Implementing a balance between productivity, safety and quality: a comparative analysis of operational risk management in the ports of Tema and Aarhus

Emmanuel Insaidoo

Follow this and additional works at: https://commons.wmu.se/all_dissertations

Part of the Risk Analysis Commons

Recommended Citation
https://commons.wmu.se/all_dissertations/1185

This Dissertation is brought to you courtesy of Maritime Commons. Open Access items may be downloaded for non-commercial, fair use academic purposes. No items may be hosted on another server or web site without express written permission from the World Maritime University. For more information, please contact library@wmu.se.
IMPLEMENTING A BALANCE BETWEEN PRODUCTIVITY, SAFETY AND QUALITY:
A comparative analysis of operational risk management in the ports of Tema and Aarhus

By

EMMANUEL INSAIDOO
GHANA

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

MASTER OF SCIENCE
In
MARITIME AFFAIRS
(MARITIME SAFETY AND ENVIRONMENTAL ADMINISTRATION)

Year of Graduation 2019

Copyright: Emmanuel Insaidoo, 2019
Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): ....................................................

(Date): ............................................................

Supervised by: ................................................

Supervisor’s affiliation......
Acknowledgements

I am grateful to my Lord and Maker for His grace and by Whose will this program of study in Maritime Affairs has been realized.

To my beautiful wife, Mrs Patricia Anima Insaidoo and adorable children Thaniel Ayeyi Insaidoo and Darlene Emerald Nhyiraba Insaidoo, thank you for the tremendous support and sacrifices you had to make only to ensure that I have a peace of mind to go through the course successfully. To my wife, your support for me reflects the statement “Behind every successful man, there is a virtuous woman”.

My next biggest thanks go to my supervisor Professor Michael Ekow Manuel who provided a deal of invaluable support and assistance throughout the conduct of this research. Certainly, I couldn’t have done better without his counsel which was always demonstrated in the spirit love, patience and gentleness. Thank you, Sir.

I would like to thank the able leadership of the prestigious World Maritime University for the opportunity granted me to study. My dream of acquiring a higher education to enhance my expertise in the area of maritime safety could not have seen the light of the day if you were left out of my life’s equation. My heart is full of gratitude for the award of scholarship which has made this education in MSc. Maritime Affairs a reality in my life.

To my sponsors, Orient Fund, my heart is full of gratitude for the honor done me with an award of a United Nations Full Student Fellowship. I appreciate your generosity which has brought me this far on the academic ladder. Thank you.

To the Faculty of Maritime Safety and Environmental Administration (Prof. Raphael Baumler, Prof. Dimitrius Dalakis, Dr. Anish Hebbar and Commander Pete Raneri), I would to say a big thank you for the rich knowledge you shared with us during the
2019 academic year that we remained under your tutelage. I can boldly say we are enlightened because you wholeheartedly chose to shine your light of knowledge for us to share. It is a privilege to have learnt from you. Thank you.

Also, I would like to thank my parents for the godly counsel which has seen me this far in life. Finally, I would like to say a big thank you to all friends who have been supportive of me in various ways until the end of the study program. I would single out Ms Ida Ngo Njobinkir, who brought a lot of smiles to many faces. Thank you, Ida, for the selflessness and do keep that heart of gold. You are truly a sister.
Abstract

Title of Dissertation: Implementing a balance between productivity, safety and quality: a comparative analysis of operational risk management between the ports of Tema and Aarhus.
Degree: Master of Science

The aim of this study is to examine the implementation of a balance between the productivity, safety and quality in the operations of ports. The purpose is to ascertain the hidden value of an efficient safety system in the operations of ports. Additionally, this study seeks to identify how safety perception will be realigned for a more balanced approach in the implementation of system safety for an enhanced Port Attractiveness Index in Ghana.

The study looked at key theories such as Safety, Risk and Systems Theory and how they impact the operations of the port. Concepts such as ‘Espoused Theory’ and ‘Theory-In-Action’ which apply in the decision-making process of top management and their effect on organizational risks was considered in the study.

The study adopted a mixed method approach for a comparative analysis between the ports of Tema and Aarhus. Surveys and Interviews were conducted between the two ports and the results collated for analysis. The method of triangulation was used to ensure the validity of the received data.

The concluding chapter examines Cost-Benefit Analysis and provides recommendation for the balance implementation of an efficient system.

KEYWORDS: Productivity, Safety, Quality, Management Commitment, Risk Management, Port Attractiveness.
Table of Contents

Declaration .......................................................................................................................... ii
Acknowledgements ......................................................................................................... iii
Abstract ............................................................................................................................. v
Table of Contents ........................................................................................................... vi
List of Figures ................................................................................................................ viii
List of Tables ................................................................................................................... ix
List of Abbreviations ........................................................................................................ x

Chapter 1: Context of the Study.................................................................................... 1
  1.0 Introduction ............................................................................................................... 1
  1.1 Research Background .............................................................................................. 1
  1.2 Problem Statement .................................................................................................. 3
  1.3 Aims and Objectives ................................................................................................. 7
  1.4 Research Questions .................................................................................................. 7
  1.5 Expected Results ..................................................................................................... 8
  1.6 Research Framework .............................................................................................. 10
  1.7 Key Assumptions and Potential Limitations ......................................................... 11
  1.8 Structure of Research Work ................................................................................... 11

Chapter 2: Literature Review ...................................................................................... 13
  2.0 Introduction ............................................................................................................. 13
  2.1 Productivity ............................................................................................................. 13
  2.2 Quality of Service .................................................................................................. 14
  2.3 The Concept of Safety ........................................................................................... 16
    2.3.1 The Safety Management System and System Approach ............................ 17
    2.3.2 Operational Risk Management ................................................................. 18
    2.3.3 Models of Risk .............................................................................................. 19
    2.3.4 Entropy Model and Organizational Capability ........................................... 20
    2.3.5 Risk Assessment and Scorecard ................................................................. 21
  2.4 Etiology of Accident Causation ............................................................................ 22
    2.4.1 Swiss Cheese Model of Organizational Losses ......................................... 23
  2.5 Complex Socio-Technical Systems ...................................................................... 25
  2.6 Systemic Accident Models ................................................................................... 25
    2.6.1 System Theoretic Approach ................................................................. 25
    2.6.2 A System Approach to Risk Management .............................................. 26
  2.7 Nexus of Safety, Productivity and Quality ......................................................... 27
  2.8 Espoused Theory versus Theory In-Action ......................................................... 28
  2.9 Management Commitment to a Balance System Implementation ............... 29
  2.10 Balanced Scorecard Approach ........................................................................... 29
  2.11 Business Alignment Scorecard .......................................................................... 30
  2.12 Port Attractiveness Index ..................................................................................... 31

Chapter 3: Research Design and Methodology ......................................................... 33
  3.0 Introduction ............................................................................................................. 33
3.1 Research Design ......................................................................................................... 33
3.2 Target Population ........................................................................................................ 35
3.3 Sample and Sampling Techniques........................................................................... 35
3.4 Description of Data Collection Instruments ........................................................... 36
  3.4.1 Questionnaires ...................................................................................................... 37
  3.4.2 Interviews ............................................................................................................. 37
3.5 Validity and Reliability of Research Instruments ................................................... 38
  3.5.1 Reliability ............................................................................................................. 38
  3.5.2 Validity ............................................................................................................... 39
3.6 Data Collection and Ethical Processes ..................................................................... 40

Chapter 4: Analysis, presentation and interpretation of data ........................................ 41
4.1 Profile of Respondents .............................................................................................. 41
4.2 Findings from the Questionnaires - Part A to E ....................................................... 43
  4.2.2 Part A – The Importance of a Balance between Productivity, Safety and Quality ............................................................ 43
  4.2.3 Part B – Implications of maintaining a balance between productivity, safety and quality......................................................... 46
  4.2.4 Part C - Challenges to the Attainment of a Balance ............................................ 52
  4.2.5 Part D - Sustaining a Balance ............................................................................. 55
  4.2.6 Part E - Assessment of a Balanced Implementation ............................................ 58

Chapter 5: Recommendations and Conclusion .............................................................. 59
5.1 Cost Benefit Analysis ................................................................................................. 59
  5.2.4 Legal basis for System Implementation ............................................................... 64
  5.2.5 Research Conclusions ......................................................................................... 66
  5.2.6 Limitations and Further Research ...................................................................... 67

References ...................................................................................................................... 68
Appendix 1 Consent Form .............................................................................................. 78
Appendix 2 Guide for Semi-Structured Interviews ....................................................... 80
Appendix 3 Questionnaires ............................................................................................ 82
List of Figures

Figure 1: Oil tanker splits in two halves and spill oil at Tema anchorage ................... 3
Figure 2: Second tanker splits and spills oil 6 months after first incident ................... 4
Figure 3: The Good Friday disaster in the PSC Tema Shipyard .................................. 5
Figure 4: Schematic flow of study ............................................................................. 10
Figure 5: An overview of a port's marine services ................................................... 15
Figure 6: A simple interactivity of a port's operational processes .............................. 16
Figure 7: Risk management framework and process ............................................... 19
Figure 8: Entropy Model- Loss causation of productivity, safety and quality .......... 21
Figure 9: A classic risk assessment matrix ................................................................. 22
Figure 10: Swiss cheese model of organizational losses ............................................ 24
Figure 11: Capital resources, decisions and expenditure of management ................. 31
Figure 12: Framework of Port Attractiveness Index (PAI) ....................................... 32
Figure 13: The methodological outline of the study ............................................... 34
Figure 14: Mixed Method Approach ....................................................................... 35
Figure 15: Methodological triangulation validation method .................................... 39
Figure 16: Categorization of respondents by sector of operation .............................. 42
Figure 17: Summary of age ranges of participants .................................................... 42
Figure 18: General perception of the importance of a balance implementation ........ 44
Figure 19: Perception of benefits associated with balance implementation ............. 47
Figure 20: Comparison of perceived associated constraints of a balance implementation .......................................................... 50
Figure 21: Challenges to achieving a balance ............................................................ 53
Figure 22: Focus areas for the sustenance of a balance ............................................ 56
Figure 23: Perception of a balance in productivity, safety and quality ..................... 58
Figure 24: Sustaining a balanced implementation through the management of risks 63
List of Tables

Table 1: A comparative data of the ports of Tema and Aarhus................................. 9
Table 2: Valued cost of accidents per a construction employee................................. 60
### List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMH</td>
<td>Berth Moves per Hour</td>
</tr>
<tr>
<td>BSC</td>
<td>Balanced Score Card</td>
</tr>
<tr>
<td>EMS</td>
<td>Environmental Management System</td>
</tr>
<tr>
<td>ETA</td>
<td>Event Tree Analysis</td>
</tr>
<tr>
<td>FMEA</td>
<td>Failure Mode and Effect Analysis</td>
</tr>
<tr>
<td>FTA</td>
<td>Fault Tree Analysis</td>
</tr>
<tr>
<td>GMH</td>
<td>Gross Moves per Hour</td>
</tr>
<tr>
<td>GRT</td>
<td>Gross Registered Tonnage</td>
</tr>
<tr>
<td>HSA</td>
<td>Health and Safety Authority</td>
</tr>
<tr>
<td>IHMA</td>
<td>International Harbor Masters Association</td>
</tr>
<tr>
<td>ILO</td>
<td>International Labor Organization</td>
</tr>
<tr>
<td>IMS</td>
<td>Integrated Management System</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>LSCI</td>
<td>Liner Shipping Connectivity Index</td>
</tr>
<tr>
<td>LOA</td>
<td>Length Overall</td>
</tr>
<tr>
<td>MHM</td>
<td>Man Hours per Move</td>
</tr>
<tr>
<td>MT</td>
<td>Motor Tanker</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation Development</td>
</tr>
<tr>
<td>OHS</td>
<td>Occupational Health and Safety</td>
</tr>
<tr>
<td>OPC</td>
<td>Open Plan Consulting</td>
</tr>
<tr>
<td>PAI</td>
<td>Port Attractiveness Index</td>
</tr>
<tr>
<td>PNDCL</td>
<td>Provisional National Defense Council Law</td>
</tr>
<tr>
<td>PQI</td>
<td>Port Quality Index</td>
</tr>
<tr>
<td>PSC</td>
<td>Penang Shipbuilding and Construction</td>
</tr>
<tr>
<td>QMS</td>
<td>Quality Management System</td>
</tr>
<tr>
<td>RA</td>
<td>Risk Assessment</td>
</tr>
<tr>
<td>RM</td>
<td>Risk Management</td>
</tr>
<tr>
<td>SMS</td>
<td>Safety Management System</td>
</tr>
<tr>
<td>TEU</td>
<td>Twenty Feet Equivalent Unit(s)</td>
</tr>
<tr>
<td>Acronym</td>
<td>Abbreviation</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>UNCTAD</td>
<td>-</td>
</tr>
<tr>
<td>WEF</td>
<td>-</td>
</tr>
</tbody>
</table>
Chapter 1: Context of the Study

1.0 Introduction

In the history of the maritime industry, seaports have been crucial to maritime transport and trade as they facilitate cargo operations for sea transport. With a study growth in seaborne trade, the need for enhanced operational efficiencies commensurate with the growing demands in the shipping industry has been a subject of concern. Recognizing the necessity, ports are generally responding with different approaches to optimize operational efficiencies and enhance their physical capacity. The operation of the port, within the scope of productivity, safety and quality, has been at different levels with trade-offs which have the potential to lead to mishaps and losses. This chapter of the research paper presents the subject of imbalance between the implementation of productivity, an efficient safety system and the quality of the port’s service.

