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THE NEW INSPECTION REGIME ON PORT STATE CONTROL AS A TOOL IN THE OPERATIONAL MANAGEMENT AT THE LEVEL OF SHIP OWNER / SHIP OPERATOR COMPANY

Doctoral dissertation

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Abstract

The dissertation primary extents are to identify the possible improvement in the Port State Control inspection procedures to increase the effectiveness of the targeting system, furthermore, the possibility of harmonisation of the international rules by coordination under IMO legal instruments implemented and ratified by all members.

The research main objectives were to distinguish management methods and dedicated approach towards Maritime Safety and Safety of Life at Sea procedures at the level of ship Owner/Ship operator with the attempt to identify possible ISM new measures/procedures resulting to increase maritime safety and reduce risks associated with ships operating as well as increase of the operational and managerial effectiveness, where regulations and technical standards apply to all maritime sector wherever in the world they operate.

By addressing Shipping Management efficiency and effectiveness, attention should be given to the increasing operations costs, including those related to the implementation of safety policy under new regulations and the effectiveness of avoiding accidents or major environmental damage. Nevertheless, this efficiency always conditioned by cost optimisation and mitigating concomitant management risk. Therefore, managing safety in shipping became a combination of regular training, governing regulations, and advancements in technology used by parties involved in marine transportation including marine state agencies as port state control. It has been 2,611 reported shipping casualties during 2016, decreasing 4 per cent during 12 months. Machinery damage and engine failure is the primary cause and was also responsible for driving 16 percent[14] of the reported cases. Growing complexity and interconnectivity of shipping risk with Environmental damage fines issued for add-in present economic instability a significant cost raises and higher risks to Owners liability under an insurance contract with P&I Clubs.

[14] Allianz Global Corporate & Specialty, Safety and Shipping Review, 2017

The decline in the number of total losses and incidents and casualties' year-on-year, combined with the reduction in mid-sized claims seen in recent years, is likely to reflect this improving safety culture in the shipping industry. The practical analysis shows that shipping management, in general, gain financially from the reducing risk of total loss of ships realised by a port state control inspection, example was measured the total insured value (TIV)-based on total estimated cost savings (TECS), vary from USD 74 to 192.8 thousand (median value of USD 18.9 to 45.9 thousand). For industry inspections, the range runs from USD 93.5 to 169.5 thousand (median values of USD 16.8 to 33.1 thousand) for dry bulk, and from USD 136.7 to 379.0 thousand (median values of USD 43.6 to 131 thousand) for tankers. It is not surprising that the cost savings of industry inspections are higher, especially for tankers, since the effect of industry inspections is stronger and much more extensive than port state control inspections[15]. Considering outlined determinants in maritime transportation and its management responsibility against ships safety under international rules in force, especially at the level of the shipowner, Author indicates the main methodological aspects of the dissertation as:

1.The object of the research:

Maritime Safety and Safety of Life at Sea under present binding regulations and Port State Control inspection regimes as safety net targeting -sub-standards vessels. Obstacles in Maritime Safety Management and possible Safety Performance improvement

2. Research Area:

a. International Maritime Safety Regulations and Shipping Management from the fleet operator's perspective.

b. Management approach towards safety onboard under adopted SMS

c. Port State regulations and inspection targeting systems

3. Limitations in the research:

The operational aspects are considered from BRIESE SCHIFFAHRT GmbH & Co, which manages a fleet of more than 130 multipurpose heavy-lift vessels with 125 dedicated staff

[15] S. Knapp, G. Bijwaard, C.Heij, *Estimated incident cost savings in shipping due to inspections*, science Direct, ELSEVIER, Vol 43, July 20108

members at head office. Additionally, over 2,000 employees from various countries handle transportation tasks worldwide on board of BRIESE's vessels.

The scope of the efficiency categories: Ships Safety organisational efficiency related to operational (managerial) side.

Time frame: between years 2011 – 2015.

4. The theoretical part of the dissertation:

To define fundamental principles of Port State Control, explain the structure of three major authorities namely Paris MoU Port State Control, USCG and Tokyo MoU organisations, their aims towards environment protection and maritime safety. Comparison between the legal instruments represented and used by each memorandum.

a. To identify the New Inspection Regime on Port State Control as an efficient tool in the Maritime Safety Management System and its effectiveness of the Safety Management System towards safety implementation on board.
b. To review and systematise legal instruments related to Safety in Maritime Transportation (to prepare an original toolbox of instruments).
c. To conduct a comparative analysis and effectiveness of the new inspection regime of Paris MoU on Port State Control, USCG and Tokyo MoU in order to identify the differences of inspections models used by these three memoranda.
d. To identify possible improvements in present Port State Control Inspection Regimes to increase maritime safety and determine achievable improvements by harmonisation of rules and procedures internationally under IMO legal control.
e. To define SMS possible improvements to increase the efficiency of safety measures implemented on board and possible reduction of deficiencies or detentions by PSC (which influences the potential of the operational and organisational effectiveness).

