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EFFECTIVENESS OF PORT STATE CONTROL INSPECTIONS WITHIN THE FRAMEWORK OF THE MEDITERRANEAN MEMORANDUM OF UNDERSTANDING

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ABSTRACT

During the end of the last century, marine accidents triggered the maritime community to apply and develop the international regulations for safety and environmental protection. Consequently, Port State Control (PSC) regulations were introduced as a new mechanism to enforce the implementation of such regulations. The main target for PSC is to exclude the substandard ships from the seaborne fleet, ensure ships safety and reliability in clean seas.

The PSC programmes have been regarded as the main measure to improve maritime safety level, and the methods for selecting ships for inspection are a necessary part of the PSC programmes due to their effectiveness. This research assesses the methods adopted by the USCG, the Paris MOU, and the Med MOU as three representatives of the different regional memorandums. Data on the PSC inspection records (annually, from 2007-2017) were collected and analyzed.

Quantitative analyses will be concerned with the collection and analysis of data in numeric form and are intended to emphasize the relatively large scale and representative sets of data. On the other hand, qualitative analyses will be concerned with collecting and analyzing information in as many forms.

KEYWORDS: *Port State Control (PSC) Regulations, Qualitative Analyses, Development of Information Technology*

INTRODUCTION

Port State Control (PSC) is a system of harmonized inspection procedures designed to target sub-standard vessels with the main objective being their eventual elimination. PSC involves the inspection of foreign ships in the national ports world wide to verify that the condition of the ship and its equipment comply with international standards and that the ship is manned and operated in compliance with these standards. Many of IMO's most important technical conventions contain provisions for ships to be inspected when they visit foreign ports to ensure that they meet IMO requirements. These inspections were originally intended to be a back-up to flag state implementation (Bang, 2009).

The united Nations Convention on the Law of the Sea (UNCLOS) Article 25, empowered states whose ports were used by vessels to take necessary steps to prevent any violation of the conditions to which the call at its ports by such vessels may be subject. For inspection, (UNCLOS) Articles 216, and 218, enables a port state to enforce international anti-dumping and anti-pollution measures. Moreover, states are required by Article 219 to take administrative measures to prevent misbehaving vessels from sailing. Legality for PSC inspections may be found in these Articles of (UNCLOS), because it is possible for there to be an oil pollution threat, even if only bunkers, from an unseaworthy ship.

The only limitation is that the steps are taken were reasonable, public, and fair (Articles 25, 216, 218, and 219 of the UNCLOS, 1982).

In March 1978, the grounding of the supertanker "Amoco Cadiz" off the coast of Brittany (France) resulted in a massive oil spill, causing a strong political and public outcry in Europe, calling for more stringent regulations with regard to the safety of shipping. This pressure resulted in a more comprehensive Memorandum of Understanding signed in Paris in 1982 and known as Paris MOU.

States within various regions have grouped together under memorandums of understanding (MOU) with respect to PSC. Regional PSC regimes have developed to eliminate substandard ships, to enhance the efficiency of PSC inspections by means of harmonization between port states and sharing of information, and to reduce the burden of repetitive inspections of foreign ships.

The creation of the other regional MOUs followed of the successful operation of the Paris MOU. Resolution A.682 (17) concerning regional cooperation in the control of ships and discharges, which was adopted by the IMO Assembly in 1991, acknowledged the performance of the Paris MOU in combating substandard ships and called on the parties to the IMO to consider concluding more regional arrangements (IMO Resolution A.687 (17), 1991). The MOUs cover nearly all the regions of the world, e.g. Tokyo MOU (1993), Caribbean MOU (1996), Indian Ocean MOU (1998), Black Sea MOU (2000), and Riyadh MOU (2004). While the United States is not a member authority under any regional MOU, the United States Coast Guard (USCG) has its own PSC program.

The Memorandum of Understanding on Port State Control in the Mediterranean Region (Med MOU) was established following a declaration by the European Community (EC) that it would finance a cooperation project supported by the IMO and ILO in an effort to increase the maritime safety of shipping and pollution prevention. The Mediterranean PSC MOU was concluded in Malta, eightmember authorities signed it on July 1997: Algeria, Cyprus, Egypt, Israel, Malta, Morocco, Tunisia, and Turkey. Lebanon and Jordan have subsequently joined. Cyprus and Malta have also joined the Paris MOU, and Italy and Spain (Paris MOU members) are observers, which raise questions about the possible expansion of the Paris MOU to cover this region and about seeking ways to have the two MOUs work together more closely. The Mediterranean MOU is similar to the earlier regional MOUs such as the Tokyo MOU. The inspection rate is set at 15% of the estimated number of individual foreign merchant ships that enter the ports of its parties (www.memou.org).