1.1 Research Background

Seaports remain fundamentally integral to the growth of international trade and the world economy (Fobbe, Lozano & Carpenter, 2018). From an economic point of view, maritime transport has sustained its dominance over the other modes of transport for global trade. This success has been attributed to globalization and the increasing demand from emerging economies for maritime transport services (Grammenos, 2013). This holistic achievement may not have been realized had there been no consideration for capacity enhancement, the safety of operation in seaports as well as the efficiency of operational processes. The United Nations Conference on Trade and Development, UNCTAD (2018) states that port operations account for the facilitation of cargo-handling activities for the over 80% of the world merchandise trade transported by sea in volume terms. The
The importance of ports is reflected in their role as essential nodes in international supply chains and logistics and in their capacity to act as an "engine" for economic development through the provision of employment, worker incomes, taxes and business earnings for their regions (Talley, 2009). De Fino, Fatiguso & De Tommasi (2015) note that, as points of linkage for global shipping, ports have transformed dramatically with an increase in world trade. Recent mishaps, accidents and crises suggest, however, that organizations (including ports) have to enhance efforts in the maintenance of safety through means that are systematic, systemic and proactive (Kontogiannis, Leva & Balfe, 2017). Although historically, the typical approach to implementation of safety has been reactive and established based on accident investigation outcomes, modern safety advisory and regulatory bodies recommend a new safety approach which is proactive and effortlessly integrates with other forms of management systems. Bluff (2003) states that modern safety management systems are shifting from the prescriptive functional approach to a more 'self-regulatory' and performance-oriented' model which is geared towards proactiveness, is participative and can well be integrated into the activities of these businesses.

In August 2015, the port of Tianjin in China recorded an unusually massive explosion (equivalent to and 8.12 magnitude earthquake) originating from a warehouse within the precincts of the port. Considering the grave consequences of the incidence, one may question the state of port safety vis-à-vis efficiency and productivity. According to an investigative report issued by the Chinese State Council Investigative Team (2016), disorderliness in the management system led to the disaster. The hazardous material explosion ranked as the topmost man-made explosive disaster in Asia and third on the global scale in terms of insurance losses (Sigma Re, 2016). 165 lives were lost, 8 were missing, 798 people were injured and a direct economic loss of CNY 6.866 billion (US$ 1 billion) was incurred over the incidence (Zhao, 2016). This example highlights the importance of the achieving and maintaining a balance between safety implementation and productivity.
1.2 Problem Statement

In 2018 the port of Tema experienced at least two incidents where two tankers which regularly called the port from the neighboring countries to trade, broke into two halves at its anchorage.

![Figure 1: Oil tanker splits in two halves and spill oil at Tema anchorage](source)

Source: Ghana Ports and Harbors Authority, 30 May 2018

The first incident occurred on 24 May, 2018 when MT Alice, a regular tanker which had been operating along the West Coast of Africa for a minimum of three years broke into two halves (see Figure 1) and spilled 1,200 metric tons of crude oil at the Tema port anchorage. The thirteen-member crew were rescued and brought to safety (GPHA, 2018 May 29).

Similarly, six months after the first incident, a second tanker split into two at the same anchorage (see Figure 2) with an unknown amount of oil spill (GhanaWeb, 2018 December 14).
Another incident had previously occurred on Good Friday in 2005 at the Tema shipyard, when a fire outbreak on a vessel under repairs (see Figure 3) took at least 10 lives, razed down valuable national assets within the port and plunged the country into crisis (GhanaWeb, 2005, April 2). It would be expected that after such incidents, a much greater emphasis would be placed on safety in the port. However, although the Port Authority has since initiated the concept of management systems such related to quality and environmental management under International Organization for Standardization’s (ISO) standards 9001, 14001 and Occupational Health and Safety OHSAS 18001 to enhance its operations, the effectiveness of their absolute implementation is somewhat a challenge.

Figure 2: Second tanker splits and spills oil 6 months after first incident

Source. GhanaWeb, 2018, December 14
While the concepts of safety and risk management have generally received wide attention, institutional commitment for their effective implementation in many countries appears to be rather inadequate (Kheni, Dainty & Gibb, 2008). Fundamentally, safety is generally accepted in the Occupational Health and Safety (OHS) management discipline to be a strategic part of a business entity’s operations as it affects its net earnings. However, contrary to any management system’s clear mandate for top management’s commitment to safety, the dilemma that comes with other crucial and competing matters concerning the organization is sometimes perceived to affect the management commitment. The importance of safety in the organizational processes is therefore believed to be disputed. Does what appear to be a compromise suggest that safety is actually given less importance than espoused or that its value is of limited significance to the quality and efficiency of service?

Although ports consider safety to be essential to their workings, a significant number of them seem to be struggling with its effective implementation.
According to Goss (1989), although safety may prove to be technically viable, the associated cost of implementation in some instances is uneconomical and therefore becomes unattractive for some entities in the industry to implement. Goss argues that this reason explains why developing countries have such a low level of safety regulation implementation. Through the application of system dynamics in a study on the level of port safety, Yeo et al. (2013) established that a significant percentage of stakeholders believe that maintaining a low level of safety creates the possibility of increased financial benefits (Yeo, Pak & Yang, 2013). In as much as these statements may be deemed to be true, could they be the reasons why safety challenges in developing countries seem to persist?

The World Economic Forum (WEF) (2018) reported that the issue of risk in Africa and the negative perception it projects to key trade communities over decades have been a major impediment in efforts to attract foreign investment to Africa. Between 2014 and 2016, West and Central African ports received support in terms of funded projects from the European Union (EU) which was inducted by the Open Plan Consulting, OPC (2016) to improve port safety and efficiency. Around the same time, the Ghana Ports and Harbors Authority initiated the implementation of a comprehensive Quality Management System which in 2018 was upgraded to an Integrated Management System (IMS) entailing Quality, Environmental and Safety Management Systems. While this work remains an important subject of interest to both ports and trade partners, there still appears to be a persistence challenge to the effective implementation of safety.

Safety perception is critical in both management decision and optimum implementation. Where the cost aspect of safety in general terms, is projected over its benefit, the effectiveness of safety implementation loses its priority in management decisions limiting the level of executive commitment to the maintenance of safety. As a result, workplace safety, instead of being promoted as an organizational core value, is handled only as espoused sentiments seldom translating the organization’s specific safety objectives into operational reality. The potential consequence can be grievous and ironically, costly economically (Rechenthin, 2004)
It must be borne in mind that no amount of insurance value placed on human lives and the environment is in reality worth the true value of damage caused by workplace incidents (Gruter, 2008), the question may be raised as to “why safety is not prioritized in equivalence to the importance given to productivity in the operations of all seaports”.

1.3 Aims and Objectives

This research aims at examining how a balance between productivity, safety and quality can be attained in a port.

The study had the following outlined objectives:

i. To analyze the influence of a balance between safety, quality and productivity on a port’s performance and the effect of an imbalance thereof

ii. To examine the possibilities of enhancing the effectiveness of accident prevention methods in ports.

1.4 Research Questions

To help in the facilitation of this research to arrive at its objectives, the study seeks to answer the following research questions;

i. What is the relative importance of a balance between safety, productivity and quality?

ii. What are the implications of maintaining a balance between safety, productivity and quality?

iii. What are the challenges that impede the attainment of a balance in a port context?

iv. How can a sustainable balance between safety, productivity and quality be achieved?

v. How can such a balance be assessed?
1.5 Expected Results

While the port of Tema is currently expanding in capacity and striving to achieve the status as the maritime transport hub for the West African sub-region, it is left with some pertinent safety implementation challenges to deal with. An observation that was made between February to June 2018 in the port of Aarhus revealed that the port did not have as much human resource capacity and tug boats as the port of Tema. However, the port of Aarhus, which happens to be Denmark’s largest port, has earned a reputation as having efficiency in safety systems and remarkable productivity in Europe. The port of Aarhus boasts of handling about 9 million tonnes of cargo annually. Table 1 below provides a brief comparative data between the two ports. The expectation for this research is finding the hidden value of an efficient safety system in the operations of ports. Furthermore, it is as anticipated that after this study, safety perception will be realigned for a more balanced approach in its implementation for optimum performance in the port industries of the two countries.

It is expected that the analysis of this research will contribute to the theories of strategic risk management of ports in the area of safety, productivity and quality. Secondly, it is anticipated that the outcome of this study will influence organizations to reconsider their inputs to safety implementation and enhance their performance levels. The research seeks to contribute to the current conventional methods of operational risk management and risk control to enhance operational safety in the ports of developing countries with the port of Tema as reference.
Table 1: A comparative data of the ports of Tema and Aarhus

<table>
<thead>
<tr>
<th>Marine Services</th>
<th>Port of Tema</th>
<th>Port of Aarhus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Harbor area</td>
<td>3,900,000 sq. m</td>
<td>2,585,673 sq. m</td>
</tr>
<tr>
<td>2 Location</td>
<td>5° 37.00’N, 000° 01.0°E</td>
<td>56° 10.0’N, 010° 13.0°E</td>
</tr>
<tr>
<td>3 Current berth space</td>
<td>Container – 575 m</td>
<td>Container – 1,300 m</td>
</tr>
<tr>
<td></td>
<td>Multipurpose – 1,110 m</td>
<td>Multipurpose/ bulk – 1,700m</td>
</tr>
<tr>
<td></td>
<td>Bulk – 1,310 m</td>
<td></td>
</tr>
<tr>
<td>4 Deepest depth</td>
<td>11.4</td>
<td>14</td>
</tr>
<tr>
<td>5 Staff strength</td>
<td>2000</td>
<td>105</td>
</tr>
<tr>
<td>6 Number of registered agencies</td>
<td>235</td>
<td>7</td>
</tr>
<tr>
<td>7 Number of pilots</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>8 Operational times</td>
<td>24/7 - 363/365</td>
<td>24/7 - 365</td>
</tr>
<tr>
<td>9 Maximum size of ship handled</td>
<td>LOA = 265 m</td>
<td>LOA = 400 m</td>
</tr>
<tr>
<td></td>
<td>GRT = 60,000</td>
<td>GRT = 171,542</td>
</tr>
<tr>
<td>10 Number of tugboats</td>
<td>4 tugboats</td>
<td>2 tugboats</td>
</tr>
<tr>
<td>11 Bollard Pull</td>
<td>59.8 ton for 3 tugboats</td>
<td>55 ton for 1 tugboat</td>
</tr>
<tr>
<td></td>
<td>10 ton for 1 tugboat</td>
<td>45 ton for 1 tugboat</td>
</tr>
<tr>
<td>12 Number of crew per boat</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Port Operations</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>13 Number of gantries</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>14 Lifting Capacity of gantries</td>
<td>60 ton</td>
<td>64 tons</td>
</tr>
<tr>
<td>15 Average time for delivering cargo</td>
<td>Estimated to be 73 hours</td>
<td>Quick and flexible</td>
</tr>
<tr>
<td>16 Mode of cargo transportation</td>
<td>Trucks</td>
<td>Rails</td>
</tr>
</tbody>
</table>

Source: Aarhus Havn (www.aarhushavn.dk) and Ghana Ports & Harbors Authority (www.ghanaports.gov.gh)
1.6 Research Framework

This research work adopts the mixed-method approach for its study. This applies to the scientific methodology for data collection, analysis and the cost-benefit assessment.

