC regimes exist globally and comprise all these local PSCs.

The PSC allows the empowerment of the port state government with exclusive power on the arrival ships, whereby the PSC officers inspect those ships in line with the rules and regulations (Marten, 2016). Furthermore, they can detain ships if the ship and the crew condition are not up to relevant regulations. Detained ships will not be released until rectifying this identified deficiency threatens the environment and the crew on board. More extended detention affects many aspects- such as mismanagement of schedules, hamper economically to the shipowner, especially to the ships that carry freights. Therefore, ship detention becomes a severe issue for the respective authorities, including the shipowner.

Previous research has been done to determine ship detention factors under PSC. However, there is limited research done to study the factors of ship detention in Malaysia. By implementing the GRA model, Chen et al. (2019) identified several factors for the Asia Pacific region. Using a quantitative approach, this study analyses statistical data on ships detained in Malaysia to identify the main detention factors under PSC in Malaysia. The detailed information on detained ships was acquired from Asia Pacific computerized Information System (ACPIS) and Tokyo MoU database from 2013-2018. We focused on analyzing the ship detention factors that enhance the decision-making for the safety purposes of ships and the

protection of maritime environments. The results can serve as references for the stakeholders of the shipping industry, including the government.

2. LITERATURE REVIEW

PSC detention has been widely researched. Many studies were done before this to investigate more on the factors using various research methods. Chen et al. (2019) utilized Port State Control inspection and detention data to identify the critical factors of ship detention. To evaluate ship detention variables under PSC, this research builds the GRA model with enhanced entropy weight using statistical data on ship detention from the Tokyo MoU from 2008 to 2017. Based on the data analyzed, the ISM, emergency systems, and fire safety precautions were found to be the most relevant, indicating that these elements play a role in ship detentions. This paper's essential contribution was to give government and shipping companies a basis for making decisions to identify the causes of ship detention and prevent it in the future (Chen et al., 2019).

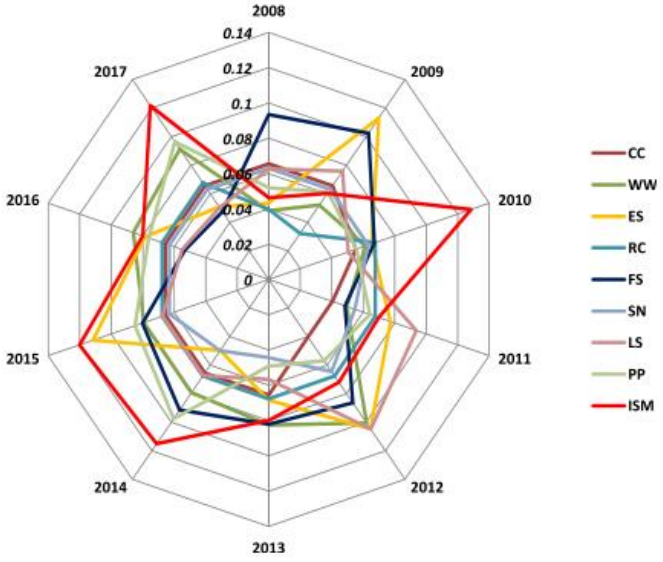

Figure 1: Trend of ship detention factors
Source: Chen J et al., (2019)

The research also examined the relationships between detention deficiencies, external factors, and detainable deficiencies. One exciting discovery in this research was specific ports, flag states, class societies, and shipping companies associated with particular deficiencies (Tsou, 2018). Tsou (2018) claimed that association rule mining techniques in extensive data analysis could accurately determine the regularity correlation between ship detention deficiencies and related factors.

2.1 Ship's risk profile

The Paris MoU was the first to develop a process for choosing which vessels to inspect. The vessel already designated in the category of priority inspection and the higher general selection factor were the first two procedural criteria for choosing boats for inspection (Paris MoU, 2019). Each ship was given a risk profile in 2011 to help determine any potential future inspections. The ship's risk profile is categorized as high, standard, or low based on general and historical factors (HR, SR, or LR). Recalculating the pattern takes changes in dynamic parameters like age, the previous 36 months' history, and corporate performance into account. For each ship's data, a risk profile, a potential inspection benchmark, and the time between inspection and scope are allocated (Ravira et al., 2016). According to the ship's risk profile, the inspection and selection process determines the frequency and priority of inspections (Bang and Jang 2012).