LITERATURE REVIEW

Attempts were made to analyze the effect of PSC inspections on the probability of the casualty by Knapp (2007). Cariou, et al (2008) analyzed the relationship between marine vessel total losses and selected vessel population characteristics such as ship age and registration flag. Gasparotti, et al (2008) studied the main causes and sub-clauses that affect ship operation safety at sea and revealed the need for implementing a Safety Management System in each shipping company. By applying the cause-effect method, it was found necessary to implement a sea pollution and safety management system to provide more safety in ship operation. Knapp and Velden (2009) recommend accelerating the harmonization process by putting more emphasis on the harmonization of inspection procedures, combined training of PSC officers and the use of combined data sets across regimes.

Cariou, et al, (2009) investigated the determinants of the number of deficiencies and of the probability of detonation. The results show that the main contributors to detention are the age of the vessel at the inspection, the recognized organization and the place where the inspection occurs.Mejia,et al (2010) investigated the newly implemented PSC system in Taiwan. The major contents include the introduction of the system and the analysis of ship's inspection results over the past four years. The research further discusses some in-depth issues about the system, including the difficulties of the implementation and the inadequacies of the system.

Moreover, Rodrigo and Steliana (2010) established a common criterion for PSC of ships, harmonizing procedures for inspection and detention and taking into account the commitment made by the maritime authorities of Romania. Elwakeel (2010) studied the role of classification societies in the PSC system to ensure ships safety and reliability in clean seas. This research recommended that more co-operation and exchange of data is required. Also, it concluded that the PSC system must be more efficient, and detentions-of-ship statistics should not be regarded as an efficient PSC system, in order to get an enhanced and better targeted PSC and reduction of the number of inspections of ships of good ship operators.

Sam and Jong (2012) examined the regional MOUs with a focus on their operational strengths and weaknesses. Also, they discussed the regional PSC MOU regimes systematically in order to show a degree of comparison between them and to evaluate which MOUs may need more assistance. Some of the regional MOUs, e.g., the Caribbean, Abuja, and Riyadh MOUs have not fully participated in the PSC that can be perceived as important programs to deal with substandard ships. Kara (2016) attempted to assess the performance of flag states in the Black Sea MOU by using the method of the weighted-sum model.

PSC Effectiveness versus Ships-Selection Method

Three concepts are used to assess the merits of the PSC selection methods; these are effectiveness, efficiency, and stability. Effectiveness is the power of the selection method to target substandard ships in advance. Efficiency means that the inspected ships based on the selection method are highly likely to be substandard ships. Stability means that the efficiency can remain at a fixed value at any time. An ideal selection method can be an effective one with high efficiency and high stability (Ozcayir, 2004; Haisha, 2008).

Inspection number and detention number are the two main items used to measure the practicality of the PSC selection methods. The two indicators were used in former studies, e.g. Li (1999); Chen (2001); Haisha (2008)and Cariou, et al (2009).

To investigate the effectiveness of the selection method, inspection number and detention number are observed. The effectiveness can be judged directly when the condition is satisfied that after checking the ships according to the selection method, the port state authorities can find substandard ships. To investigate the efficiency of the selection method, a measure called Detention-Inspection Rate (DIR) is used. The concept of efficiency is borrowed from Economics, and economic efficiency is a general term for the value assigned to a situation under which a measure is designed to reduce the amount of waste (Ozcayir, 2004).

Economic efficiency is achieved by dividing the produced output by the cost. In PSC, the inspection number can

be regarded as cost and the detention number is the output. A DIR per year can be calculated by using the following formula (Ozcayir, 2004):

$$\text{DIR}\ (\%) = \frac{\text{number of detentions}}{\text{number of inspections}} \times 100 \quad (1)$$

For example, the Med MOU states inspected 19700 ships and detained 1300 ships in 2015. Substituting these data in the above formula, a DIR value of the Med MOU in 2015 can be obtained:

$$\text{DIR} = \frac{1300}{19700} \times 100 = 6.6\% \quad (2)$$

The efficiency of the selection method is higher, the higher the value of DIR is. The logic behind this criterion is that the production of a unit of goods or services is termed economically efficient when that unit of goods or services is produced at the lowest possible cost (Haisha, 2008).

To measure the stability of the selection method, Standard Deviation (SD) is used. Since the variation of DIR obtained from any selection method shows the method's stability, the standard deviation of the selection method was used to measure the variation range. A method with a lower stability has a greater standard deviation. An ideal PSC selection method should not only have a high level of efficiency but also high stability.

In order to make this point clear, the yearly inspection number and detention number of ships according to Med MOU, Paris MOU, and the USCG are considered in the period from 2007-2017(Med MOU, Paris MOU, and USCG, Annual reports of PSC inspections, 2007-2017. These data are illustrated in Figure 1 (a) and (b).