The study maintains its methods of data acquisition as both primary and secondary. The primary includes questionnaires and interviews that target both staff and port users such as terminal operators, management staff of ports, supervisors, shipping agents and other port users.

The research seeks to arrive at its objectives with a comparative analysis approach. The comparative safety analysis focuses on the two major ports of Ghana and Denmark which are the ports of Tema and Aarhus respectively. The focus of the cost-benefit analysis will be on intangibles.

![Figure 4: Schematic flow of study](image-url)
1.7 Key Assumptions and Potential Limitations

The initial limitation that was encountered was the difficulty in reaching the target population for data collection. This had a significant impact on the study as it limited the scope of analysis. The initial perception for the use of an online questionnaire was the ease with which it could generate the needed data for the study within the limited time required for the data collection. However, it turned out that after the participants had received the questionnaires there was the need for extra effort with persistent reminders to the sample population before a number of them eventually responded. Apart from the port workers, the response from the other stakeholders was weak and provided limited information for the analysis. Furthermore, access to top managers for the interviews also posed a challenge to the study. The challenge was greater on Ghana’s side as managers could hardly make time for the approximate 35 minutes interview by phone. Thankfully, a couple of deputies who also play active roles in the policy-making of the port opted to represent their superiors.

1.8 Structure of Research Work

The following structure shows how this study is organized:
CHAPTER 1- This chapter briefly looks at the background of the study. It further views the challenges with a balance implementation in the three focus areas in the operations of ports. The questions which motivate this study are mentioned and the expected outcome of the study is presented. This chapter takes a look at the limitation that the study encounters as well.
CHAPTER 2- To help respond to the research questions, an in-depth literature review that discusses the relevant subjects in detail is done in this chapter. Literature reviewed include those on Safety, Risk, Systems theory, Espoused theory and Theory-In-Action.
CHAPTER 3- This chapter provides the details of the methodology that the study uses. It indicates the research approach and describes data collection instruments and
processes. The procedures relating to the ethical considerations in research involving human participants before the data collection procedure are also discussed.

CHAPTER 4- This chapter assesses the data collected from the two ports of interest. It analyzes the received data and presents them to answer the research questions.

CHAPTER 5- This part discusses the findings vis-à-vis the literature, makes recommendations based on the research outcomes and presents the conclusion of the study.
Chapter 2: Literature Review

2.0 Introduction

The role that the port industry plays in the global economy makes it indispensable in the modern society. Much effort has been committed to formulating control systems to manage the number of mishaps in this industry. However, over decades, the industry is still challenged with incidents of safety.

In this chapter, the study mainly focuses on the complexity of port operations and their relation to risk and its management. The review also captures concepts that are perceived to influence the implementation of decisions that are made by management in the areas of productivity, safety and quality.

2.1 Productivity

Ports constitute essential systems for the facilitation of maritime trade which are reflected in the economic development of maritime countries. The productive outcome of any port is hinged on the efficiency of its functional systems (Lowin, 1968) and effectiveness in the business processes. Depending on its context of use, productivity as a term in port operations, may be used to express different meanings within the industry. Productivity of a port is an indicator of how efficiently the port functions. For terminal operators, productivity denotes Gross Moves per Hour (GMH) which refers to the ability of the crane to move containers over the quay wall each hour. Another form of measurement for productivity is Berth Moves per Hour (BMH), which refers to the overall number of containers that all the cranes move on/off a specific vessel each hour. Manhours per Move (MHM) is also a measure of productivity and signifies the efficient use of the total workforce needed for the operation of moving the containers across the quay wall.
Whilst port productivity may be expressed differently by different stakeholders, there is a general belief that it can be significantly enhanced with certain tools and initiatives. In a broader perspective, the productivity of a port may be viewed as its throughput. Port throughput provides a measure of the amount of cargo or number of vessels that the port handles over a stipulated period of time. According to Phusavat (2013), productivity and quality are the two main distinctive characteristics that have been the driving forces behind modern industries and still will remain relevant to their performance. Higher productivity, in economic terms, indicates a lower operating cost, more profitability and increased competitiveness. The measure of productivity is considered as one of the greatest distinct determinants of an organization’s effectiveness as a system.

2.2 Quality of Service

Quality, as defined by ISO 9001, is “the totality of characteristic of an entity that bears on its ability to satisfy stated and implied needs”. The term *quality* was used to refer to the characteristics for which investors have the will to pay a higher price (Asness, Frazzini & Pedersen, 2019). Its broad description includes excellence in services as well as the processes that yield the expected productive outcome. Singh (2016) primarily described service as deeds, processes, and performances delivered by an individual or entity for another individual or entity. In a wider context, it includes the performance of economic activities, the output of which, is not a physical product or construction (Quinn, 2003).

In the context of the port, services may be grouped either under two main categories (1) Marine Services or (2) Port Operations. Marine services include the processes of engaging ships which are meant for a particular port until the ship is finally berthed for cargo operations. It includes the booking arrangement processes by the ship’s agent and sending updates of pre-arrival notification to the port. On arrival to the port, ships are either provided with pilotage services to berth or required to wait at the port’s anchorage for berthing prospect
Figure 5: An overview of a port's marine services

With the developing trend in maritime trade and the increasing levels of competition amongst ports, quality of service to customer is key to the sustenance of business. The business of ports is in service delivery to its clientele. The perception of clients concerning the standard of service delivery matters for the sustainability and the growth of the business. As a precursor factor, service quality significantly correlates with the satisfaction of customers (Ha, 2003; Nir 2009). The selection of ports by shipping companies for the transportation of goods is an essential decision that these shipping companies pay attention to considering the competitiveness or attractiveness of the port. (Cullinane et al., 2005 De Langen 2007).

Port operations (see Figure 6), on the other hand, refers to loading and discharging of cargo from ships, stevedoring and cargo transfer from the port to the receivers.
2.3 The Concept of Safety

Safety is generally defined to be a state which is free from the occurrence of harm to persons or damage to property. It is intangible (Kim, Wang, Jhu, & Gao, 2016), subjective and can be controlled to tolerable levels through a system of Safety Management (SMS).

Its perception is dependent on an individual’s view of protection from harm. This notion differs from person to person and is influenced by several factors such as the individual’s knowledge, background, experience or expertise. Reason (2000) described it as the ability of persons or organizations to deal with hazards and risk in order to avert losses or damages and still be able to reach the set goals. Similarly, the International Civil Aviation Organization, ICAO (2009) defined it to be the state at which the risk of harm to individuals or damage to property is minimized to, and maintained at or even below, a level that is acceptable through a persistent process of hazard identification and risk management. In addition, Ding and Tseng (2012)
showed that there are distinctive dimensions that linked safety factors and their related risks. These were identified to include human, machine and management categories. Issues relating to matters such as operator’s mistakes, human negligence and omissions were classed under the human category whereas mistakes linked to the safety protection selection or maintenance failures were categorized under machine type. Under the management classification were matters that relate to training or lack of safety auditing.

2.3.1 The Safety Management System and System Approach

The management of an organizational safety challenge is done through its SMS. The recent concept, Total Safety Management (TSM), seeks to integrate quality and productivity into safety implementation.

Kontogiannis et al (2017) substantiated that the principles of Total Quality Management (TQM) have, in the past, offered the foundation for the development of several health and safety systems. It is upon the foundation of TQM that Geotsch (1998) developed the theory of TSM which aimed at equipping organizations with viable benefits within the industrial setting. This was targeted to be achieved through the establishment of a work environment that is safe and conducive to raise the organizational performance to its peak point and continually improve upon it.

Kontogiannis et al (2017) further added that the uniqueness associated with the approach in total safety concept is how the business processes are ably integrated into the organization with safety engineering methods within a culture of continuous improvement that influences the functions of the organization at all levels. The complexity of a work process, however, is its web characteristics of interdependencies between multiple physical entities, information, knowledge channels, communication and decision-making activities.

The role of the system’s approach, its models and supplementary decision support systems then turn out to be of critical importance to the management of organizational operational risks.
2.3.2 Operational Risk Management

The term ‘Risk’ (R) is of extensive implication as it can be applied in a variety of contexts like financial, psychological including other organizational setups. In technical terms, it is considered a measure of the level of safety. Different schools of thought have expressed their appreciation of the concept. Henley and Kumamoto (1996), regarded risk and safety as opposite concepts and deemed their relation to be inversely proportional. Harms-Ringdahl (2001), regarding financial institutions, gave the working definition of “operational risk” to be the risk of loss that emerges from inadequate or failure of internal processes, persons, and systems or from external events. Manuele (2003) defines risk as the measure of safety that is expressed by the probability and severity of related consequences for an unwanted occurrence. This implies that Risk (R) = Probability (P) x Consequences (C).

The application of this method for risk assessment and management has been widely accepted in most organizations.

Manuel (2009) notes that objective definitions of risk, while having merit philosophically, are limited as they often fail to acknowledge the very real risks which are predominantly subjective and on which risk policy of an organization depends.

It is vital for managers in seaports to evaluate and ensure an appropriate management of risks that are associated with the diverse maritime operations (Mokhtari, Ren, Roberts & Wang, 2012). The essence of a risk management (RM) process is to address these concerns founded on a structured method that is to aid the decision-making process. Characteristically, a RM structure entails four key phases which are risk identification, risk assessment, risk mitigation and risk monitoring (see Figure 7).
2.3.3 Models of Risk

Risks are viewed by Mol (2003) as being in two main categories - residual risk and entropic risk. The inherent risk in all the organizational, human and natural systems that interlink in a business function to deliver a service within an organization is what her study described as residual risk. The Business Dictionary (2013) defines inherent risk as the probability of loss that emerges from existing circumstances in an environment. It implies the risk of an accident before any preventing or controlling action is taken.

Residual Risk = Inherent Risk x Preventability

Its source includes system factors like the human element, technology, work processes and the environment where the operational activities are performed.

Entropy as a characteristic of systems is both non-conserved and extensive in any state (Demirel, 2014). In systems, the concept is described by Demirel and Gerbaud (2019)
as the summation of the entropies of all the applicable system factors. According to Mol (2003, p12), entropic risk refers to the risk introduced when functional systems which interact to perform organizational tasks tend to degrade. More so, her entropy model (described below in section 2.3.4) demonstrates that risk may be reduced with control measures but not completely eliminated after all the necessary mitigating measures have been applied. The effect of risks on efficiency and productivity of seaports are negative.

Thus, Total Entropic Risk = Human Resource (HR) x Process (P) x Technology (T) x Physical Environment (PE).

2.3.4 Entropy Model and Organizational Capability

The system factors identified in subsection 2.3.3 cover all aspects of an organizational activity irrespective of the nature of business that entity is engaged in (Davenport, 1990; Noe et al, 2017). Every port uses the services of people, technology and operates in a physical environment. The interaction of the various activities for an organizational achievement forms the processes.

Figure 8 shows the two categories and how they are influenced by the system factors, as presented by Mol (2003, p12). In an ideal condition of an organization, all the systems are assumed to operate perfectly with performance, safety and quality as indicated on the left of diagram. However, in reality, organizations operate in a natural system which is subjected to universal laws that make the system factors to degrade over time. To be able to operate at optimum efficiency, there is a need for adequate action for risk management in the workplace.

The risk of an accident increases exponentially with the probability of systemic degradation.
2.3.5 Risk Assessment and Scorecard

The scientific approach discussed in subsection 2.3.2 above is extensively used by organizations in determining their operational risks. To manage risk efficiently, it is essential that the hazards leading to such risks are identified (Cameron, Mannan, Németh, Pasman, Rogers, Seligmann, 2017). An assessment of risk is then done, considering ‘what is likely to go wrong’, the probability of such a mishap and the extent of potential consequences. The result of the assessment then determines whether an operation is safe or not based on the risk matrix (see Figure 9).

Operational risks exist in various forms and are capable of causing losses of almost any magnitude ranging from insignificantly minor ones to massive disruptions which may be violent enough to destroy an entire establishment.

Figure 8: Entropy Model- Loss causation of productivity, safety and quality

Source: Van Der Stap, 2018
The management strategies or approach to dealing with these operational risks have primarily included quantifying risks based on past operational accidents/incidents and procuring some other risk-transfer product or insurance.