2.2 Contributing factors of ship detention

According to the Annual Report on PSC in the Asia Pacific, ship detentions have decreased while inspection has increased. In 2017, the percentage of detention recorded by the Malaysian authority was 1.55%. Although there is an improvement in the quality and performance of shipping in the region, there are still unsafe and substandard ships trading across the region. Despite the decline in detention numbers, the factors have contributed to varied detentions (Tokyo MoU, 2017).

Figure 2: Top 10 contributing factors of ship detention

2.3 Port State Control in Malaysia

Malaysia is categorized as one of the "white list" countries under the Tokyo MoU. They take detention by any local or foreign port authorities due to serious non-compliance to cancel the certificate of registry of the detained ships (Tokyo MoU, 2017). The Malaysian Marine Department administers all the issues related to inspection and detention in the Malaysian region. There are seven regions of Marine Departments in Malaysia, consisting of the central, northern, southern, east coast, Sabah, Sarawak, and Labuan regions. Consequently, the

Marine Department that governs PSC in Port Klang is in the central region of Malaysia (Jeevan et al., 2015).

2.4 The effects of ship detention

An inspected ship that is said to fail the minimum standards is detained, and the deficiencies must be rectified before the ship is released. Sometimes, ships can be banned from re-entering the ports if detained several times. Thus, a detained ship affects the company's reputation and the registry's flag (Perepelkin et al., 2010). Shipowners and companies wish to avoid detention because it increases the economic costs and future inspection rates. Moreover, the ship's detention disrupts the schedule and undermines the profits of the shipping company. So, shipping companies and port state authorities take this matter seriously. As stated in the International Law Reports, the damage is suffered when the ship loses its freight, charter, and purchase option due to detention, leading to a loss of profit. Therefore, the ship would be in high demand; however, its detention affects its reputation (Lauterpacht, 1986).

3. METHODOLOGY

3.1 Methodological Approach

A variety of variables cause ship detention. This article examines the Annual Reports on Port State Control in the Tokyo MoU Asia Pacific Region to determine the primary variables considered during the inspection. According to the Annual Reports, the listed factors include crew certificates, Water/Weathertight conditions, emergency systems, radio communications, fire safety measures, the safety of navigation, life-saving equipment, pollution prevention, and ISM. Another factor was included in this paper: the ship's age, which significantly contributes to the ship's detention (Cariou et al., 2009). It is also found that the probability of vessel detention also increases with the vessel's age.

3.2 Data Sources

A computerized database system known as Asia-Pacific Computerized Information System was established to report and store port state control inspection results and facilitate the exchange of information in the Asia Pacific region, including Malaysia. The data used in this study was gathered from 2013 to 2018 within the regions of Tokyo, MoU, and Malaysia. The data is downloaded from Tokyo Mou's website in a Microsoft Excel format. Accurate information about the vessel, the flag of the registry, recognized organizations, the type of vessel, the gross tonnage, the deadweight tonnage, the year of delivery, the type of inspection (the initial or follow-up), the inspection date, the detention date, the release date, the location of the inspection, the inspecting authority, and the records of detention are all provided for each PSC inspection, and types of detention found. Besides, data was gathered from the Malaysian Marine Department to get additional Port State Control Officers' sources. Based

on the collected data, the factors that recorded the highest detention are the key to ship detention.

3.3 Method of Analysis

Statistical analysis generates statistics from a data source and studies the results to infer meaning from the gathered data set. It provides crucial information on the collected data and the analysis of samples to achieve the research objectives. Thus, the statistical analysis is carried out to determine the key factors of ship detention in Malaysia. The factors of ship detention are obtained by dividing the number of detentions in a particular year by the total number of ship detention which is 111. Then, data is then analyzed and compared every year to determine which factor contributed to vessel detention in Malaysia. This calculation method is carried out in Microsoft Excel for easy data recording.

Table 1 shows the detailed description of ship detention factors considered in this research—these factors are set as criteria for detaining ships under the PSC of Tokyo MoU.