5. The practical dimension of the dissertation (mainly at the level of shipowner/ship operator):

a. Support for the management team to increase safety effectiveness aboard by implementation of higher safety measurements through SMS.

b. Analyse the operational, organisational and consequently economic effects of implementing integrated safety systems such as occupational Health, Safety & Environment (OHSE) protection.
c. Recommendations to improve the Formal Safety Assessment basis on IMO's guidelines and evaluation of the cost-benefit from Maritime Safety Policy Instruments.
d. Whether it will be possible to unify PSC as one regime worldwide under IMO legislation as the universal regime.

6. The main working hypothesis:

Present experience with the implementation of ships safety management systems and the domain of safety of navigation and environment protection through analysis and selection of preventive solutions adopted by shipping managements basis on ships type and operation specifications shows the erosion of procedures at the level of shipowner/ship operator and create demand for improvement.

The research methods used in this dissertation:

a. Deduction, as a task is to build a comprehensive structure of work according to rules from general to specific;
b. Scientific material development (ordering, selection and elimination, classification, segregation and grouping);
c. Existing literature study and research in the field of management, transport, maritime safety to obtain an overview of the definitions and the existing *status quo*;
d. Critical analysis - distribution of a complex object of research into components including logical relationships;
e. Specific synthesis - assembly, recognition of parts resulting from the analysis as all, including;
    - Statistical reasoning with two stages' approach: Dirichlet distributions as the first approach to raw data examination, and consequently upgraded logarithm based on the Bayesian Network model as a second stage for better understanding of probability density and distribution;[1]

[1] Dirichlet distributions are commonly used as prior distributions in Bayesian statistics, and in fact the Dirichlet distribution is the conjugate prior of the categorical distribution and multinomial distribution – the Author's note.

- Comparative methods;
- The quantitative method, the data gathered are compared with the data available from Briese Shipping Management GmbH, Studied different MOU annual reports, DNVGL Port State Control Planner and online published Fairplay database;
- Mapping and Algorithmicising of the management processes.

Such defined methodological aspects of presented dissertations have laid the foundation for five chapters. To define the role of maritime transportation, the *First Chapter* highlights the dependence and interrelation between the seaborne trade and globalisation process. In this chapter the significance of the growing need for maritime transportation as globalisation development backbone has been emphasised at the beginning and, subsequently, the magnitude of maritime transportation in the economy, their potential results figure of the trade flow worldwide which is very often coordinated by multiple modal routes has been highlighted.

To explore maritime transportation as a universal facilitator for the global trade process some of the crucial figures are shown. Also, the first Chapter evaluates world merchant fleet distribution by age and ships type designed for a different type of commodities and finally examines at the end the impact of the international trade flow associated with slowing growth on maritime trade in the present economic situation and future prognoses.

Respectively, the *Second Chapter* points out crucial indispensable factors concern: risk management in the maritime transport safety and security domain. Understand the contemporary meaning of maritime security, explores the possible economic repercussions, the risk, anxiety against a nation's interests launched from the maritime domain. The increasing potential of modern terrorism has required countries to review their counterterrorism strategy to redevelop systems for the marine domain; border and transportation security through the International Maritime Organization IMO. The Second Chapter also elaborates the practical steps and regulations which have been adopted by IMO and other international organisations under UN umbrella involved in the maritime sector in order to set legislation and rules related to safety at sea, ships construction, equipment of the safety management system installed by commercial vessels. Additionally, it revealed all the regularities and legal framework- guidelines.

Understanding the risks associated with contemporary ships safety at sea permits to indicate management tools in hands used to protect environment and encounter adverse effects of human activity within various maritime boundaries by adopting a comprehensive multilateral treaty of technical measures and legal instruments, established the general rights and obligations of Port State Control forced as a reaction to the belief that many Flag States are unable to adequately perform their mandatory duties that ships are flying their flag fully comply with international safety standards. Define the set of legalisation concern functionality and Port State Control PSC inspectors' obligations.

The *Third Chapter* represents the comparison of the regional safety regimes of Port State Control due to its functionality, often referred as the last Safety Net to prevent marine accident occurrences for purpose elimination substandard ships. Another important aspect discussed in this chapter the specific powers applied by jurisdiction authorities of maritime States to exercise PSC power, including those provided within SOLAS and international treaties. Apart from PSC legal framework and its application in this chapter shows the differences in the inspection systems across Paris MoU, USCG and Tokyo MoU, compare between ships targeting matrix, inspection parameters, profiles used to determine ships visiting priority, weighting points possible to score for non-conformities discovered. Furthermore, studied the New Inspection Regime (NIR) specific regulations of the Paris MoU, the new information system introduced called '' THETIS'', emphasis on the background behind these changes dictated.