2.4 Etiology of Accident Causation

In general, system safety is typically deemed as having the essential qualities for preventing injury or loss to human life, damage to property and adverse consequences to the environment. Today’s industries such as the maritime, aviation and the petroleum industries which are of highly technological systems are exceedingly growing complex. According to Qureshi (2007), this complexity in the systems tends to exhibit a potentially disastrous failure mode. Models of accident offer a holistic conceptualization of the accident’s characteristics, which classically show how related the causes and effects are. In the early 1940s, Heinrich proposed the Domino theory which presented accident causation models in the form of a chain of discrete events which happen in a particular
temporal order (Ferry, 1988). The Domino theory forms part of the class of sequential accident models such as Failure Modes and Effects Analysis (FMEA), Fault Tree Analysis (FTA), Event Tree Analysis (ETA), the Cause-Consequence Analysis (Leveson, 1995). The theory views accidents as a sequence of distinctive events which happens in a precise temporal order.

2.4.1 Swiss Cheese Model of Organizational Losses

A new category of epidemiological models of accident causation emerged in the 1980s. These sought to rationalize accident causation models in complex systems. The Swiss cheese model (see Figure 11) is a key example of this epidemiological theoretical models.

According to this model of accident causation by Reason (2003), the bedrock of organizational mishaps and losses are organizational factors such as strategic decisions, planning, budgeting, generic organizational processes - forecasting, scheduling, managing, communicating, auditing, and the like. The shape and nature of these processes are identified to be formed by the corporate culture, or the unspoken attitudes and unwritten rules regarding the manner in which an organization conducts its business.

The consequences of corporate culture are hence communicated through the organization to the distinctive work environment, team, individual and task influences, maintenance facilities and so on-where they are revealed as factors which are likely to promote unsafe acts.
Influential factors known to contribute to these unsafe acts include undue time and commercial pressure, insufficient training, poor human-machine interfaces, inadequate tools and equipment, under-manning, poor supervisor-worker ratios, low status, low pay, macho culture, poor communications, unworkable or ambiguous procedures and the like.

The local factors within the workplace combine with natural human tendencies to generate errors and violations which are referred to as ‘unsafe acts’. The commission of these unsafe acts by individuals and teams occurs at the human - system interface which is otherwise referred to as the sharp end.

The frequency of committing these unsafe acts are noticeably more, but only few of such acts do pass through the porous holes in the barriers. While unsafe acts usually get implicated in most of the organizational accidents, the problem seems to go beyond the unsafe acts.

In some cases, the barriers fail simply as the result of latent conditions.
2.5 Complex Socio-Technical Systems

Socio-technical systems exhibit a lot of system factor interactivity in order to deliver organizational outcomes. Qureshi (2007) notes that such outcomes are unattainable with the human or technology operating in isolation. The systems which comprises technical artefacts and human agents are embedded in complex social structures like organizational policies and goals as well as political, legal, culture, economic and environmental elements. A study by Trist and Bamforth (1951) implies that in a socio-technical theory, human agents and social institutions form an integral part of the technical system by the mutual optimization of the technical and social aspects.

2.6 Systemic Accident Models

This refers to the set of theories which are considered as models of how accidents and incidents occur in a system – at a whole system level. It includes the causal factors which influence such occurrences. The relevance of these mental models with regards to safety is within their influence on system design, operational decisions and behaviors.

2.6.1 System Theoretic Approach

Systems theory comprises models, laws, principles that are essential to the complexity of interrelations and interdependencies between components (Qureshi, 2007). Hollnagel (2004) indicated that in a systemic model, accidents are viewed to occur when a number of causal factors like human, technical and environmental coincidentally exist in a specific time and space; accidents are emergent phenomena that develop as a result of complex interactions between system components which may cause degradation of system performance or lead to an accident.

In systems theory, systems are viewed as comprising interacting mechanisms which stay in equilibrium via feedback loops of information and control. A system has a dynamic characteristic and continually adapts to dynamic changes in order to maintain
safety. Accidents are considered as the outcome of defective processes with the involvement of humans, social and organizational structures, engineering activities, and physical and software system components (Leveson, 2004).

2.6.2 A System Approach to Risk Management

A system, in scientific terms, denotes a group of interacting components or mechanisms which operate towards a common goal within defined limits (Murphy & Nguyen, 1985). These integrated sets of elements include people, processes, machinery, transportation, the physical environment and technology. Factors such as social, economic, ethical, ecological, demographic, legal and cultural inputs influence the functions of these system factors (Clayton & Radcliffe, 2018). (Mol (2003) emphasized that the degradation of workplace systems over time is due to the fact that organizations are subjected to natural laws and environmental changes. Baldwin (2019) validated this in a study which implied that a socioeconomic system would naturally tend to disintegrate in subjection to natural laws to reach a state of entropy.

Devastating incidents and systems failures of complex infrastructure have contributed to the increased relevance of the systems approach to risk management (Madni & Jackson, 2009). These complex systems as characterized by a variety of multiple social and technical sub-systems interact with each other, usually in non-linear patterns for a productive outcome (Jain, Pasman, Waldram, Pistikopoulos & Mannan, 2018). An example of such a complex socio-technical system is the port industry. The application of social factors such as policies or regulatory related concerns, human, and organizational factors have received acknowledgement for the crucial role they play in process safety and the maintenance of the efficiency of technical barriers to prevent unwarranted consequence events. Subsequently, an integration of a systems-based approach of risk management suggests a balance between the various management systems.
2.7 Nexus of Safety, Productivity and Quality

The pursuit of the shipping industry for a high operational efficiency in ship operation has driven the port industry to increase and operate with such a capacity so as to meet the growing demand (UNCTAD, 2016). This development influences the ability, performance and revenue generation in the competitive markets (Otieno, Lin, Hualong, Banomyong, 2011).

In addition, with the introduction of these new technological developments and concepts in modern port operations, comes the challenge of new risks. Seaports are in themselves noted to be mainly exposed to utmost hazards in the categories of operational, environmental, technical and organizational capable of causing unexpected disruption or damage (John, Paraskevadakis, Bury, Yang, Riahi & Wang, 2014).

However, as expressed by Schröder-Hinrichs (personal communication, March 12, 2019), organizations usually tend to ignore the existence of a hazardous condition provided the outcome of such an existence is not costly.

With the existence of such a hazardous condition at the workplace, one may have considered that the situation would not to be conducive for work, but sometimes that notion is debunked and work is carried out as usual. This is per Yhprum’s law which states that “anything that can work, will work” (Pranata & Susilo, 2016).

Besides, the notion of Murphy’s law indicating that “what can go wrong, will go wrong” (Bloch A & Bloch A, 1977), cultivates a culture that leaves accident causation to chances and tends not to encourage commitment to safety implementation.

As indicated earlier, risk is measure in terms of probability of active failures and the consequences of the occurrence of such a failure. The probability of an unwanted incident may be low but the devastating outcome is what makes the difference.

Provided that the unwanted event does not result in negative consequences, the situation is overlooked. However, if the situation results in a negative outcome, then all attention will then be focused on the cause of the incident (Schröder-Hinrich, personal communication, March 12, 2019).
It is essential to note that further reduction in the risks indisputably diminishes their potential adverse effects on human health, environment as well as on company’s viability through financial loss (Ugurlu, 2015) and decrease insurance costs. On the other hand, an effective port safety management has many positive effects of increasing productivity, improved efficiency, quality of health, reducing company costs and sustaining its development.

Consistent with the study of Thomas (2012), a port which is well-integrated into the safety management system not only reduces the level of accidents but also improves upon safety holistically. A workplace having disorderliness in its safety management system with degrading functional systems becomes a high-risk area and poses danger to lives and the immediate surroundings. Furthermore, systemic weaknesses such as inadequate training, continual excessive working hours, commercial pressures, overly demanding tasks, high-risk environments and faulty equipment contribute to accidents.

2.8 Espoused Theory versus Theory In-Action

For reputation and continuity of business, a number of organizations are progressively adapting to ISO standards which covers quality, environmental and safety management systems. These management systems require organizations to have strategic plans articulating the organization’s established core values - what the organization deems as being of central importance to its operation.

Upholding these values, an organization develops its policy with a set of objectives which it aims at attaining, in order for it to reach its desired goals. According to Argyris and Schön’s (1974) argument, visions that an entity has in fulfilment of its intention is the Espoused Theory. When management perceives an effective action to take in a given situation, and acts to express same values in the management of the situation, their belief and actions in this case correlates. This is the case in routine situations. However, in some complex situations where a key decision is required to be made to save a person or the organization from disrepute, espoused theories
virtually become inoperative (Christensen, 2008). This implies that organization may tend to act differently under unusual conditions.

As stated by Argyris (1974), the theory which is actually reflected in practice is the Theory-In-Use, or Theory-In-Action. That presupposes that an entity may provide a well thought through espoused theory response for a demand under a certain circumstance, but may act inconsistently with the thoughts or intentions expressed earlier on.

The gaps between ‘Espoused Theories’ and ‘Theories-In-Action’ may be evident at the national and organizational strategic levels including small group and interpersonal behaviors.

2.9 Management Commitment to a Balance System Implementation

Regularly, management within organizations are challenged with competing priorities and for which they make decisions. This certainly brings in the concept of trade-offs which influence their commitment to some aspects of the business while the others become neglected. Three of the areas where management is required to make such key decisions include production, safety and quality (Michael, Evans, Jansen & Haight, 2005). Commitment from management in the area of organizational policies have been shown to drive employee performance in the area of safety (Stewart 2001; O’Toole, 2002) within different organizational establishments. As it also serves as an essential foundation for having a firm productive and safe system, it would appear that the benefits to be derived from the system are projected by safety experts to management in order to gain the high level of commitment.

2.10 Balanced Scorecard Approach

The Balanced Scorecard (BSC) as a strategic planning and management system is a business tool that provides four distinct perspectives of organizations (Kaplan & Norton, 2001) for the implementation, adaptation and alignment of strategies (Cano et al, 2017). Additionally, it enables organizations to develop objectives, measure key
performance indicators (KPIs), establish targets and initiatives which are associated with the various distinct perspectives such as finance, customer, internal processes and the organizational capacity which is also referred to as the learning and growth. According to Chavan (2009), one of the main characteristics of the BSC is its feedback and learning step which enables the organization to quantify its performance in the journey of building its strategic capability.

2.11 Business Alignment Scorecard

A large number of organizations experience constraints as a result of the limited resources available to them for the conduct of operations. According to Mol (2003, p34), organizations use financial capital to obtain human and non-human resources after evaluating their external environment and developed the appropriate strategic plan.

The model as illustrated above in Figure 11 demonstrates how system factors can be managed effectively for a productive outcome. In order to minimize risk, it is required that each system factor be managed at an acceptable level of quality. The kind of expenditure will be determined by the quality of maintenance which will then be reflected in the efficiency of the system. Organizations invest in new equipment and maintenance for a higher productive outcome.

Training which focuses on the human resource also enhances the quality of their knowledge, skill and abilities for a desirable output.

The use of the organizational resources for higher economic gains rests on the ability of management to make the right decisions for optimum operations. An organization will perform well when its system factors are better managed to maintain a balance.
The alignment indicators, as referred to by Mol (2003, p.345), help to determine if the systems are aligned and balanced. These indicators are also known as the Key Result Areas (KRAs) for the productive safety system include the following:

- Productivity
- Safety
- System factor quality
- Financial and customer
- Compliance (with legislation, internal standards or plans)
- Social Responsibility.

2.12 Port Attractiveness Index

The 2008 historic financial crisis and its repercussive effect of restricted credit availability, highlighted a key long-term investment challenge for ports. According to Medda (2015), a port’s ability to attract investment is pertinent to its sustenance and growth in market share and profit margins. Port Attractiveness Index (PAI) will further extend beyond the features of the port and take into consideration the probable market
size, transshipment capability and the emergence of inland trade. PAI notably covers policy stability, a system of regulatory transparency and support for investments.

The determinants of PAI are in three main categories and include endogenous, exogenous and subjective variables.

**Figure 12: Framework of Port Attractiveness Index (PAI)**

*Source: Adapted from “The Port Attractiveness Index”, (Medda & Cashili, 2015)*

The endogenous factors refer to the factors that are directly related to the port, in terms of its infrastructure endowment, monetary costs, logistics efficiency (Tiwari, Itoh & Dio 2003., Ha, 2003) and the accessibility of the port (Huybrechts et al, 2002).