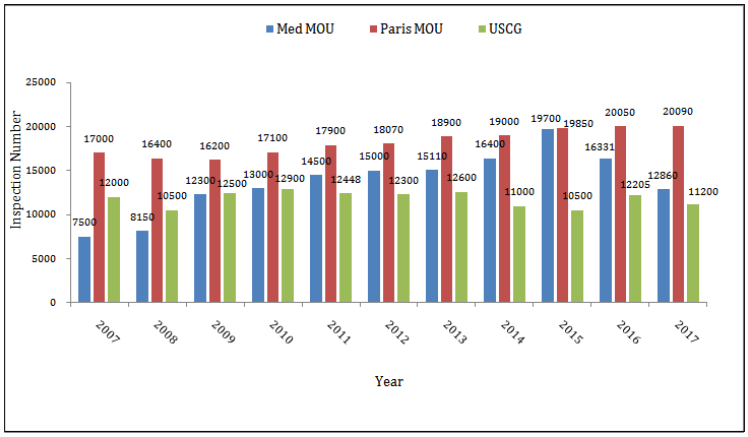

Figure 1 (a): Inspection Number According To Med MOU, Paris MOU, and USCG (2007-2017)

Source: Med MOU, Paris MOU, and USCG, Annual Reports of PSC Inspections, 2007-2017

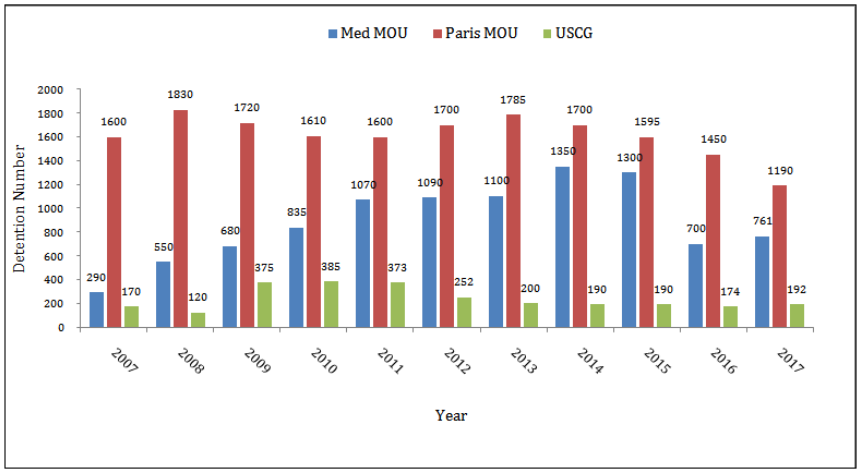

Figure 1 (b): Detention Number According to Med MOU, Paris MOU, and USCG (2007-2017)

Source: Med MOU, Paris MOU, and USCG, Annual reports of PSC inspections, 2007-2017

Equation (1) has been applied to calculate the yearly detention-inspection rate (DIR) for these data and the results are depicted in Figure 2.

The three lines represent the DIR yearly changes for each selection method adopted by Med MOU, Paris MOU, and USCG.

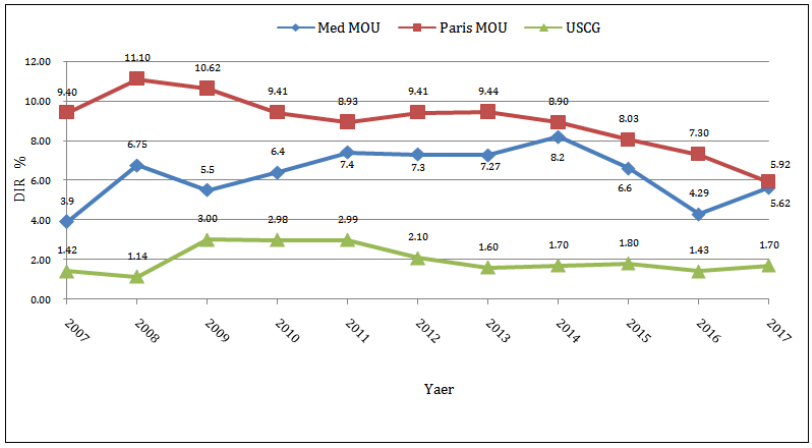

Figure 2: DIR According to Med MOU, Paris MOU, and USCG (2007-2017)

The SPSS statistical package has been used to calculate the mean, variance and standard deviation for the yearly DIR data, and the results are listed in Table 1.