Table 1: A detailed description of ship detention factors considered in this research

Factors	Items	Code	Descriptions
F1	Certificates and Documentation	CD	Check all the crew certificates and required documents.
F2	Water/weathertight conditions	WW	Verify that load lines, freeboard signs, shelters, ventilation, air pipes, bushings, portholes, hatches, and other watertight ships are all in good working order.
F3	Emergency Systems	ES	Verify that the emergency fire pumps, power supply, lighting facilities, fire drills, and safety zones are functioning correctly.
F4	Radio Communications	RC	Check for broken radio communication equipment, poor upkeep, the inability to hear safety alerts, and a lack of adequately stored radio logs.
F5	Fire Safety Measures	FS	Examine the structural integrity of the fire protection, the fire detection and alarm system, the fixed fire extinguishing systems, and the firefighting pumps, pipes, and valves for any flaws.
F6	Safety of Navigation	SN	Various navigation safety-related equipment should be checked for faults, including charts, radar, voyage recorders, speed and range indicators, non-compliance with voyage plans, navigation records, and navigation

			monitoring.
F7	Life-saving equipment	LS	Check for any flaws in the preparation of the life-saving equipment, the life-saving boats, the life-saving appliances, the aboard drills, and the survival instruction.
F8	Pollution Prevention	PP	Examine the equipment for any MARPOL, convention appendix, anti-fouling, and ballast water compliance issues.
F9	ISM	ISM	Look for violations of the ISM rules for ship operation, manpower and resource allocation, upkeep of the ship and its equipment, and safety and environmental regulations.
F10	Age of ship	AS	Look for flaws in the ship's hull structure, life-saving equipment, and age factor that are not in compliance with current standard regulations.

Source: Annual Reports on Port State Control of Tokyo MoU; Cariou et al., 2009

4. RESULTS AND DISCUSSION

From 2013 to 2018, 111 ships were detained by the Malaysian port authority, and the Malaysian Port Authority carried out 7177 inspections during these five years. The total number of deficiencies recorded was 12249 showing an increase in the number of deficiencies from 2013 to 2018. The development trends of ship detention vary yearly, whereby the detention percentage has fluctuated over the past five years. The five-year range is sufficient to analyze and determine the contributing factors of detention. In 2015, the percentage of vessels detained by the Malaysian Port Authority was recorded to be the highest, 2.84 %, in five years, and the detention rate slightly reduced afterward.

Although ships operating in the region have improved, the factor has led to varied detention and contribution. Thus, this paper carries out an analysis to determine the critical factors of ship detention. An additional parameter was added in this research to identify whether the vessel's age plays a vital role in ship detention.

Year	No. of inspection	No. of inspection with deficiencies	No. of deficiencies	No. of detention	Percentage %
2013	898	443	1763	17	1.89
2014	918	380	1357	9	0.98
2015	1057	444	1833	30	2.84
2016	1193	469	1855	18	1.51

2017	1544	603	2918	24	1.55
2018	1567	615	2523	13	0.83

Table 2. Number of detention and inspection (2013-2018)

4.1 Ship Detention Factors

This study gathers PSC ship detention data under ten factors in Malaysia's recent five years (2013-2018), which Tokyo MoU governs. In accordance with the above figures, the categories represent the factors in abbreviation form and the number of ship detention from 2013 to 2018. The data is analyzed for each year

Detailed information on the detained ships was extracted from the database of the Tokyo MoU. The extracted data is then analyzed into statistical data and compared yearly to identify which factors have recorded the highest number of ship detentions in Malaysia. It has been noted that certificate and documentation, fire safety measures, and life-saving appliances continue to be the top three categories of deficiencies discovered on ships in 2018, with 22 deficiencies related to fire safety measures, 17 deficiencies pertaining to certificate and documentation, and 14 deficiencies related to life-saving appliances were recorded, representing nearly 56% of the total number of documented deficiencies.