The exogenous factors are those factors that seek to evaluate the status of socio-economic development of the host country of the port (Medda, 2015). A positive correlation was established between the attractiveness of the port and the country’s socio-economic factors such as good governance quality.

Subjective factors form the third category that influences the reputation of a port among other stakeholders. These factors include Port Quality Index (PQI) which entails the efficiency of the port’s infrastructure, Liner Shipping Connectivity Index (LSCI) and Piracy Attacks among others.
Chapter 3: Research Design and Methodology

3.0 Introduction

In the previous study, detailed literature was done to illustrate the theories and concept which correlates to this study. Most importantly, the mainstream theoretical framework and other concepts of interest to this research which are meant to guide this study were identified and discussed in the literature review.

This chapter aims to discuss the methodology applied in this research and present a generic framework used accordingly. It describes the details of the research design, sampling techniques, methods used for the collection of data, target population, research instruments, ethical consideration, reliability and validity of instruments.

3.1 Research Design

To be able to efficiently research into the effective safety implementation challenge, the study adopted a mixed method approach upon which a framework of techniques and methods capable of bringing the various components of the study together in a justifiably logical manner, was established. This framework of methods and techniques is otherwise referred to as the ‘Research Design’. Bogdan and Taylor (1975) used the term to refer to the entirety of the process of research, that is from the point of conceptualization of the problem, through the stages of developing research questions, data collection, data analysis, interpretation and writing report on the research outcome. Ogula (2005) see such a design as the plan, structure and strategy of a study which is directed towards answering research questions and controlling variance. Furthermore, Yin (2009) described the term research design to mean a logical sequence which links the empirical data to the research questions that the study seeks to ultimately explore to its conclusions.
The research sought answers through a comparative analysis of operational risks management between the ports of Tema and Aarhus. The concept of comparative analysis in this research design uses a mixed method approach. Mixed method was adopted for this study because it has the benefit of providing experts an opportunity to share detailed and rich information. This helps the phenomenon of the study to be understood within the multiple contexts. This research employed the questionnaire and interview as its primary mode of survey. The questionnaire was designed and administered to obtain data on the general perception of the target populace. It was supplemented with an interview with managers who influence the company’s decisions for additional information.
3.2 Target Population

The entirety of the set of individuals or elements that meet the criteria needed for sampling are referred to as the target population. The term population is used to mean a specific group of individuals or objects that are the focus of the research (Grove, Gray, Burns & Nancy, 2015). Considering the scope of this research which is port related, the target population constituted of various stakeholders with interest in the conduct of business in the port. These group of eligible individuals included staff of the port authority, shipping agents, terminal operators and other port users who qualify as interested parties for the operations of the port. The port of Tema has a staff strength of 2000 and has 235 registered agencies. On the other hand, the port of Aarhus has 5 employees with 7 registered agencies. Since the port is open to the public for business activities, the number of port users varies constantly rendering the number unstable.

3.3 Sample and Sampling Techniques
In the quest to obtain qualitative data for the research through a systematic approach, a set of questionnaires was prepared for a sampled group of individuals who would participate in the survey. This was done purposively to reach the right caliber of respondents with some amount of experience in the port business. Sampling is core to the qualitative survey (Robinson, 2014) and refers to the group of people who are engaged, or have had the opportunity to engage, in some sort of port commercial activity. Sampling is representative of the target population and an effective way of conducting a good survey. The scope of selection for sampling was kept wide so as to offer the study a fair representation of all port users. It included staff of the port authority, terminal operators, agents and others. The sampling method was neither limited to individuals of the same level in the hierarchy of their organizational structure nor to only any particular department within the organization. This technique was adopted to ensure the maximal variation within the context of the research (Patton, 1990). The sampling for the initial survey was kept open for the general safety perception but became limited to a few key decision-making managers who influence policy making in the second phase which involved the interview. They basically should have business to carry out in the port or must have done so previously. Their experience for the time of conduct of business was deemed useful in supporting the data for use in the study. The number of participants that this study aimed at working with was 70. The study aimed at having the various stakeholders fairly represented in the target population. This includes port workers, shipping agents, consignees each represented by 10 respondents to provide the broad perception of the general populace for both ports. The number that was targeted for the management representation was 5 for each port. This brings the sum to 70 for target population.

3.4 Description of Data Collection Instruments

A survey, which formed an important part of the research, involved directly collecting data from individuals who were of interest to the study (Leung, 2001). Data collection designs, as stated by Diekmann (1995), provide the means for the acquisition of valid data for research. To be able to arrive at a meaningful dataset, the methodology of this
study employed the use of questionnaire and interviews as instruments for data collection. The data collection instrument was developed on the basis of the research objectives and review of literature.

3.4.1 Questionnaires

To facilitate data collection from the sample group, a web-based questionnaire was developed with Google Forms. The on-line questionnaire was preferred because of the ease with which it could be administered to the target population in a short time. Due to the convenience of their use, Dörnyei & Taguchi (2009) acknowledged that these questionnaires remain one of the most widely used approaches in data collection as they have remarkable advantage of versatility in addition to their distinctive characteristic of gathering a large amount of data within a short while. For this study, the questionnaires were thoughtfully done to ensure that they were easy to understand and responded to. This is in consideration of the fact that not all respondents in the port may have a firm safety background which therefore led to the exclusion of technical details.

3.4.1.1 Structure of the questionnaires

There were five subdivisions in the questionnaires which are from ‘Part A’ to ‘Part E’. Each subdivision attempted to address one research question in order to arrive at the objectives of the study.

The instrument was structured and standardized to ensure that participants of the survey from both Ghana and Denmark would respond to the same set of outlined questions. This was particularly important for the data analytical aspect of the study which is comparative in nature. The instrument mainly contained closed-ended questions with a few open-ended questions.

3.4.2 Interviews
To obtain top management and policy influencers input to the survey, interviews were conducted. This was relevant to the study as the direct engagement with top management for their perception could reveal in detail the data which could further assist in the enhancement of a balance. The interview was helpful as it brought a distinctive dimension to the finding of the survey.

The arrangement for access to top management and policy formulators in the port of Aarhus was successfully organized by a gatekeeper, a contact with whom the researcher established a relation for data collection assistance. Interviews were conducted in person at the port for the needed data. The benefit of having the interview recorded was the accurate reflection of the data provided.

3.5 Validity and Reliability of Research Instruments

Being cognizant of the fact that the credibility of the research could be dependent upon the quality and accuracy of data, the research instrument and measurement method had to meet minimum authenticity requirements, as recommended by Marczyk, De Matteo & Festinger (2005). Its essence was to ensure the relevance and accuracy of strategies used in the measurement of the study. The study adopted the two most commonly used and significant concepts that basically interlink with measurement strategy and assessment-instruments which are reliability and validity.

3.5.1 Reliability

According to Andrich (1981) and Leary (2004) the term ‘reliability’ in general, signifies dependability or consistency of a measurement technique. In precision, it is concerned with the stability or consistency of the derived score from an assessment or a measurement technique over time and across conditions or settings (Anastasi & Urbina, 1997). The benefit of having a reliable measurement technique is in the reduction of the probability that acquired results is due to measurement error or random factors.
One way of increasing reliability in this study was standardizing the administration of the instrument. Secondly, the instructions and questionnaire contents were simplified to ease understanding for all categories of participants. Lastly, the obtained data from the instruments were recorded, compiled and carefully analyzed.

Marczyk et al (2005, p.106), however, reiterated that even though reliability is an essential consideration with regards to the selection of an instrument, it is not adequate in itself until complemented with validation.

3.5.2 Validity

The concept of validity was highlighted by Maxwell (1996, p.87) to reflect the credibility or correctness of a description, interpretation, explanation, conclusion or other sort of an account. Marczyk et al (2005) added that it refers to another critical characteristic of measurement that may be deemed as part of a holistic measurement strategy. Conceptually, it seeks to answer whether the research instrument measured what it was intended to. To ensure the validity of the study, the philosophy of triangulation (the basis of a mixed methods approach) was used. This entailed the use of a literature review, survey and interviews. The aim for adopting this approach in the study was to complement each distinctive technique with the others in order to fortify the credibility of the findings (Kane, 1990). Figure 15 illustrates the triangulation method that this study used to ensure the validity of its results.

Figure 15: Methodological triangulation validation method

Source: Alassafi et al, 2017
3.6 Data Collection and Ethical Processes

Prior to the distribution of questionnaire for data collection purposes, approval was sought from the University’s Research and Ethics Committee as the study involved human participation. The necessary documents required by the Committee were presented and clearance for same received. Effort in establishing contacts in both ports yielded results and communication was established with the representatives of the ports where the survey would be conducted in order to clarify the purpose of the study. The assistance of the gatekeepers who volunteered to assist with the distribution of data collection instruments among the local staff was very helpful.

Before any respondent partook in the study, information about how the data would be protected and stored was provided to them. Additionally, participants were assured of anonymity or confidentiality in accordance to their request. Respondents were made to understand that participation was absolutely voluntary and therefore had the freedom to decline or withdraw from partaking whenever they decided.

Furthermore, the participants were informed of the need for their consent before their engagement in the interview. All participants therefore provided their needed consent. For the respondents to the questionnaire, their consent was obtained by checking an appropriate required box which was included in the questionnaire and reflected their decision.
Chapter 4: Analysis, presentation and interpretation of data

4 Introduction

The study began with an overview of the importance of ports in the growing maritime trade. The discussion further looked at safety implementation as applied to ports of developing countries especially in West Africa and how the perceived lack of management commitment negatively impacts safety performance. With the aim of finding out the importance of and challenges to the sustenance of safety performance and how a balance between productivity, safety and quality can be attained and assessed, a literature review was done on key concepts of relevance. These included Safety, Risk, Productivity and Quality of Service, Espoused Theory and Theory In-Action. To further aid in the comparative analysis of operational risk management between ports of Denmark and Ghana, questionnaires were administered and interviews conducted in these same selected countries.

This chapter entails the analysis of the data obtained from the questionnaires and interviews which were based on the theories discussed earlier.

4.1 Profile of Respondents

In response to the survey, the study had 48 participants with 28 from Ghana and 20 from Denmark. There were 14 participating females representing 29.17% and 34 males representing 70.83%. The educational background of the Ghanaian participants ranged from the Senior High School level to Masters level and those of the Danish respondents ranged from Higher Preparatory Examination level to Master’s degree level. 17 out of the 20 respondents from Denmark, representing 85% had 10 years and more experience in the maritime industry and 19 out of the 28 respondents from Ghana, representing 67.86%, equally had similar experience.
Additionally, the interviews had 6 policy influencing respondents, with 4 participants from the port of Aarhus and 2 from the port of Tema.

Figure 16: Categorization of respondents by sector of operation

As demonstrated in Figure 17 below, majority of the respondents from both ports had ages in the range of 41 to 50 years which was followed by 51 to 60 years, indicating a high experience level of the participants.

Figure 17: Summary of age ranges of participants
4.2 Findings from the Questionnaires - Part A to E

The survey that was conducted had five parts which ranged from part A to E. A number of questions were asked which sought to address the following issues;

- The importance of a balance between productivity, safety and quality.
- Implications of maintaining a balance between productivity, safety and quality
- Challenges to the attainment of a balance in these three key focus areas
- How a sustainable balance can be achieved and finally,
- How the balance can be assessed

4.2.2 Part A – The Importance of a Balance between Productivity, Safety and Quality

In seeking to ascertain the significance of a balance, questions of the relevance of safety were asked participants. This was to obtain the respondents’ view of safety as against the popular belief that safety is mostly a cost as compared to its benefit. The data from the survey as shown in Figure 18, however, indicated a rather similar pattern of perception for both ports. 23 (82.1%) respondents from the port of Tema and 15 (75%) from the port Aarhus indicated that safety actively contributes to the building a positive reputation for the port. An Aarhus port respondent representing 5% remained uncertain and the rest from both ports disagreed to the notion.