The yearly DIR values of the USCG are seen to be lower than the values of each of the Paris MOU and the Med MOU. On the other hand, the USCG is seen to have the highest stability, since it has the lowest SD value (0.6877). This result implies that the USCG DIR values fluctuate about the mean value, but are close to it. Although the USCG selection method is the best in terms of stability, it is the lowest in terms of efficiency, as has been shown previously.

Table 1: Mean, Variance and Standard Deviation for the Yearly DIR According to Med MOU, Paris MOU and USCG (2007-2017)

Parameter	Med MOU	Paris MOU	USCG
Mean DIR	6.2936	8.9509	1.9873
Variance	1.7965	2.1030	0.4730
SD_{DIR}	1.3404	1.4502	0.6877

The selection methods adopted by the Paris MOU and the Med MOU have relatively high efficiency, with Paris MOU efficiency generally higher than that of Med MOU. Nonetheless, both have lower stability (1.4502, and1.3404), respectively, when compared with the stability of the USCG. Therefore, it can be concluded that the methods of the Paris MOU and the Med MOU have a relatively high efficiency with low stability.

Another observation is that the methods of the Paris MOU and the Med MOU give close results to each other, especially starting from the year 2011, with the exception of the year 2016. For example, in 2011, the DIR of the Paris MOU was 8.93%, that of the Med MOU's was 7.40%, with a difference of1.53%. In 2017, the difference was reduced to 0.3%, corresponding to the respective DIR values of 5.92% and 5.62%. This indicates that there must be some reason that causes the effectiveness of these two methods to have the same developmental trend.

Assessment of Selection Methods

The evidence shown by analyzing DIR and SD of the three selection methods indicates that none of the methods have the best level of efficiency and stability, i.e. effectiveness. The USCG has the highest stability with low efficiency, whereas the Paris MOU and the Med MOU have a relatively high efficiency but low stability.

This is caused by the differences between the selection methods adopted by the Med MOU, the Paris MOU, and the USCG. The first column in Table 2lists the ship-selection criteria in the three selection methods and the second, third and fourth columns show the criteria adopted in each of the three selecting methods. From a quantity standpoint, the USCG has nine criteria’s, the Paris MOU has ten and the Med MOU has only eight.

The range of vessels' information collected by the USCG is the widest, involves ship owner/manager/charterer detention ratio; another operation control number (i.e. Customs hold); and casualty number. Also, the Paris MOU collects more detailed information than the Med MOU. The Paris MOU information involves flag states that have not ratified all conventions and classification society detention ratio.

All these methods are effective, but there are different efficiency and stability, the method adopted by the USCG has high stability, and the methods used by the Paris MOU and the Med MOU have high efficiency. The findings suggest that the ships-inspection criteria adopted by the Med MOU need to be improved and also suggest combining these three selecting methods to enhance the effectiveness of the PSC inspections within the framework of the Mediterranean memorandum of understanding.

Table 2: Risk Indicators Comparison

Ship-Selection Criteria	USCG*	Paris MOU#	Med MOU¥
A Ship Owner / Manager / Charterer Detention Ratio	✓	×	×
A fag State Detention Ratio	✓	✓	✓
Flag State has Not Ratified all Conventions	×	✓	×
A Classification Society Detention Ratio	✓	✓	×
Non Recognized Classification Society	×	✓	✓
Detention Number	✓	✓	✓
Other Operation Number (i.e. Customs Hold)	✓	×	×
Casualty Number	✓	×	×
Time Since Last Initial Inspection	✓	✓	✓
Deficiency	✓	✓	✓
Outstanding Deficiencies	×	✓	✓
Ship Type and ship age	✓	✓	×
Ship age	×	✓	✓
Ship Type	×	×	✓

Note: (✓) means that this criterion is considered; (×) means that it is not considered

Source: *USCG Marine Safety Manual (homeport.uscg.mil/mycg/portal/ep/);

#Paris MOU's Target Factor (http: //www.parismou.org/upload/pdf/tf.pdf.); and

¥Med MOU Port State Control Manual 2017

CONCLUSIONS AND SUGGESTIONS

The detention inspection rate of a selection method has been very useful in revealing the efficiency level and stability of the different selection methods adopted by the USCG, the Paris MOU and the Med MOU. The three methods have quite variant efficient levels and stability. In detail, the method adopted by the USCG has high stability and the methods used by the Paris MOU and the Med MOU has high efficiency levels. So these methods are all effective, however, there are different efficient level and stability.

These findings suggest that the methods need to be improved and also suggest combining these three selecting methods to strengthen the enforcement of the PSC programmes. Meanwhile, with the development of information technology, regional PSC database is built on the basis of the method of targeting inspection ships. However, there are barriers among these regional PSC databases to share information because of the different targeting inspection methods. Therefore a uniform selection method is required to share vessels' information.

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