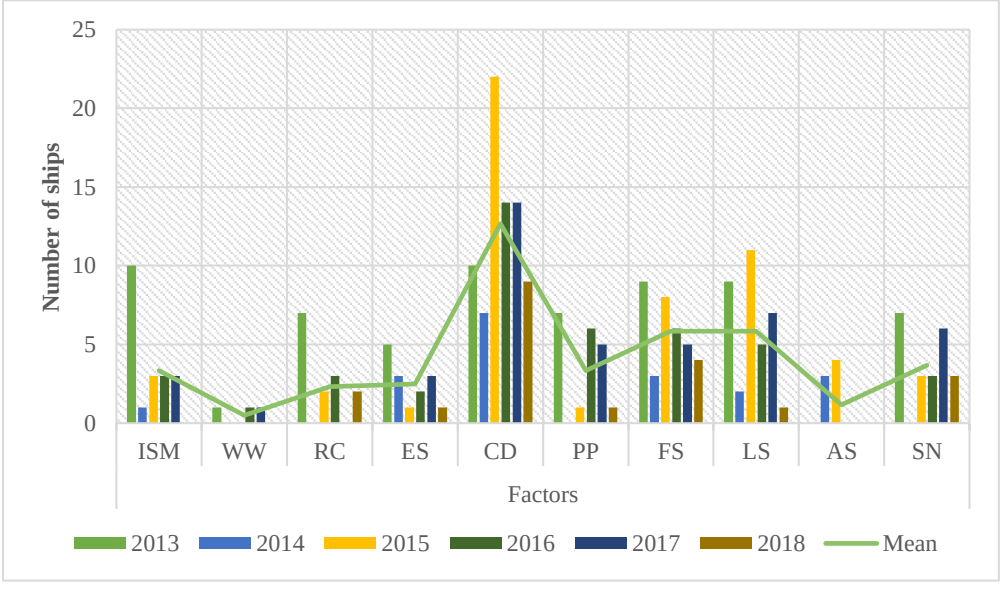

Figure 03: Percentage of factors that caused ship detention in different years.

Data and statistics show that, from 2013 to 2018, the deficiencies that recorded the highest percentage of detention were 43% for Certificate and Documentation. Ships were detained when they did not comply with IMO's requirements and were not valid. A Port State Control inspection includes inspecting machinery, equipment, and ship structure and verifying

relevant certificates and documents. All the certificates and documents to be carried onboard are valid and follow applicable international conventions and regulations.

Table 3: Descriptive statistics of factors that caused ship detention from 2013-2018

Factors	ISM	WW	RC	ES	CD	PP	FS	LS	AS	SN
Mean	3.33	0.5	2.33	2.5	12.67	3.33	5.83	5.83	1.17	3.67
SD	3.197	0.5	2.357	1.384	4.887	2.749	2.115	3.578	1.675	2.285
Min-Max	0-10	0-1	0-7	1-5	7-22	0-7	3-9	1-11	0-4	0-7

The trend of ship detention is followed by Fire Safety Measures (FS), which recorded the second most significant factor of detention at 19% from 2013 to 2018. Meanwhile, Life-Saving Appliances (LS) is Malaysia's third most significant contributor to shipping detention. Inspecting firefighting equipment and life-saving appliances ensures they are properly maintained and ready to use.

Moreover, most lifeboats and lifebuoys found the most deficiencies in life-saving appliances than any other life-saving equipment. Focus is also given to ISM compliance, Emergency Systems (ES), and Safety of Navigation, which shows implications for ship detention over the years. On the other hand, deficiencies relating to labor conditions ratified by Maritime Labour Condition (MLC) have increased yearly. The implications and contributing factors should be considered for enhancement in the upcoming years.

5. CONCLUSION

For the benefit of shipping businesses and other stakeholders, port state control ship detention should be well analyzed. It provides a reference for ships to ensure safe sailing, standard operation, and pass-over PSC inspection. Governments and policymakers shall consider enhancing the areas such as certificates and documents, fire safety measures, and life-saving appliances for improved inspections so that risk involving accidents and maritime pollution is reduced and

Maintained. Thus, ship companies and governments are safe from economic loss and sustain a good reputation. Further consideration should also be given to the age of vessels as a criterion during the inspection. For instance, in Malaysia, oil tankers and bulk carriers of 20 years are subject to approval and verification before ship registration.

The vital contribution of this research paper is to provide effective methods to pass over ship inspections in the future. The Port State Control Officers suggested these methods to reduce the implication of detention. Some of the recommended preventive measures include the Planned Maintenance System, which should be up to date, enhancing the role of FSC over PSC, and ensuring ship auditing is done at the specified time. Furthermore, timely self-inspection, crew education, and ensuring ISM compliance are vital to reducing the number of

detention and effectively preventing pollution. In this paper, detailed information was considered for further review and analysis.

This paper implements statistical analysis to identify the factors of ship detention. This study is reasonable and adequate. The presented research results and analyses can help shipping companies undertake measures whereby the safety of ships will be increased, thus fulfilling the requirements of International Conventions and Regulations.

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