The data signifies that both ports have a high regard for safety as a key contributor to sustaining a positive reputable business image for investment and growth.
4.2.2.1 Port Reputation

The reputation of port, as opined by majority of the respondents, is a major factor for the sustenance and growth of the port’s business. As was discussed in subsection 2.12, the reputation of a port is a subjective variable which is influenced by the Port Quality Index, PQI. Among the known features for PQI are efficiency of the port’s infrastructure, piracy issues and Liner Shipping Connectivity Index (LSCI), all of which can directly or indirectly be impacted by an inefficient safety system challenge. As affirmed by a corporate manager Kweku¹ (Tema) during the interview on the subject of connectivity between safety, efficiency and the quality of service, he stated;

“Yes, it (safety) has a lot of influence on the quality of service. The mission of the port is to provide an efficient port services by delivering a quality port service to the customer. When we talk about quality service here, we refer to the totality of quality which includes elements of safety. So, safety plays a bigger role in the quality of service”.

¹ The names used in this study are not the actual names of respondents. This is to maintain the identity of respondents in anonymity for ethical purposes
Additionally, it is worth noting that a mediocre implementation of safety creates chances for organizational losses through accidents and poor maintenance culture. Furthermore, when a port is declared an unsafe port due to its high rate of accidents, it reputable image that might have been built over a period of time becomes tarnished. Its repercussion would remain a low business attractiveness which might make the port become redundant if no adequate corrective actions are taken to remedy the situation.

Commenting on the significance of a balance implementation, Kobina (Tema), a corporate manager with a vast experience in the port industry, stated;

“Productivity losses are avoided as workers and equipment are available for continuous production. The company (port) is then able to meet customer deadlines”.

Nelly from the port of Aarhus added that

“Safety influences the quality of service delivery in port in a positive way and remains important to the business growth as our customers consider safety first. That is why our customers will choose the port of Aarhus to land goods because the safety level is high. This is because the safety level in the port of Aarhus is always maximum”.

The data analysis for Part A therefore implies that reputation is critical for the image of the port for the conduct and growth of its business and safety is thus considered important in this regard.
4.2.3 Part B – Implications of maintaining a balance between productivity, safety and quality

This part of the survey which comprised open ended questions, sought to delve into the effect of having a balance in the three areas of interest. The responses were analyzed using a qualitative data analysis approach via coding and this informs the following discussion. Among the commonly mentioned benefits were enhanced efficiency, reduction in accidents, increased revenue generation and above all a reputable port image.

4.2.3.1 Benefits of a Balance Implementation

This phase of the study received a total of 38 respondents with 25 from the port of Tema and 13 from Aarhus. Concerning the gains associated with the balance, the common areas that both ports covered related to enhanced workplace safety with minimized accidents, improved efficiency and customer satisfaction which leads to business growth. Figure 19 below illustrates the data as compiled. Improved workplace safety leading to less accidents was the predominant response from 12 participants from Tema representing 48% and 4 participants from Aarhus representing 30.8%. The other group of respondents comprising of 8 (32%) of participants from Tema considered enhanced port efficiency as gain interconnected with a balance implementation just as the 5 participants from Aarhus representing 38.5%. The last group of participants deemed customer satisfaction as a key benefit to having a balance implementation. This group consisted of 5 respondents from the port of Tema representing 20% and 4 from the port of Aarhus representing 30.8%.
4.2.3.1.1 Improved Workplace Safety and Employees Health

When healthy employees of an organization work in an environment that is considered as safe, it is believed to reflect in their output as productivity becomes maximized. Maslow (1943) named safety as one of the basic needs necessary to be satisfied in order to motivate individuals for a positive outcome. One of the key findings that emerged was the issue of the health and safety of the employees. A total of the 13 respondents out of the 25 from Tema (representing 52%) who responded to this question indicated that the employees will be healthier, work safer and that translates into cost savings in the area of health care. Similarly, 6 out of the 12 respondents from Aarhus (representing 50%) supported the notion of improved health of the workers and better employee output.

Kobina (Tema) - 36 year experienced in the maritime industry and a corporate manager stated that, “Fewer accidents means less insurance premiums, avoidance of court costs from families of casualties, savings from likely fines from regulatory authorities”.
While emphasizing on the relevance of safety, Perry (Aarhus) with 36 years of experience in the port industry stated:

“One of the reasons of course is that we believe that the people are very important. Also, we think the people must report to work and go back home healthy so that they can come to work the next morning. So, it (safety) is for the people (employees), they are of course important. But also, I think that we don't want to cause any damage. So, in our mind, we try to reduce the chances of occurrence, which I think is more or less a link. I think it is the main interest of managers.”

This implies cost savings in the area of health and insurance when employees become healthy and work safely which is indicative of minimized accidents. Minimized downtime due to accidents also translates into revenue generation as do the avoidance of direct costs from accidents.

4.2.3.1.2 Enhanced Efficiency

The primary objective of port managers is to run an efficient port. Port efficiency is imperative as it forms a major part of satisfying customers. In this respect, the respondents from the port of Tema highlighted quick turnaround time of ships and equipment reliability as benefits. Similarly, the respondents from the port of Aarhus named enhanced ship’s turn-around time, stable and reliable service, reduced off hires as the gains from a balance implementation in a port system. All of the listed conditions put together becomes a boost to the efficiency of the port.

In elaborating on how a balanced implementation of the system can influence a positive image of the port, Esi, a 10-year experienced Officer stated;

“Competitive advantage is gained as safety, productivity and quality service are benchmarks for assessing a well-managed port. There is increased revenue as cost is saved with less accidents. Furthermore, confidence in the (port) authority (grows) and hence an increase in the clientele base”.

48
4.2.3.1.3 Business Sustainability and Growth

One other key area that got highlighted as an advantage for having a balanced system is the sustainability of the port operations and the opportunity for business growth. 12 out of the 25 respondents (48%) from Tema were of the view that a balanced implementation will form the basis for the sustainability of the port business and as well, present opportunities for business growth. Similarly, 6 out of the 12 respondents (50%) from Aarhus shared almost the same view.

Customer perception of a balanced implementation within a port is important for port selection. As discussed earlier chapter 2.3 of the literature review, safety is subjective and directly fits into the ‘Subjective Factors’ which influence the reputation of the port. To be able to gain customers’ perception of a port in a positive light, management of the port needs to have a system which runs effectively in order to draw more business as the port grows.

4.2.3.2 Associated Constraints of a Balance

While a significant level of positivity could easily be associated with a balanced implementation, the study sought to probe for any ramifications linked with the same. This aspect of the survey had 22 respondents from Tema and 10 from Aarhus.

The general response from the participants to this particular aspect of the survey was basically in 3 areas. These included loss of productive time, high cost of implementation and negative impact on organizational finances (See Figure 20).
Whereas 3 respondents (13.6%) from Tema were uncertain about the disadvantages linked to the balance implementation, 7 (31.8%) were convinced that the consequence thereof would be loss of productive time, 5 (22.7%) perceived a high cost implementation, 4 (18.2%) envisaged a decline in the organizational finances and 3 (13.6%) believed that there were no associated losses.

Similarly, the responses from the port of Aarhus showed that 2 (20%) remained uncertain about the losses associated with the balance implementation, 2 (20%) saw loss of productive time as an issue, 3 (30%) related it to the cost of implementation and remaining 3 (30%) believed there were no known associated losses.

4.2.3.2.1 Loss of Productive Time

In service operations, time is a key factor the measure of which translates into monetary value. Time lost is therefore viewed as loss of productivity. The cause of Lost Time Incidents (LTI) are mainly accidents which become drastically reduced with the implementation of a balanced system. However, the time loss referred to in this discussion as a constraint is the time lost due to procedures and processes that one may
consider not to add much value to the services provided. These include the numerous safety meetings; ad hoc meetings and the time spent for job safety analysis or risk assessment before any operations as many considered such times as productive time wasted.

It is in such manner that Yeo et al (2013) denotes that maintaining a mediocre level of safety provides the possibility of an economic advantage and increased benefits.

4.2.3.2.2 High Cost of Implementation

In an earlier discussion, reference was made to Goss’ (1989) claims of the cost of implementation being uneconomical and therefore limiting its attractive to certain organizations even though the concept of system safety itself is viable.

On seeking the view of policy influencers and makers on whether safety was a financial burden to the organization, this is what Nelly a Departmental Head with 25 years of experience had to say;

“Accidents are also very expensive. That is a very hard way to look at it. Also, if you look at the cost you might think it is wasting money but I don’t think that is wasting money. It is making the operation safer by avoiding accidents. Accidents are very expensive for any company. And also, there are lives to think of.”

The part in the statement above “… Also, if you look at the cost you might think it is wasting money” is what the 22.7% of the respondents from Tema and 20% from the port of Aarhus referred as a loss. However, by weighing the options, one may ask whether the loss is significant or trivial in comparison to the losses that are incurred when accidents happen.

4.2.3.2.3 Decrease in Revenue Generation

Revenue generation for any profit-making entity is core to its business. The remaining minority of 4 (18.2%) and 3 (13.6%) respondents from the ports of Tema and Aarhus respectively considered the rigidity that comes with compliance to certain system
safety standards as limiting their ports ability to make more gains. The view of these minority also tends to support Goss (1989) view of economic immoderacy for implementation as some opportunities for taking economic advantage will no more be compromised. In a way this limits the extra revenue that the port could have generated with a compromise in the system.

4.2.4 Part C - Challenges to the Attainment of a Balance

One area that remains critical to attainment and sustenance of a balance is the challenges that are associated with it. These challenges to the attainment of a balance as identified mainly centered on management commitment to policy implementation. This section of the survey had a total of 44 respondents with 28 and 16 from the ports of Tema and Aarhus respectively.

As presented in Figure 21, 16 respondents (57.1%) from the port of Tema and 6 (37.5%) from the port of Aarhus conceded that commitment to the implementation of the policy was a major gap. 4 respondents (14.3%) from the port of Tema and 2 (12.5%) from the port of Aarhus believed that the gap was in policymaking. Additionally, financial resource availability was identified by 5 respondents (17.9%) and 1 (6.3%) from Tema and Aarhus ports respectively. Further to that were also 2 respondents (7.1%) from Tema and 2 (12.5%) from Aarhus acknowledging human resource as a gap creator. The remaining respondents comprising of 1 (3.6%) from Tema and 5 (31.3%), however, held the view that there was no gap.
4.2.4.1 Policy Making

Policy making as identified in the finding is critical to organizational directives. The survey had 4 respondents (14.3%) from the port of Tema and 2 respondents (12.5%) from the port of Aarhus who perceived the policy making to be a hindrance to achieving a balance in productivity, safety and quality. Managers make policies in order to ensure that organizational decisions are aligned with objectives that are set out. These are generally captured in the organization's policy manual, if there is one available.

One characteristic of policy is that it may be implied from the executive decisions of top management rather than it being written down (Birkland, 2015). In reality, it is not uncommon to find that a number of organizations operate under policies which differ from its stated policies.

According to Reason (2003), latent conditions which associated with such decisions at the organization’s policy level, play an essential role in the safety culture and effective risk management of an organization. This makes decisions at the policy level critical for an effective system safety within the organization.

Figure 21: Challenges to achieving a balance
The responsibility for an adequate system implementation begins right from the top level. Management commitment in any organization is core to the success of effective system implementation. Although the results from the survey for both ports revealed that the general perception of the current organizational policy in supporting and harmonizing productivity, safety and quality is high, the management commitment for same was, however, found to be challenged as is reflected in Figure 21.

As deliberated in section 2.9 of chapter 2, the dilemma that comes with management decision for key competing concerns tend to bring in the issue of trade-offs. These often sway in the direction of where there is usually an economic advantage. The issue with this is the possible relegation of pertinent system safety matters to the background instead of giving it a priority.

4.2.4.3 Financial Resource Availability

Budgetary planning and allocation form an important aspect of an organization’s strategy for economically managing its finances in order to facilitate the organizational processes for a desirable outcome in a cost-effective manner.

A section of the respondents comprising of 5 (17.9%) and 1 (6.3 %) from the ports of Tema and Aarhus respectively viewed this as an impediment to the attainment of a balanced implementation as the organizational targets yet to be handled compete for the monetary allocation.

This notion was, however, considered differently at the management level. When it was enquired through the interview with managers and policy formulators whether the balanced implementation was a financial burden on the port, the following corporate managers had this to say;

_Perry (Aarhus)_

_No, I think it is a necessary burden. As discussed earlier the safety of the people are more important._

_Nelly (Aarhus)_
Maybe or maybe not but it is a necessary burden. The authority does not see or have this perception for safety. Once the worth of a safety equipment can be substantiated, they will acquire it for operations. In order words, safety is not a financial burden

Kweku (Tema)

No, not at all. It is a necessity

Inferences made from these managers, however, indicated that although the balanced implementation of system safety appear to be a burden, its importance makes it a necessity which therefore does not reflect as monetary waste.

