

**UNIVERSITI TEKNOLOGI MARA**

**OPTIMAL BERTH ALLOCATION  
FOR TANKER VESSELS:  
EVALUATING COST-EFFICIENT  
QUEUE PRIORITIES  
VIA SIMULATION**

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## **ABSTRACT**

All parties involved in maritime supply chain are striving for supply chain efficiency. Vessels arrive at the port over time and aim for departure within a specific time frame. Problems with berth allocation were investigated, and a methodology was devised to reduce departure delays and total service time, endeavouring to reduce demurrage as a penalty cost. This study is being carried out in response to recent massive congestions from an Oil and Gas refinery terminal in one of Malaysia's safe ports which have been caused by a boom in oil trading and fuel bunkering. This issue isn't just highlighted due to the penalized cost which incurred but also to show the hindsight of congestion towards vessels' safety. This study presented a multi-objective continuous berth allocation improvement model with priority to address this issue. On the basis of an examination of berth waiting time, the suggested model investigated the relationship between arrival and queue priority of calling vessels, and generated weight vectors for demurrage penalty cost. Simulations on models were used to compare and verify different parameter techniques on their upshot to the overall terminal performance. Further analyses were done to determine the influence of the demurrage cost ratio between priority based on vessel arrival, cargo size, and demurrage rate on waiting time in line. Aside from this research, various supply chain inefficiencies and reasons of demurrage costs have been examined for future improvement, along with potential solutions. However, because these solutions have been noted to be of long term planning, the vessel queue priority models can be used as an immediate solution to reduce waiting times and save money, hence improving supply chain efficiency and profitability.

Keywords:

Simulation model, berth allocation, waiting time, queue priorities, demurrage, tanker vessels

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# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Introduction**

This chapter starts with the global scenario of growing maritime transportation in vessel chartering in Malaysian Oil and Gas Industry, then it is narrowed down to the efficacy of vessel berthing allocation for more productive berthing arrangements. This writing will be followed by the significance of the few elements that contribute to the cost saving of chartering period. Next, problem statement, objectives of research and questions of research are presented. Scope and significance of the study are also presented in this chapter.

### **1.2 Background of the Study**

With over billions of tonnes of products transported by sea each year, maritime transportation is one of the most essential modes of freight transportation. Maritime transport, which accounts for more than four fifths of global merchandise trade by volume, remains the backbone of globalised trade and the manufacturing supply chain, reflecting changes in the global economy and commercial activity. As far as the world is concerned on the more globalised and interlinked, international logistics and maritime industries are experiencing challenges as well as enjoying greater business opportunities.

In this regard, transportation is becoming a more strategic business function because transport costs are accounting for a larger percentage of the cost of goods sold. In addition, delays in transit time can undermine enterprise performance, affecting the organization's competitiveness. Consequently, ports are now seriously exploring the potential of the supply chain management concept. Effective supply chain management is an essential strategy for enterprise success in global and e-markets to get products to market faster and at a minimal total cost.