The *Fourth Chapter* presents the PSC inspection statistics and dataset overview for the period 2011 -2015, in this Chapter, will classify inspections overview analysis on Port State Control under the PSC inspections standards corresponding to NIR -PMOU, TMOU and USCG taking into consideration commercial ships with G ≥ 500 metric tons gross tonnage falling under SOLAS and MAROL conventions, represent descriptive inspections overview including statistics performed under these main regimes, represent the main detainable deficiencies identified per ship type, per RO and per flag with indication of the best practises followed by PSC qualified staff, also, assessing the reason behind differences of findings in PSC regions. Having in hands statistics with possible cost, in this chapter discuss the lessons learned from PSC findings towards, possible financial impact of the management failures to satisfy the provisions of law and regulations but also, rewards ships owners with a good performance for the low-risk by

an inspection window up to 36 months. The external factors affecting maritime domain referred to in this chapter, indicating the role of RO's and convenient flags as an open registration over the recent years, records showing an inconsistent level of performance and technical failures identified, the research shows that between 2011-2015 that the IACS recognised RO's shows lower failures rates, American Burau of Shipping ABS as best performing RO's acting on behalf of flag administration contrary to the Russian Maritime Register of Shipping RS as the worst-performing RO score the highest detentions percentage and highest bans issued against ships seaworthiness, inasmuch findings EU commission having regard to maritime safety forced a council directive common rules and standards for ship inspection and survey organisations regulating the minimum criteria for recognition of organisations along the necessary professional standards for their activities should, therefore, be uniformly established and applied across the Community.

Considering the context of the presented study to risk management, *Chapter Five* evaluates quality management role towards safety regime characteristics of SMS implemented by BRIESE SCHIFFAHRT GmbH & Co as a research object, emphasising on statuary requirements. Researcher convolute the risk management procedures followed by operators, measuring the possible impact on the operational activity of shipowners in the contemporary researches.

Also, in this chapter conduct cumulative analysis for the period, 2011-2015 for PSC inspections carried out on managed vessels, examine the reasons behind differences in findings, category of deficiencies with indication to the weakness area lead to deficiency, followed by researcher an explanation of the management mapping installed by BRIESE management and how tackle the risk management to mitigate ships delays or financial impact on company profit parallel to improvements to safety management followed by management and onboard vessels.

In the second part of this chapter researcher weighing possibility using upgraded logarithm basis on the Bayesian Network model as first approach, to predict results of ships future inspection in the form of points similar to PSC method, the data used examined contained detailed records PSC past inspections for the period between 2011-2017 for every 994 ships in the data, more recorded ships inspection historical result will increase accuracy in predicting the possible weakness onboard, the method gave an

excellent accuracy with ability to learn more patterns if records kept were more accurate and elaborated to include SMS section or deficiency category, the second approach to predict of negligence severity by the classifier, result of accuracy was lower the predicting inspection points as the task is more complicated to calculate due to records low quality.

The researcher's conclusions and suggestions on how to improve safety management and discuss the possibility of improving logarithm outcome by acquiring more properties to inspections records allowing more accurate results, as software form can be used by management to measure safety management quality by referring to weak areas in safety procedures or management onboard — crew knowledge. Also, proposed algorithm development that works with the encoding through the application of a modification and classification system for the human factor - HFACS, including the registration of Master and officers on board with details of the deficiency, under which ISM section, subsections to predict kind of weakness can expect onboard and how can act to reduce deficiencies by using proactive approaches such as extra training or more supervision by responsible department. The considerations in this study should be regarded as independent study to define the basic principles of port State control, clarify the structure of the three main PSC regimes and the objectives of environmental protection and maritime safety compared to legally binding instruments and identification of possible improvements related to inspection procedures.

Findings suggest that type and nature of deficiencies depend in significant degree on the number of port state inspectors in the team carrying inspection, the educational background or technical knowledge of the inspectors, the cultural origin of inspectors and the level of professionalism play a significant impact over the final report and findings.

From practice also noted that several regimes corruption level and poverty have an impact of PSC inspection, some vessels noted in poor condition but still receive clean PSC report.

For such purpose need to consolidate the efforts to unified regulations and laws on the national and international level to eliminate differences in inspection procedures and standards. Ensure proper professional training for port state control inspectors.

It was suggested by several parties to develop a more efficient ship selection scheme with a combined database shared between all nine major port state control regimes, including ships historical data including all information related to incidents or accidents took place to get a comprehensive database.

The Author of the presented dissertation hopes that his research findings and operational proposals may be considered as a methodological assessment of maritime safety management with a view to improving the safety performance on board and increasing the effectiveness of operational and organizational management by adopting selective risk quantification solutions. It should help the maritime society to transform safety culture from reactive policies to proactive policies, and at the scope of efficiency, categories provide a platform for the increase in organisational effectiveness related to the operational management side. In this research found differences between varied MOU by performance, the number of findings, type of deficiencies or even nature of these deficiencies varied between different ports in the same state. What is more the main aim of dissertation defined as Identification of management methods and dedicated approach towards Maritime Safety and Safety of Life at Sea procedures at the level of shipowner/ship operator with the attempt to identify possible ISM new measures/procedures in order to increase maritime safety and reduce risks associated with ships operating as well as increase of the operational and organisational effectiveness has been achieved. Also, the main working hypothesis stated that Present experience with the implementation of ships safety management systems and the domain of safety of navigation and environment protection through analysis and selection of preventive solutions adopted by shipping managements basis on ships type and operation specifications shows the erosion of procedures at the level of shipowner/ship operator and create demand for improvement has been proved (the potential new project based on this research findings: ship inspection flow chart and pre-inspection check-list is ready to be launched).