4.2.4.4 Human Resource

A minority of 2 respondents (7.1%) from the port of Tema and 2 (12.5 %) from Aarhus believed that the issue of people as human resource was a concern to the balanced implementation. Systems, in themselves, could not perform any function without human involvement. This is what makes the human resource critical to a balanced system implementation. However, the human resource be influential to the balanced implementation in terms of their numbers and quality of skill or competence.

4.2.5 Part D - Sustaining a Balance

The sustenance of a productive system balance is essential for any business entity to thrive. Figure 22 illustrates the responses to how a sustainable balance can be attained. In the conduct of survey for the establishment of a sustainable balance, 11 respondents (57.9%) port of Tema and 2 (25%) from Aarhus indicated that a balance implementation can be sustained with a management commitment for effective policy implementation. The second majority consisting of 6 respondents (31.6%) and 1 (12.5%) from Tema and Aarhus ports respectively associated the sustenance of a balance with employee training.
Figure 22: Focus areas for the sustenance of a balance

A port respondent, Tema (5.3%) and 2 (25%) from Aarhus port deemed employee participation as a key factor to the achievement of a sustainable balance. Additionally, a respondent from each of the two ports believed that it can be achieved through monitoring and measurement.

The last view from a respondent from the port of Aarhus pointed out that the political willingness for effective implementation will make a sustainable balance.

Apart from the political willingness for effective implementation, the other findings such as management commitment and training directly associate with the BSC principle of harnessing a balanced implementation.

In agreement with the discussion on the application of the BSC in section 2.7 of the literature review, Kobina and Esi from Tema, provided a general summary of his perception of how the ports can harmonize a balance for sustainable development by stating that;

Kobina (Tema)
“Commitment of top management in the implementation of safety policy developed and then linking safety processes and implementation to strategic plan implementation with balance scorecard and ISO processes. Ensuring the training and re-training of employee in the strategic plan to ensure that dictates of the plan are adhered to”

Esi (Tema)
Management need to adopt the 5Cs approach. The management should demonstrate Commitment towards the implementation of these systems. The Competency of the workers must ensure by considering their knowledge, ability, training, experience and skills in carry out their duties. There should be measures in place to Control Risk at the workplace. There should be a means of Communicating to the workers issues relating to charges in policy, operational procedures, risk known assessment and other relevant issues. Finally, there should be a Cooperation between the workers and management toward the achievement of the organization’s safety and quality objective.

However, with reference to the indicators mentioned in subsection 2.7.5 of Chapter 2, among the indicators discussed includes productivity, safety, system factor quality, financial and customer, compliance with legislation, internal standards or plans and social responsibility.
4.2.6 Part E - Assessment of a Balanced Implementation

An evaluation of the performance of a balanced system is critical to the success of its implementation to any port. It provides feedback to the management which enables the determination of the level of achievement of targeted goals and whether resources were put to use effectively. It was revealed in the entropy model that the quality of system factors directly contributes to organizational performance and safety, which therefore makes it essential to be incorporated into the measurement system.

According to Mol (2003, p347), measures for assessment are placed under three distinct categories which are external strategic alignment, internal strategic alignment and internal goal alignment.

It is of primary importance to determine the period of the cycle to which the measures apply in the development of the system.

Considering a 3-year strategic plan period as an example, the targets, measures, baselines, and the relative weights assigned to each weight are recorded. On an annual basis, progress is monitored and evaluated within the cycle. Expert recommendation for weighting according to (Mol, 2003, p349) is 20, 60 and 20 for external strategic alignment, internal strategic alignment and internal goal alignment respectively. The internal strategic alignment bears a bigger weighting as it contains the core business measures:

$$\text{Actual Weighting} = \left(\frac{\text{Actual result} - \text{Baseline}}{\text{Target} - \text{Baseline}}\right) \times \text{Weighting}$$

The calculation on the weighted actual is progress made towards the targeted for a given year which is then multiplied by the weighting.
Chapter 5: Recommendations and Conclusion

5.0 Introduction

This chapter presents the conclusion of the study while highlighting the key findings that were identified. It, also, provides recommendations in support of a balanced implementation of a productive safety system in the management of the port.

5.1 Cost Benefit Analysis

The traditional practices for the management of cost are reactive and imprecise which occasionally create vast unintended consequences. In the short term, indiscriminate maintenance cuts may seem to save cost but eventually lead to breakdowns, affecting service delivery, safety and compliance. These excessive costs have the potential to ultimately affect the viability of the organization.

The cost of accidents can sometimes be extremely heavy for organizations to bear. To help policy makers appreciate the true value of safety, the National Safety Council, NSC conducted a study in 2001 that quantified the cost of mishaps in a construction firm. The estimated cost of injury and death in the organization is as outlined below in Table 2.
Table 2: Valued cost of accidents per a construction employee

<table>
<thead>
<tr>
<th>Category</th>
<th>Valuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Workers</td>
<td>9,125,000</td>
</tr>
<tr>
<td>Deaths</td>
<td>1,210</td>
</tr>
<tr>
<td>Cost per death</td>
<td>$1,020,000</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$1,234,200,000</td>
</tr>
<tr>
<td>Disabling Injuries</td>
<td>470,000</td>
</tr>
<tr>
<td>Cost per disabling injury</td>
<td>$29,000</td>
</tr>
<tr>
<td>Sub Total</td>
<td>$13,630,000,000</td>
</tr>
<tr>
<td>Total</td>
<td>$14,864,200,000</td>
</tr>
<tr>
<td>Cost per employee</td>
<td>$1,629</td>
</tr>
</tbody>
</table>

*Source: Rechinthin, 2004*

By weighing the cost of training and maintenance for system factors in comparison consequences of a neglect which degenerates into an accident, the data presented in the NSC’s report shows the worth of what organizations risk to lose in an accident. The data limits valuation of the consequences to human lives which implies that by including damage to property and environmental impact to the valuation, the value of the cost becomes multiplied.

5.2.1 High Cost of Implementation

In an earlier discussion in subsection 2.11, it was shown that the quality of service depends on the efficiency of the system factors. Having established that it is system degradation that reduces the efficiency of the work system, measures to ensure optimum performance of the same system must then be targeting any conditions for possible elimination of factors which are concerned with facilitating system degradation. These include:

- Corrective action
- Maintenance
- Monitoring and Control of Residual Risk

The maintenance of a balanced system comes at a cost with the acquisition of new equipment, replacement parts or routine maintenance.

5.2.1.1 Recommendation for High Cost of Implementation

Companies often view maintenance as a cost whereas if the assets required to function for production remain inoperative, there will neither be service delivered or profit generated.

Economically it is not prudent for a port to acquire expensive equipment such as tugboats, shore-based fixed firefighting systems and then allow them to lie inoperative due to lack of maintenance which is often attributed to the organization’s fiscal challenges.

Preventive maintenance, which is proactive in nature, is recommended for the upkeep of port equipment since it effectively ensures their operational readiness and safety.

5.2.2 The Cost of Training and Decrease in Revenue Generation

The productivity of the port has a direct correlation with its sustainability. The capability for port to utilize limited assets and to further minimize waste from its processes forms the basis for sustainability. Being productive is a significant part of attaining excellent performance.

In a work environment, humans operate systems to ensure adequate performance. Their output depends on skill, knowledge and competence which periodically require to be upgraded for optimum efficiency.

In the situation where adequate training is not carried out, the organization may be observed to have engaged a larger than required human resource for tasks that a few qualified people could have undertaken.
5.2.2.1 Recommendation for Training, Loss of Productive Time and Decrease in Revenue Generation

Trainings modeled according to required international standards need to be conducted for employees to deliver at their best. This enhances the quality of personnel engaged for port operations and directly influences the level of productivity. Where there is a lack of appropriate training, the port pays dearly through mismanagement of expensive logistics, improper maintenance of facility investments and a higher rate of incidents/accidents which may cause lost operational time.

In reality, such lost time may be costlier as damage sustained to property may attract legal consequences with fines and insurance costs. Severe incidents may even end up with loss of lives.

An added advantage for the training of staff is employee retention which strengthens the port’s workforce and mode of operation.

Pragmatic ways of curbing human resource (as a system factor) degradation includes training for continual improvement and regular review of operational processes to minimize the variations in operational processes which eventually lowers process-related entropy. Effective maintenance is one key action necessary to optimize the organizational safety, performance and system factor quality.

5.2.3 Reputable Image of Port

Positive port reputation means a lot to the sustenance and growth of the port business. As discussed earlier in chapter 2, the reputation of the port is built on a subjective variable which is based on culture at the workplace that can be enhanced with the implementation of a balanced system.

Through a positive reputation, the port is able to build a high Port Attractiveness Index which increases its opportunities for foreign investments.

5.2.3.1 Recommendation for the Port Reputation
To be able to gain and sustain positive port reputation, the efficiency of its systems must be kept at optimum. Mol (2003) suggests that there is the need for strategic alignment where the measures contained in the organization’s scorecard support the ones applied at the corporate level. The core business activities of the port are incorporated in its internal strategic alignment. Detailed measures which are concerned with the alignment of the port’s management and employees come under the internal goal alignment section.

A set of specific priority areas which suits the port’s needs can be developed granted that they are compatible with the corporate outcomes and as well support the interdependencies of the various operational units.

Figure 24: Sustaining a balanced implementation through the management of risks
Source: Van Der Stap, 2018

As the systems degrade over time, the probability of losses in the delivery of service and quality increases and so do the incidents within the organization. Corrective action is required to revert the trend. Additionally, the importance of operational maintenance in such a system is the reduction of risk to level that is as low as reasonably possible (ALARP). Where, in the practices of the port, corrective actions and maintenance culture are not sustained, the system tends to degrade and the probability of organizational losses increases until they become inevitable. The result is the
occurrence of undesired accidents which occur at a cost that may be higher than its prevention cost.

5.2.4 Legal basis for System Implementation

While it was established that both ports are taking bold strides to be at their best in terms of reputation, it was unveiled that the approach adopted by the Danish Government for the effective implementation of system safety for the operations of the port was comparatively sustainable.

The implementation of the system safety is independent of any influences from the management of the Port Authority. The Danish Labor Inspectorate (DLI) oversees and controls the safety and environmental management implementation issues of every company in Denmark. The inspectorate embarks on unannounced visits to conduct inspection of safety and environmental management practices for any establishment they randomly select.

With the authority vested in DLI, the level of implementation of work standards is high as they are empowered to halt any operation so long as they are not in conformance with the required standards. This has sustained the level of high implementation standard in terms of the harmonization of safety and efficiency in their industrial setup and leaves the port with impracticable chances for any compromises.

With a national policy binding all corporate entities to abide by a productive safety system, the temptation of viewing the implementation as a financial burden is annulled as non-compliance with the required standards attracts punitive actions.

Beyond the control of management in the effective implementation of a balance, a respondent from the port of Aarhus stated:

(Seak – Aarhus)

“Political willingness is the most important factor to accomplish the above and relevant recommendations for change towards the general national rules of operations”
Although only the minority identified the success of the implementation with political will, it appears to form the foundation for the sustenance of the productive system implementation in the port of Aarhus.

On the issue of political influence for a balanced implementation, the Nelly (Aarhus) also stated;

“Also, there are strict safety laws in Denmark, maybe stricter than the laws in the countries around us regulating the safety of operations in the harbor. And we answer to everything that we have done.”

The response from these managers shows the strength of the legal system in the operations of the port which ensures that the needful is done to prioritize safety.

Under the relevant national legislation for Ghana (Ghana Port and Harbors Authority Act of 1986), the Port Authority is empowered to “plan, build, develop, manage, maintain, operate and control ports” in the country. Although the autonomy enjoyed by the port to a certain degree is good, it has a greater chance of allowing compromises which defeats the purpose of an effective implementation of a productive system. This is possible because most decision-making policies and processes in matters relating to the effective implementation of systems, rest with the port authority. The port, being an environment with different stakeholders, sometimes is challenged with compliance issues as other institutions and different stakeholders resist any new change made to the existing system.

5.2.4.1 Recommendation for Legal Support System

To further enhance the approach for an effective implementation of system safety within ports for a balance in their operations, the following are recommended to be addressed;

- Having established that organizational risks have their roots connected to the latent conditions emanating from the management decisions, it becomes
imperative that managers are awakened to the call of organizational policy commitment. To be able to achieve this, a comprehensive value-based training on systems is recommended for the management of both ports.

- The ports need to review the management behaviors in critical areas such as decision-making practices in order to ensure that managers are rightly equipped in the pursuance of optimal outcomes. Top management decisions forming part of the organizational policies should be able to be defended both legally and from the point of view of organizational objectives.

- The review of the management system for the port of Tema to shift the focus of management system from mere safety to the attainment of a balance between production, safety and quality outputs will further enhance operational processes.

5.2.5 Research Conclusions

In conclusion, the data from the study demonstrates that both ports share common understanding of how important management commitment to system implementation is. It could, however, be deduced that the difference in implementation of the system is hinged on the national policy and legal framework which has not been comparatively successful in the implementation process in Ghana owing to some lapses and leeway for compromises.

The management of risk entails the process of making decisions for the control of risks posed by hazards within an organizational setup and implementing such measures to effectively reduce the risk.

By giving operational risks of the port due consideration at the policy level, risk management initiatives will be enhanced. Latent conditions which exist for accident causation will be reduced as top management commitment towards risk is not compromised. With this development, core values of the port remain core to its operations which then will influence the maintenance of systems factors for optimum output.
5.2.6 Limitations and Further Research

Historically, political interferences, influences and change management challenges have proved to cause setbacks in the management of state institutions. However, since the study was not focused in this direction, much could not be derived concerning this subject area in this study. In response to the question on management commitment, a respondent, Kweku from the port of Tema stated:

“The change management approach to safety in the port is a problem. When it comes to safety there is the need for top management commitment to drive it. But this kind of approach is lacking in one way or the other. One may not understand but you’ll realize that only a few selected people are given the role to drive safety for its implementation. The top management sees things rather differently. The change management approach when it comes to the port in Ghana is rather poor”.

Being mentioned as an area of importance in an interview, it is deemed worth researching into in a future research. It is hoped that further research in this area will unearth important findings that will enable growth, development and sustainability.
References


Balanced Scorecard Institute, BSI (2019, September 03), Balanced Scorecard Basics. Retrieved from https://www.balancedscorecard.org/BSC-Basics/About-the-Balanced-Scorecard


Cameron, I., Mannan, S., Németh, E., Park, S., Pasman, H., Rogers, W., and Seligmann, B. (2017), "Process hazard analysis, hazard identification and scenario definition: Are the conventional tools sufficient, or should and can we do much better?", *Process Safety and Environmental Protection*, Vol. 110, No.1, pp. 53–70.


Dannenberg, M. (2018). The main thing is to keep the main thing, the main thing. *Organizacja i Zarządzanie: kwartalnik naukowy*.


Roller, M. R (2017), The Added Value of Mixed Methods Research (Slides). Retrieved from https://www.slideshare.net/MargaretRoller/mixed-methods-research-73994556


Appendix 1 Consent Form

**Consent form**

Dear Participant,

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

The topic of the Dissertation is *Implementing a balance between safety, productivity and quality: A comparative analysis of operational risk management in the ports of Tema and Århus*

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

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

Your participation in the interview is highly appreciated.

Student’s name: Emmanuel Insaidoo
Specialization: Maritime Safety & Environmental Administration
Email address: w 1802926@wmu.se

***

I consent to my personal data, as outlined above, being used for this study. I understand that all personal data relating to participants is held and processed in the strictest confidence, and will be deleted at the end of the researcher’s enrolment.

78
Appendix 2 Guide for Semi-Structured Interviews

GUIDE FOR SEMI-STRUCTURED INTERVIEWS

Section A

i. Considering current global economic growth in the maritime and port industry, do you consider safety to have contributed in any way to the increase of maritime trade?
ii. Could the growth have been better with a lesser emphasis on safety implementation?
iii. Does safety in any way influence the quality of your service?
iv. How much of a role do you think the commitment of management to safety played in this sense?
v. One a scale of 1 to 10 (where 1= Very low and 10= Excellent), how would you rate management commitment to issues related to safety in port operations?
vi. Can you kindly share how safety has impacted your operations?

Section B

i. From a management perspective, why would the port invest in safety when there appears to be no immediate and tangible benefits?
ii. Is safety not a financial burden to the port industry? Can you kindly substantiate on the reason for your answers provided above?
iii. Apart from your response to (i), are there any other reasons why a balance in the implementation of safety must be meaningful to management?
iv. Can this balance influence the quality of the port’s services? Can you please elaborate on that?
v. Is safety always of benefit? Can you please expound on how its negative side influences your operations?
vi. Considering the two sides, which is pronounced in the interest of the organizational performance?
vii. Why is commitment to safety sometimes a challenge to management?

Section C

i. Can you please share any struggles this establishment has encountered in its attempt to ensure adequate safety implementation?
ii. Why was it an issue and how was it overcome (if it has been overcome)?
iii. Do you foresee any potential safety implementation challenges and/or hinderances in the near future, with particular reference to its effect on your productivity?
iv. If yes, what are they and what is the management’s plan for addressing them?
Section D

i. How does your organization ensure quality of service delivery through the workforce?
ii. In your operations, does your organization experience difficulties that hamper the operational processes? How do you ensure the integrity of your work processes?
iii. Is technology influencing your operations?
iv. How is the integrity of technology ensured?
v. What would you say about the design of your work environment? Do you see any shortcomings that affect your productivity? What are they and in what way do they affect productivity?
vii. Has your organization encountered situations where it is evident that your operations are not functioning as expected? Were they isolated or systemic?
viii. How was such a weakness addressed?

Section E

On a scale of 1 to 10 where 1= Extremely low and 10= Excessively high, how would you rate the following:

<table>
<thead>
<tr>
<th>Production Factors</th>
<th>Current Average Score</th>
<th>Potential Average Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human resource (The probability of their inability to respond to safety and risky situations: Proficiency based on level of training, competence and behavioral factors)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processes (Considering the compliance to standard operational procedures, the correct application of risk assessments and the maintenance of equipment)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology (Considering the reliability of technology or the risk of failure)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical environment (Considering the planning or design of the environment and its effect on the ports performance, environmental pollution issues)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SECTION TWO

Kindly indicate your agreement/disagreement with the following statement by ticking the appropriate box (□). The statements are in a port context.

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Safety does not necessarily contribute to building a positive reputation of a port</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>A2</td>
<td>Efficiency is a port is better when safety is not fully integrated into its operations.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>A3</td>
<td>The quality of service provided in a port cannot be reduced by a mediocre level of safety</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>A4</td>
<td>Formal training is not necessary if staff appear competent on the job</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>A5</td>
<td>Further training for continual improvement is not necessary so long as staff can perform their duties as required</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>A6</td>
<td>Effective routine maintenance of operational crafts and machinery enhances port productivity</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>A7</td>
<td>So long as service provision goes well in a port, it does not really matter if the resources for the operations are inadequately maintained</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>A8</td>
<td>Safety is not absolutely important as its benefits are outweighed by the associated cost of implementation</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
| A9  | In your opinion, are there gaps between the current levels of safety, productivity and quality of service in port operations?  
   a) Yes □   
   b) No □    
   c) No sure □  | □              | □     | □         | □        | □                 |
<table>
<thead>
<tr>
<th>A10</th>
<th>In which areas do you identify these gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) There are no gaps</td>
</tr>
<tr>
<td></td>
<td>b) Policy making</td>
</tr>
<tr>
<td></td>
<td>c) Commitment to implementation of policy</td>
</tr>
<tr>
<td></td>
<td>d) Financial resource availability</td>
</tr>
<tr>
<td></td>
<td>e) Human resource</td>
</tr>
</tbody>
</table>
Kindly indicate your agreement/disagreement with the following statement by ticking the appropriate box (□). The statements are in a port context.

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Profit margins will reduce when a balance between safety, productivity and quality of service is implemented</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>B2</td>
<td>Increasing profit margin is more important than having a well-integrated efficient safety system</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>B3</td>
<td>Enhancing safety in port operations for a balance with productivity will improve the service quality for customer satisfaction</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>B4</td>
<td>Operating a port where safety, productivity and quality of service are in equilibrium will compromise on its commercial performance</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>B5</td>
<td>Clientele may opt for an alternative port irrespective of enhanced productive safety system</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Kindly indicate your viewpoint to the following statements by ticking the appropriate box (□) and/or stating your thoughts in the text box. The statements are in a port context.

B6 In your opinion are there any gains associated with a good balance between safety, productivity and service quality?
   a) Yes □   b) No (Please proceed to C1) □   c) Not sure (Please proceed C1) □

B7 If yes, can you kindly mention any two of such gains that is related to having a balance between safety, productivity and service quality
   a) □
   b) □
| B8 | Kindly indicate any possible losses associated with a balance between safety, productivity and service quality?
|    | a) [ ]
|    | b) [ ]

| B9 | In your judgement, kindly indicate which of these fits best your perception
|    | 1) The gain related to the implementation of a balance is more than its losses [ ]
|    | 2) The losses associated with a balance are rather more than its gains [ ]
|    | 3) Not sure [ ]
Kindly indicate your agreement/disagreement with the following statement by ticking the appropriate box (□). The statements are in a port context.

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Current organizational policy supports the harmonization of safety, productivity and service quality</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>C2</td>
<td>Current operations in port generally indicates a balance in safety, productivity and safety</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>C3</td>
<td>Commitment to harmonizing the three elements above can be improved</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>C4</td>
<td>Awareness of policy is enough to inspire commitment to ensure port performance</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>C5</td>
<td>The implementation of an efficient safety system is a heavy financial burden on organizations</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
Kindly indicate your agreement/disagreement with the following statement by ticking the appropriate box (□). The statements are in a port context

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>A balance between an efficient safety system with productivity can be sustained with a cost-effective approach</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>D2</td>
<td>Preventive maintenance has more cost than benefits</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>D3</td>
<td>A cost-effective maintenance approach can be a tool for obtaining optimum port performance with safety</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>D4</td>
<td>Commercial pressure for service delivery hinders progress towards the achievement of a balance between safety, productivity and quality of service</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Kindly indicate your viewpoint to the following statements by ticking the appropriate box (□) and/or stating your thoughts in the text box. The statements are in a port context

| D5  | Kindly name any safety related problem that affected quality of service and productivity in the port of your operations? | □               |
| D6  | Kindly state how the problem was resolved? □               |
| D7  | In your opinion what do you think can enhance the efforts of organization to reach a balance in these three areas (safety, productivity and quality of service) □ □ |
Kindly indicate your agreement/disagreement with the following statement by ticking the appropriate box (□). The statements are in a port context.

<table>
<thead>
<tr>
<th>No.</th>
<th>Statement</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Uncertain</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>Reduction of workplace accidents contributes to the enhancement of productivity</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>E2</td>
<td>Unsafe port operations are justified provided that these operations lead to significant profit margins for the port.</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>E3</td>
<td>For sustaining a good port reputation, it is good to increase spending on infrastructure maintenance for optimum port efficiency</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>E4</td>
<td>Issues of inadequate control in the area of marine pollution is an indicator of poor safety culture</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>E5</td>
<td>Reputation of a port is not necessarily important when selecting port for commercial activities</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

Kindly indicate your viewpoint to the following statements by ticking the appropriate box (□) and/or stating your thoughts in the text box. The statements are in a port context.

E6 Given that your advice is needed for your company to choose a port for business activities, kindly select which of these options would influence your decision:

   a) A port which prioritizes safety over its operations
   b) An efficient port with an average safety record
   c) Its productivity level only as safety is not much of a concern to me
   d) Any other reasons apart from the above

If you chose (d) or have any additional remarks, kindly state.
Kindly indicate your agreement/disagreement with the following statement by ticking the appropriate box (□). The statements are in a port context.

<table>
<thead>
<tr>
<th>E7</th>
<th>Statement</th>
<th>Very Low</th>
<th>Low</th>
<th>Average</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Overall level of safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Efficiency of Vessel Traffic Management service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>Quality of the conduct of pilotage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>Efficiency of tugboat services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e)</td>
<td>Quality of mooring operation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>Quality of port infrastructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g)</td>
<td>Quality of cargo handling operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h)</td>
<td>Average loss of productive time due to lack of implementation of a safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>mechanism (e.g. Portable Pilot Unit: for restricted visibility, faulty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>equipment etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>General overview of a balance between safety, efficiency and quality of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>service</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>